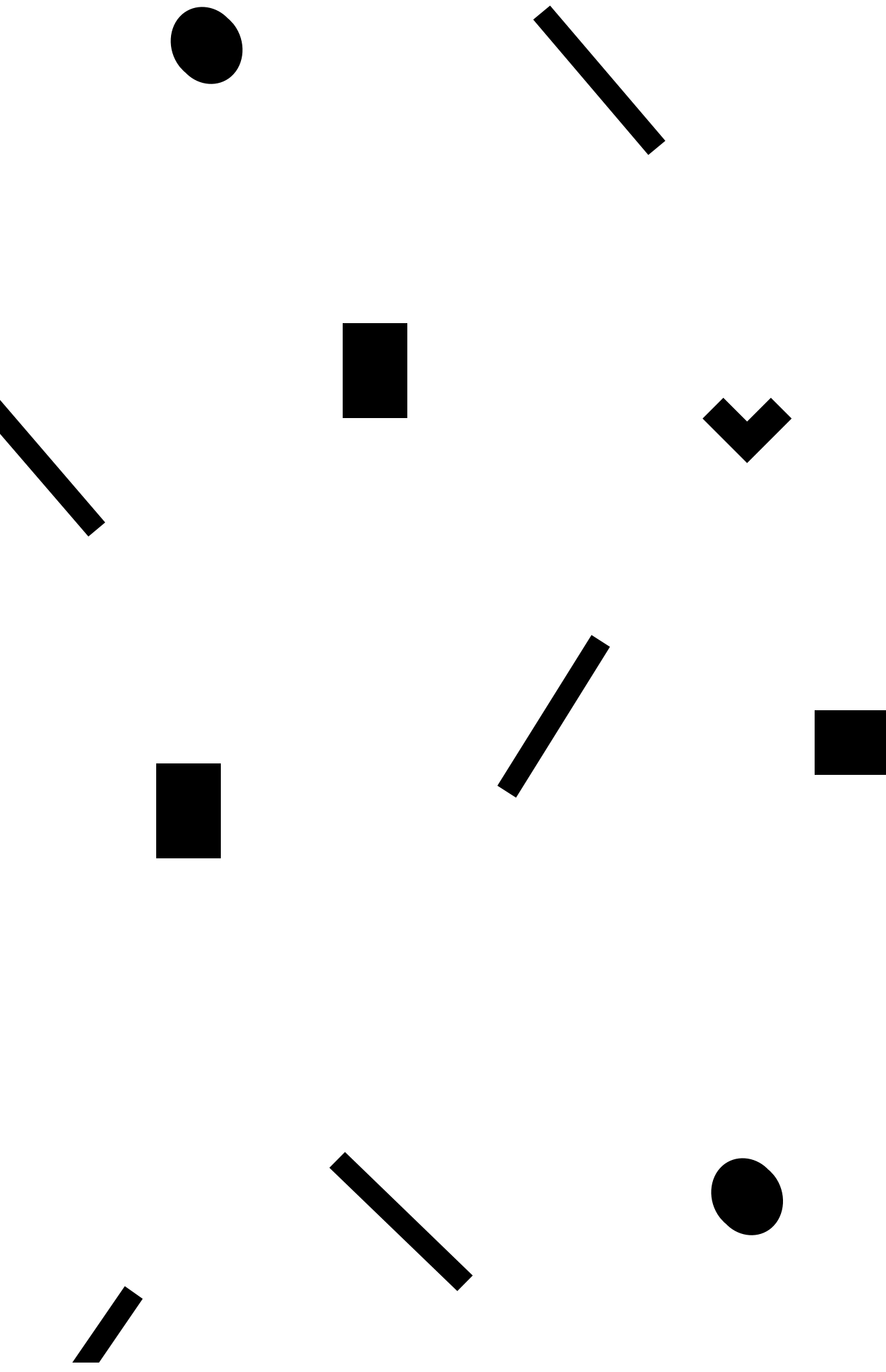
ANNA AALTO & LAURA MONTONEN(EDS.)

Smart Cities in Smart Regions 2016

Conference Proceedings

THE PUBLICATION SERIES OF LAHTI UNIVERSITY OF APPLIED SCIENCES, PART 27

LAMK Lahden ammattikorkeakoulu
Lahti University of Applied Sciences



ANNA AALTO & LAURA MONTONEN(EDS.)

Smart Cities in Smart Regions 2016

Conference Proceedings

THE PUBLICATION SERIES OF LAHTI UNIVERSITY OF APPLIED SCIENCES, PART 27

The publication series of Lahti University of Applied Sciences, part 27

Editor-in-chief: Miia Willman
Layout: Rebekka Lemmetty, Mainostoimisto SST Oy
ISSN 2342-7507 (net publication)

Foreword

Dear readers,

the first International Smart Cities in Smart Regions 2016 Conference organized by Lahti University of Applied Sciences took place in May 10 - 12, 2016 in the Sibelius Hall, Lahti, Finland.

The Conference offered an excellent meeting, networking and discussion forum that brought together thinkers, planners and practitioners from academic world, business and public sector. During the conference latest ideas, research results and innovations were discussed and disseminated. Almost 100 presentations along with esteemed keynote speakers and panelists provided deep insight on the latest trends relating to the creation of more 'Smart Cities in Smart Regions'.

The Conference Proceedings includes articles of the main themes:

A. Future Development of Regions

Future Regional Development theme focuses on different regional development organisations and their role in value creation and regional growth. The key question is how to stimulate regional development and contribute to regional competitiveness in the future.

B. Citizens and Urban Sustainability

Citizens and Urban Sustainability theme introduces key topics of sustainable and humanity urban development which enables to create a better living environment for citizens while preserving the life support systems of the planet. It presents an overview of the digital innovations for smart urban living, the clean technologies and transfer processes as well as diverse methods for promoting wellbeing and social cohesion.

C. Smart Industry and Innovation

The world is in anticipation of a fourth industrial revolution. This revolution is driven by giant leaps in digital technologies and promises to radically alter the face of industry in the coming decades. The uptake of industrial internet and internet of things in manufacturing create new value chains for the traditional industries. Innovations will underline the importance of digital and sustainable business solutions as key drivers for success.

I would like to thank all writers, participants, organizers and partners for their efforts in making the early steps of Smarts Cities in Smart Regions 2016 Conference so successful. Hope to see you all at the Smart Cities in Smart Regions 2018 Conference.

Outi Kallioinen

President, Lahti University of Applied Sciences

Lighting the fire – Story of Smart Cities in Smart Regions

Alan Barrell

Prof. Alan Barrell is the very first Honorary Research Fellow of Lahti University of Applied Sciences and is one of the keynote speakers in the coming up event Smart Cities in Smart Regions 2016. He says that the idea of the conference came up during one of his visits to Lahti. “The Idea came up when I was here for one of my earlier visits. When I saw what was going on, not only in the university but particularly at LADEC, where there is a big clean technology movement. Lahti been a modern city and LADEC been interested in this whole idea of smart cities - we discussed, it came up and during my last visit, we actually made a decision collectively to do it and the plan begun - the fire was lit, if you like, at that point in time and has been burning ever since brighter. So that’s how it all started and it has developed into what will be a remarkable conference here in May”, Alan says.

The initial discussion and the evolution of the name for the conference was a group effort. Alan’s role in the conference has been helping to design the program and making connections with some of the keynote speakers like Markku Markkula and Prof. Doug Crawford-Brown who is one of the leading authorities in the world for climate change. “I knew him, I was able to invite him - and to also encourage the Chief Executive of Cambridge Cleantech to come and talk”, Alan tells about Doug Crawford-Brown and Martin Garratt.

The program of the conference is versatile. “I think within smart cities, we will see urban agriculture. We don’t have to think of agriculture as only something distant. There’s a Finnish student at one of the universities here, who developed and is working on a system where by using aquaponics with fish. You can eat the fish, and they fertilise the soil in which you grow, let’s say lettuces. Those lettuces can be then taken in their growing grate to the superstore, so the customer can pick their own lettuce. But the real big themes will be transportation, energy conservation, the effective use of devices, electricity, the easing of problems for people who are less mobile - there’s a whole range of things”, Alan describes the program.

Attending the conference means contribution to the community and to the knowledge. ”I would hope that we get a lot of input from people who are passionate about the smart city issues. And one thing we do want to make sure happens is that businesses engage, because we are still living in a world where sometimes business and the universities or academia are no so well connected”, Alan says. The call for proposals for oral presentations and posters on the themes and subthemes of the conference was closed on February 14th. Total of 116 abstracts were received and are currently under review. All authors will receive the results of the review by March 11th.

The connection between Lahti UAS and University of Cambridge has been very progressive over the last three years - particularly in the fields of innovation and entrepreneurship. There are plans for taking the co-operation even further by introducing short term scholarships for teaching staff and possibly those who have the master’s degree and want to go under the Ph.D will be able to do it through Anglia Ruskin, in Cambridge in the future. ”There is an online one year programme, post graduate diploma in entrepreneurship which I hope more people here will do and hopefully more and more of the students in master-level can do the Ph.D”, Alan says.

Designing the Logo of the Conference

Simo Heikkinen is a fourth-year graphic design student at Lahti UAS and the designer of the logo of the conference. Smart Cities in Smart Regions will be an annual conference, so all its visual features should be designed in a way that they will endure time. “I thought some abstract design would suit well for this”, Heikkinen says. “Fire is something that makes people come together, so I started to design an abstract pattern as a logo for this conference - and it suited for the client as well”, he continued. “I chose purple as a colour because it is compatible with the graphic appearance of Lahti UAS. It is also a dignified and royal color and brings out the value of the conference”, Heikkinen says.

Simo Heikkinen

Julia Ojapelto is Head of Graphic Design at Lahti UAS and has been a mentor for Simo Heikkinen in this project. She sees this of this kind of collaboration beneficial to the students and to the University. “The student will receive experience, course credit and to add this project to own portfolio”, Ojapelto says. It is a local design, so it will also bring additional value to the conference.

Text and pictures: Heidi Kouvo
Article first published in the Internet pages of Lahti University of Applied Sciences

Content

Introduction

Review Article: A review article provides a significant insight and critical analysis of the literature into a specific topic, deemed to be of high relevance. The quality of the references and their assessment is critical for this type of publication.

Research Article: Thorough experimental or analytical studies performed in a relevant thematic field that use consistent methods and present results based on empirical data.

Pilots, Demos and Experiments Case: A Pilot, Demo or Experiment case is a well-documented case study or report of a practical, implemented technological innovation or development project. This type of full paper provides an analysis of a specific problem, description of implemented solution and evaluation of outcomes and impact.

THEME A. Future Development of Regions

Regional development enhances competitiveness, helps to create an economic balance, develops industrial and commercial activity and supports employment. The objective is to increase regional competitiveness and reduce differences in development between and within regions, while promoting citizens' wellbeing and competences.

Regional development takes place increasingly often as multilateral collaboration between organizations and experts operating in the region. In practice, the preparation encompasses regional policies of industry, employment, education and innovation implemented in the form of long-term collaboration and measures, with emphasis on the renewal of the region. This renewal builds capacity for the improvement of capabilities to respond and adapt to the negative impacts of structural changes.

Future Development of Regions theme focuses on different regional development organizations and their role in value creation and regional growth. The key question is how to stimulate regional development and contribute to regional competitiveness in the future. How do cities and regions best encourage growth and value creation in their area? Who should be involved in developing a whole region? What forms of collaboration have proved to be fruitful? What kind of policies are effective? How to use agile methods in systemic change? What is the role of higher education institutes in regional development?

As a response to recent policy development in EU, there is a growing recognition of the potential role of universities in local and regional development and innovation in the context of smart specialization. Higher Education Institutes are rethinking their roles and responsibilities, and engaging in learning and co-production of knowledge beyond the campus walls, resulting in discoveries with impact to society and regional development.

Chancing working life creates new demands for higher education institutes to equip the future experts with a new set of skills required in the dynamic working environment. The right skills, a sharp focus, and a passion for learning and adaptation are a must for enterprises to succeed in the digital universe of tomorrow. New learning methods and more seamless cooperation with business sector are called for. There is a growing recognition of the potential role of universities in local and regional development and innovation as well as in promotion of entrepreneurship.

Anttonen, T.

Title: A Master Student Acting as a Teacher in a Bachelor Degree Programme
Pilots, Demos and Experiments Case

Abstract
This case study of practice was implemented at Lahti University of Applied Sciences, Faculty of Social and Health Care. The main objective for this study was to develop the competence based Master degree curriculum and to offer effective and authentic learning experiences for both Bachelor and Master degree students. A Master Student Acting as a Teacher in a Bachelor Degree Programme – course was organized for the first time in 2015. The essential requirement is that participating Master Students have professional competences and expertise which are based on working experience in a professional social and health care context. A focus group of four Master Students was interviewed by two researchers. Researchers had a dual role in a process. The written data was categorized by using content analysis qualitative method. The main conclusion of this case study of practice is that the course was real beneficial for all of those involved. The results of this pilot project have encouraged to enhance and develop these methods and practices in future years.

Keywords: Master student, competence based curriculum, professional expertise

Introduction
This case study of practice was implemented at Lahti University of Applied Sciences, Faculty of Social and Health Care. The main objective for this study was to develop the competence based Master degree curriculum and to offer effective and authentic learning experiences for both Bachelor and Master degree students. A Master Student Acting as a Teacher in a Bachelor Degree Programme – course was organized for the first time in 2015. The essential requirement is that participating Master Students have professional competences and expertise which are based on working experience in a professional social and health care context. Taking part in this course gives Master Students an experience of working as a teacher in an authentic learning environment in higher education. Also Bachelor Students are exposed to an up to date knowledge and perspective of real working life cases. Lecturers from the Faculty of Social and Health Care mentored Master Students and worked in a close partnership with both participating Master and Bachelor degree level students. This means, that personalized and informal learning occurred in an authentic learning process. Authentic learning is defined as a concrete teaching experience, which gives the opportunity for the Master Student to reflect, act and assess as a qualified teacher in a real life higher education environment.

Implementation
A Master Student Acting as a Teacher in Bachelor Degree programme – course was a part of Advanced Elective Studies which is an essential section of the

overall Master degree curriculum. The scope of the course was five credits. Master Student applicants were informed about Moodle learning environment by email. All materials such a description of the course, an application form, planning, implementation and assessment documents were downloadable and available to all Master Students both in Finnish and in English. There are also degree programmes available in English, as well. There are three different degree programs at the Faculty of Social and Health Care, which are in the field of physiotherapy, nursing and social work. The most important element at the beginning of the process was that each Master Student examined curriculum of each Bachelor degree programs by him/herself. Which degree programme was chosen and applied for depended on Master student`s own background qualification and working experience. On the application form each Master Student described in detail the level of experience and competence they had compared to those details in the learning aims of the Bachelor degree curriculum. They were then asked to suggest the Bachelor Student courses that they were most suited to teaching and working on e.g. acute care nursing or Operating Theatre experience. If a Master Student had any previous experience of teaching and mentoring they were asked to describe it. So, the first self-assessment was done by the Master Students themselves.

When the Master Student was accepted onto A Master Student Acting as a Teacher in a Bachelor Degree Programme – course by a Principle Lecturer, a specific Lecturer was nominated as his/her personal mentor. All Lecturers were fully qualified, had many years' experience both in social and health care and in higher education. After nomination the next step for each Lecturers and Master Student was to agree an initial plan of action. Planning, implementation and assessment of Master Student competences and expertise as a teacher was divided in three phases: self-assessment, assessment by Bachelor Students and assessment by the Mentor Lecturer. Also informal learning occurred in the process. Participating in this course was an opportunity for the Master Student consider teaching as a new career. The mentor-student relationship lasted approximately six months.

Data collection

A focus group of four Master Students was interviewed by two researchers in autumn 2015. Researchers had a dual role in a process. At the time of the interview there were two Master Students who had finished their learning process and two Master Students who were still in the learning phase. One Master student provided her opinions in writing as she was unable to participate in the focus group interview. All participants were volunteers. One researcher was responsible for the organisation of interview themes while the other observed and made written notes. Participating Master Students were told that researchers might contact them later to ask further questions and more details. The interview was conducted in an open and friendly manner. The interview format allowed Master Students to comment and question each other on their experiences.

Analysis and outcomes

The interview structure involved the following themes: information and application process, planning process and mentoring, learning environments and methods, interaction between Mentor Lecturer and Bachelor Students, feedback from Mentor Lecturer and Bachelor Students and finally suggestions for further development.

The written data was categorized by using content analysis qualitative method. Results were as follows:

1. Information and materials for the course and learning outcomes were available and gave an adequate amount of information, but the actual workload was difficult to estimate and calculate. An application process started independently. This means that Master Students examined the curriculum of the Bachelor degree programme by themselves. This was useful experience and self-assessment was relatively easy to do. All available downloaded material on Moodle learning environment was found to be comprehensive and easy to access. One challenge was how to allocate working hours per credit as there were no clear guidelines. The scope of the course was five credits, but it was up to Mentor Lecturer how many credits Master Student taught in practice or Master Students made a decision by themselves. An average number of credits described as Bachelor students´ workload was two credits. It seems that learning outcomes were not clearly evident in all situations. The three credit was used for a knowledge seeking, planning and assessment process.

2. Working as a member of the teaching team was rewarding, but own contribution by the Master Student was in some cases limited. Some of Master Students found that similar learning materials already exist and they were unable to apply they own ideas. Mentor Lecturers were highly qualified and experienced in higher education. On the other hand Master Students had practical knowledge of the latest social and health care practices and techniques. However this was not always applicable.

3. The learning methods used were versatile and widely utilized in different learning environments such as online learning and simulation environments. One Master Student was particularly innovative creating learning tools based on quiz games. The mobile learning environment from Lahti University of Applied Sciences, a bus called Linkku, was also utilized during the course

4. Learning assignments should be clear and properly scheduled, but on the other hand there have to be some flexibility and capability to make changes when needed. Contact learning were experienced rewarding. One to One meetings were found to be particularly useful. Teaching was done in both Finnish and English languages but it was noticeable that when Finnish students attended courses taught in English they found the work more demanding. It needs to be keep in mind that each native Finnish speaking Bachelor Student has to pass 15 credits in English during the degree programme.

5. Interaction with Bachelor Students was considered to be fluent even though a number of students in each group was high. Master Students found that even with interesting real working life case studies some Bachelor Students were more engaged then others. Some Master Students said that they found the presence of the Mentor Lecturer in class to be a bit stressful. Bachelor Students emphasized that teachers need to have degree of authority and charisma to be really effective.

6. Mentor Lecturer - Master Student relationship was described to be supportive to seek a new knowledge and use existing competence based knowledge. The Master Students reported that they found Mentor Lecturers open to new ideas and approaches while the most rewarding and effective learning sessions were those that were informal.

7. Feedback from Bachelor Students was used to help develop new teaching methods and processes. Overall Bachelor Students were noted to be interested in the practical case studies that the Master Students implemented. It needs to be keep in mind that those Master Students who applied this elective study course were most likely already interested in teaching and mentoring new students.

8. Learning outcomes were reached except a higher education policy and an operational environment. During follow up meetings Mentor Lecturers said that working in this way had changes their perception of how the University could work.

Impacts

Further development proposals are that the impact on the teaching workload need to be clearly defined beforehand, particularly as the Master Students have no previous teaching and mentoring experience. It need to be clear to both Master Student and Mentor Lecturer that a five credit course segment needs a careful planning, implementation and assessment process.

Master Students should be familiar with the Bachelor Student curriculum and the level of achievement necessary. The need to fully understand the level of knowledge and capability that Bachelor Students already have. In addition that the whole curriculum is designed to steadily the Bachelor students to becoming a social or health care professionals.

Advanced Bachelor degree students could be utilized as a co-teacher in learning processes which are organized for beginner students. For example third year students could organize First Aid courses for first year students.

Mentor Lecturer need to allow Master Student to operate independently and to intervene only when necessary. The role of a Mentor Lecturer should be as a coach. The coach should not provide answers or existing materials, but encourages and supports Master Student to seek a knowledge and answers, be innovative and create a learning process of his/her own.

Master Students should get familiar with the operational environment and policy of higher education in advance before starting the course. There are a certain risks, if policies in higher education are not clear, for example Bachelor Student have a right to complain about their assessment. Feedback from all students is welcomed and valuable. At Lahti University of Applied Sciences course quality is closely monitored and all student feedback is reviewed regularly.

Conclusions and recommendations

The main conclusion of this case study of practice is that A Master Student acting as teacher in a Bachelor Programme – course was real beneficial for all of those involved. The lessons learned will be incorporated and used in future courses. The project enhanced a sense of community, provided the basis for better Lecturer-Student interaction and highlighted the real benefits of the Mentor Lecturer- Master Student approach. The results of this pilot project have encouraged to enhance and develop these methods and practices in future years.

References

Ammattikorkeakoulujen tutkimus-, kehittämis- ja innovaatiotoiminta. Arenen TKI-esite http://www-99-srv.blcnet.fi/~arene/sites/default/files/PDF/TKI-esite_FI_10%2011%202014_sivut.pdf (18.11.2015)

Cross, J. 2006. Rediscovering the Natural Pathways That Inspire Innovation and Performance. 1st Edition. Pfeiffer

Kelo, M., Haapaniemi, P., Luukkanen, M. & Saloheimo, T. 2012. Kohti työelämäläheistä oppimista. Työelämäyhteistyön kehittämishaasteet terveys- ja hoitoalalla. Metropolia ammattikorkeakoulun julkaisusarja http://www.metropolia.fi/fileadmin/user_upload/Julkaisutoiminta/Julkaisusarjat/AATOS/PDF/AATOS_4-12_Kohti_tyoelamalah_.pdf (17.11.2015)

Kotila, H. (toim.) Duunista opintopisteiksi. Opas työn opinnollisemisesta. OSATAAN! – Osaamisen arviointi työpaikkojen ja ammattikorkeakoulun yhteistyönä http://blogit.haaga-helia.fi/osataan/files/2013/09/Osataan_verkkoon1.pdf (17.11.2015)

Lahden ammattikorkeakoulu 2015. Lahden ammattikorkeakoulun strategia 2020 http://www.lamk.fi/lamk-oy/strategiat/Documents/lamk-strategia-2020.pdf (viitattu 18.11.2015)

Leppisaari, I. 2014. Pedagogisella vertaiskehittämisellä avoimia, autenttisia ja yhteisöllisiä oppimisympäristöjä Virtuaaliammattikorkeakouluverkostossa. Journal of Finnish Universities of Applied Sciences, No 1 (2014) http://www.uasjournal.fi/index.php/uasj/article/view/1554/1478 (18.11.2015)

Maassen, P., Kallioinen, O., Keränen, P., Penttinen, M., Spaapen, J., Wiedenhofer, R., Kajaste, M. & Mattila, J. 2012. From the bottom up. Evaluation of RDI activities of Finnish Universities of Applied Sciences. Publications of the Finnish Higher Education Evaluation Council 7:2012. Helsinki: The Finnish Higher Education Evaluation Council.

Ojasalo, K., Moilanen, T. & Ritalahti, J. 2015. Kehittämistyön menetelmät – uudenlaista osaamista liiketoimintaan. 3.-4.painos. Helsinki: Sanoma Pro Oy.

Raij, K. & Rantanen, T. 2010. Osaamisen käsite korkeakoulutuksen viitekehyksessä Teoksessa (toim.) Rantanen, T. & Isopahkala-Bouret, U. Näkökulmia ylemmän ammattikorkeakoulututkinnon tuottamaan osaamiseen sosiaali- ja terveysalalla. Laurea-ammattikorkeakoulun julkaisusarja A•71. Vantaa, Laurea ammattikorkeakoulu, 14–26.

Rantanen, T., Isopahkala-Bouret, U. & Järveläinen, E. Ylempi ammattikorkeakoulututkinto työelämän näkökulmasta http://www.uasjournal.fi/index.php/kever/article/viewFile/1186/1074 (14.11.2015)

Rantanen, T. & Isopahkala-Bouret, U. Näkökulmia ylemmän ammattikorkeakoulututkinnon tuottamaan osaamiseen sosiaali- ja terveysalalla. Laurea-ammattikorkeakoulun julkaisusarja A•71. Vantaa, Laurea ammattikorkeakoulu, 129–150.

Sarajärvi, A., Salmela, M. & Eriksson, E. 2013. TKI-työn ja opetuksen kehittämisprojektin tulokset, kehittämishaasteet ja suositukset. Journal of Finnish Universities of Applied Sciences 1 http://uasjournal.fi/index.php/uasj/article/view/1443/1368 (17.11.2015)

Seinäjoen ammattikorkeakoulu. Tutkimus-, kehittämis- ja innovaatiotoiminnan arviointiraportti. 2010. Seinäjoen ammattikorkeakoulun julkaisusarja B. Raportteja ja selvityksiä 43.

Suomi osaamisen kasvu-uralle. Ehdotus tutkintotavoitteista 2020-luvulle. Opetus- ja kulttuuriministeriön työryhmämuistioita ja selvityksiä 2015:14.

Rantanen, T. & Järveläinen, E. 2010. Ylempi AMK-tutkinto työelämän kehittämistutkintona. Julkaisussa Rantanen, T. & Isopahkala-Bouret, U. (toim.) Näkökulmia ylemmän ammattikorkeakoulututkinnon tuottamaan osaamiseen sosiaali- ja terveysalalla. Laurea-ammattikorkeakoulun julkaisusarja A 71. Helsinki: Edita Prima Oy.

Rantanen, T., Jyrkkiö, E. & Järveläinen, E. 2010. Kompetenssit sosiaali- ja terveysalan ylemmän ammattikorkeakoulututkinnon opetussuunnitelmissa. Julkaisussa Rantanen, T. & Isopahkala-Bouret, U. (toim.) Näkökulmia ylemmän ammattikorkeakoulututkinnon tuottamaan osaamiseen sosiaali- ja terveysalalla. Laurea-ammattikorkeakoulun julkaisusarja A 71. Helsinki: Edita Prima Oy.

Caird, S., Hudson, L., Kortuem, G.

Title: Communication on Smart City Evaluation and Reporting In UK Cities

Pilots, Demos and Experiments Case

Abstract

Global trends towards urbanisation are associated with wide-ranging challenges and opportunities for cities. Smart technologies create new opportunities for a range of smart city development and regeneration programmes designed to address the environmental, economic and social challenges concentrated in cities. Whilst smart city programmes have received much publicity, there has been much less discussion about the evaluation and measurement of smart city programme outcomes. Existing evaluation approaches have been criticised as non-standard and inadequate, focusing more on implementation processes and investment metrics than on city outcomes and the impacts of smart city programmes. Addressing this, the SmartDframe project aimed to examine city approaches to the evaluation of smart city projects and programmes and reporting of their impacts on city outcomes. A number of 'smarter' UK cities were invited to participate, with agreement by city authorities from Birmingham, Bristol, Manchester, Milton Keynes and Peterborough to be interviewed about their smart city work. The findings provide a series of smart city case studies that exemplify contemporary city practices, offering a timely, insightful contribution to city discourse about existing and best practice approaches to evaluation and reporting of complex smart city projects and programmes.

Keywords: smart cities, smart city evaluation, city reporting, smart city programmes, UK cities

Introduction

This communication reports on the SmartDframe project which aims to examine city approaches to the evaluation of smart city projects and programmes and reporting of city outcomes and impacts, through a series of case studies, in smarter UK cities including Birmingham, Bristol, Manchester, Milton Keynes and Peterborough. Linked to the Open University-led MK:Smart programme (mksmart.org/), which is part of Milton Keynes' Future City programme, the SmartDframe initial findings and analysis aim to inform city approaches to smart city evaluation.

Background

Global trends towards urbanisation are associated with wide-ranging challenges for cities creating complex pressures on city environments, infrastructure, buildings, networks, resources and people. City authorities need to develop infrastructures, systems and services to help citizens live, work, play and travel - ensuring that cities can develop economically, whilst protecting the environment and quality of life for citizens. The rise of smart city thinking is a direct response to such challenges, as well as providing a means of integrating fast-evolving technologies into the living environment. Smart technologies offer cities and citizens exciting solutions for new

services provision, integrated city infrastructures, as well as opportunities for innovation, digital entrepreneurship, sustainable city development and regeneration, and to capitalise on novel sources of real-time data.

While smart city programmes have received much publicity there has been less discussion about evaluation of smart city projects and programmes, and measurement of their outcomes for cities. There are several key reasons why it is important to evaluate smart city work. Nearly 90% of EU cities with over 500,000 inhabitants are smart cities already (EU Directorate-General 2014, 9). A second reason is the potential growth and value of the global smart technology industry estimated to be worth $408 billion dollars by 2020 (although there are different estimates) (Bis 2013a, 2). A third reason is the proliferation of smart city programmes and projects designed to address a broad range of city challenges, and bring opportunities for smarter: governance, economic development, citizenship, living, environments and mobility, whilst requiring effective evaluation to prove their value and benefits delivered to cities and citizens.

Existing evaluation approaches have been criticised as non-standard and inadequate, and more focused on implementation processes and investment metrics than city outcomes and impacts (Bis 2013b, 3-47). Currently there is no standardised smart city measurement indicator framework accepted by cities to measure city performance, and to help evaluate progress against city strategies aligned with measurement indicators and Europe 2020 strategies, according to the European Innovation Partnership on Smart Cities and Communities (EIP-SCC), which observed that '...there is presently no single, broadly-accepted indicator framework that reflects the 'smart city' approach...'. (EIP-SCC 2013, 16). Neither is this helped by the large number of smart city definitions (Albino et al. 2015, 3-21), nor the observation that most so-called smart cities are at different phases of becoming smart cities, according to the International Data Corporation (IDC) Smart City Maturity Model, based on benchmarking cities against maturity indicators (IDC 2013, 2). Reflecting this, the British Standards Institution (BSI) defines the smart city as requiring 'effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens' (BSI 2014b, 12).

Considerable work is currently on-going to address challenges associated with smart city evaluation. This includes work on standards by the International Standards Organization (ISO), European Committee for Standardization (CEN) and BSI. There is also significant work on evaluation driven by the European Commission (EC), including EUROCITIES CITYKeys (citykeys-project.eu) which provides EC funding for cities to develop and validate smart city measurement frameworks and measures of their Key Performance Indicators (KPIs), as well as data collection procedures to support standardized and transparent European-level monitoring, and enable comparability of smart city solutions across European cities.

Moreover, there are a number of city measurement indicator frameworks specially designed to support city approaches to smart city evaluation, including The Smart City Reference Model (Zygiaris, 2013), The European Smart Cities Ranking Model (Giffinger et al. 2007), The Smart City Index Master Indicators (Cohen, 2014) and The Smart City Maturity Model (IDC, 2013). There is also The Ericsson Networked Society City Index (Ericsson, 2014); and IBM's Smarter City Assessment Tool, which focuses on assessing cities' capabilities as instrumented, interconnected and intelligent (ibm.com). General city indexes are also a major source of indicators, measures and data

(See Moonen and Clark, 2013), such as The 'Cities of Opportunity Index' of leading cities (PricewaterhouseCoopers/Partnership for New York City, 2014). However, surprisingly few general city indexes with a published methodology open to scrutiny have identified specifically smart city indicators and metrics.

Research Methods

To support future city strategies, it is important to understand the benefits of smart city project and programme developments by examining evaluation, measurement and reporting on the outcomes for cities. The SmartDframe project aimed to examine city approaches to evaluation of smart city work and reporting of city outcomes and impacts, through a series of city case studies. Key research questions included:

- How are cities approaching evaluation of smart city projects and programmes?
- How effective are the approaches taken?
- How are cities reporting on smart city work?

A selective number of city and local authorities representing 'smarter' UK cities were invited to participate in SmartDframe case study research, including Birmingham, Bristol, Manchester, Milton Keynes and Peterborough. Representatives of Glasgow City Council and The Greater London Authority were also invited, although not included at this stage. Cities were selected because they were active in having a large number of funded smart city projects and programmes, and because they were strongly involved in smart city networks, for example EUROCITIES, EIP-SCC, Small Giants and UK Core Cities.

Selected cities also represented cities with different population sizes, a useful indicator for city stratification. According to the EC classification (EC 2012, 5): Birmingham is an XXL-sized city (over 1,000,000 inhabitants); Manchester an XL-sized city (500,000-1,000,000 inhabitants); Bristol and Milton Keynes (as a new city) represent large-sized cities (250,000-500,000 inhabitants); and Peterborough a medium-sized city (100,000-250,000 inhabitants). Small cities with populations of 50,000-100,000; and global cities with more than five million inhabitants were not included in the SmartDframe analysis.

Local government authorities representing these cities agreed to be interviewed during 2015. The authorities understood the smart city concept in terms of their smart city and future city programmes which involve partnerships between business, universities and the public sector. Some programmes were led by Councils, for example Manchester's 'Smarter City Programme'; and Milton Keynes 'Future City Programme'. Others were led by Councils and their Directorates, for example, Birmingham's 'Smart City Commission' supported by Digital Birmingham; 'Smart City Bristol' led by Bristol Futures and delivered through Connecting Bristol; and 'Peterborough DNA' led by Peterborough City Council and Opportunity Peterborough. Birmingham was the only city with an established Smart City Commission and published 'Smart City Vision and Roadmap', although Manchester and Bristol cities were considering producing a Smart City Road Map.

The case study analysis was subsequently based on reviews of city reports, and interviews with key local government authorities. City case study data were analysed in terms of: strategy and action; approach to evaluation; effectiveness of approach; reporting on city outcomes; challenges and improvements.

Smart city evaluation practices
The case study analysis revealed a dynamic, varied and detailed picture of the cities' approaches to smart city evaluation and reporting (Caird et al. 2016).

Project-focused evaluation
The cities' approach to smart city evaluation were currently focussed at a project level, and primarily driven by the external funders' requirements. For example, EC funders were interested in clear measurement indicators applied to support data sharing across European-funded projects; whereas Innovate UK funders of Future Cities Demonstrator projects currently placed more importance on demonstration of the innovation concept, although were beginning to address evaluation issues.

Most of the cities were in the early maturity phases of smart city development (IDC 2013, 2), where demonstration of the innovation concept validity may be an appropriate initial evaluation before projects can be scaled to the city. Manchester authorities said "Inappropriate evaluation could kill a good idea if conducted too early." Milton Keynes and Peterborough authorities were also cautious of premature evaluation of innovation projects, fearing it might crush opportunities arising from smart city work.

Establishing baseline measures for projects was considered a good approach to demonstrate validity and progress. Several cities, such as Birmingham, Bristol and Milton Keynes have already established KPIs and measures for projects; although only Birmingham had a formal Smart City Roadmap helping to establish actions and measures of progress towards city targets. Birmingham authorities recognised the importance of baseline measures for monitoring progress, and for identifying projects with the biggest city impacts and replication potential. Peterborough authorities intended to establish baseline measures from the outset with the Phase Two Plan for their DNA programme.

Current smart city evaluation work
The cities evaluation practices reflected an awareness of ongoing smart city evaluation work, such as the BSI work and the EUROCITIES CITYKeys programme (citykeys-project.eu). Most of the cities were aware of the BSI Smart City Framework (PAS181), which provides guidance on the articulation of smart city benefits, and mapping, tracking and baselining them against measures over time (BSI 2014, 40-49). The EC's increasing emphasis on evaluation has also influenced the cities' work to address smart city challenges, including Birmingham and Manchester's involvement with the CITYKeys project. However, the city authorities were less familiar with the details of smart city indicator frameworks and city indexes available to support evaluation.

Plans to establish a smart city evaluation framework
The local government authorities intended to undertake evaluation at the city level, and most were working in partnerships, mainly with local universities. Although most had not advanced evaluation plans, Birmingham had made significant progress in developing a city-level evaluation framework aligned with their smart city strategy and Roadmap. They had already conducted research looking at various evaluation frameworks, models and standards; worked with Arup to trial an energy-focused smart city framework; and were planning to work on evaluation with their partner KPMG, a global professional service company. However, their priority was to get projects operational, and "they did not want to get side-tracked on measurement". Nevertheless they recognised "It is not just about delivering projects, what we want to do is

identify where we are making the impacts, how we get things to change, what difference we are making to citizens and businesses."

Through Manchester's work on the Advisory Board for CITYKeys, they were leading smart city benchmarking work across city areas, including economic development, governance, city infrastructure, transport, energy and citizen engagement. Manchester were also developing an Impact Assessment Framework in partnership with universities, for one of their European-funded smart city projects Triangulum (triangulum-project.eu/), where they planned to address city level impacts. They said 'Triangulum is providing the basis to get the Framework right, dealing with energy, transport, dealing with people; it's got the basic ingredients of the impact framework. Once it's working well it can be expanded in scale, geographically and thematically'.

However, most cities had not yet adopted an effective evaluation framework to measure the impact of smart city work on city outcomes. Milton Keynes authorities had developed many measures through their MK:Smart programme which could contribute to a smart city evaluation framework, although they faced challenges proving the impact of specific projects on city outcomes. Peterborough authorities were beginning to consider impact assessment, following an initial evaluation that aimed to improve their future city 'DNA programme'; reduce the complexity of projects; and address project scalability issues. Manchester and Milton Keynes authorities regarded smart city evaluation as being at an early stage, and did not think any cities had established a full evaluation programme yet. Birmingham authorities also acknowledged that no accepted evaluation approach to smart city work had emerged as yet.

Developing data intelligence

The cities' practices reflected an interest in developing data intelligence as part of their smart city approach. New mechanisms for city data generation, collection, and sharing, including through data hubs, were helping city authorities develop data intelligence, and beginning to inform city strategies. Birmingham authorities have started to explore how data intelligence works across their city, bringing together datasets and encouraging data sharing with other organisations. Milton Keynes authorities mentioned that the city already had significant volumes of real-time data streams and other datasets collected through the MK:Data Hub. Their focus was on enabling organisations to share data, and addressing barriers such as data ownership, bureaucracy and governance issues. Peterborough authorities have also established mechanisms for feeding data collected through their city projects to the Council's Central Intelligence Unit.

Bristol authorities identified the importance of opening up data to unlock new opportunities for the city, and were using real-time traffic data collected through the Traffic Control Centre to measure congestion in the city combined with data collected through the Bristol Open Data Portal. Manchester authorities mentioned that their smart city data has been informing city strategies, such as climate change, economic development and transport strategies. Hence, the potential to capitalize on smart data sources and data intelligence is beginning to be realised.

Formal reporting processes

All the cities established processes for reporting on city performance related to measuring progress on city objectives set out in the Community Strategies (which some cities have), or the city's Council Plan or Corporate Plans led by relevant Local Authorities. The larger cities including Birmingham, Bristol

and Manchester also publish Annual State of the City Reports. However, their smart city projects and programmes did not currently feed directly into their city performance reporting process, addressing statutory reporting obligations; and were therefore not subject to a formal political reporting process.

Whilst the cities had established a variety of formal and informal city reporting mechanisms, most of the formal reporting on smart city work has been driven by funding bodies; Birmingham's Smart City Commission also required quarterly reports. However, city councils typically report on hundreds of KPIs as part of formal city performance reporting, and many reported indicators have links to areas of smart city work i.e. energy, climate change, transport, waste and the liveability of the city. Bristol authorities suggested that a mechanism was needed to report how smart city projects and programmes contributed to existing city KPIs, and formal city performance reporting processes.

Influence on city decision-making

City authorities discussed how smart city work was beginning to influence city decision-making, particularly around city investment and development. For example, smart development work around Manchester airport; and the Bristol Energy Company (bristol-energy.co.uk/) that was intended to be 'smart from the start'; and Peterborough's Smart City Leadership event for public and private sector organisations working across city areas. City decision-making would benefit from establishing effective evaluation and reporting mechanisms addressing the value and impacts of smart city work.

Conclusions and recommendations

Initial analysis of the SmartDframe findings have identified a number of challenges for evaluation and reporting of smart city work. Key evaluation challenges identified by cities centred on how to measure the causal impacts of smart city projects and programmes on city outcomes, and prove the value of such interventions. The cities already have significant project data, although faced challenges of how to make sense of data, and deciding which methodology to use to measure the impacts of their smart city work. Cities were exploring the value of data intelligence to support city strategies and actions; and were beginning to develop use of data intelligence for evaluation and reporting, supported by developments in data standards and interoperability; and to consider the opportunities afforded by smart technologies for evaluation work.

City reporting challenges centred on establishing appropriate reporting structures, so that smart city work is embedded in city management structures to support communications about the value of their projects and programmes, and to show how smart city work contributes to city performance reporting, and statutory reporting obligations. A key issue is how to make good use of data intelligence to communicate the value of smart city work generally and to report benefits for cities.

Initial analysis of the SmartDframe findings suggests the following recommendations.

Smart city evaluation approaches should:

- Be appropriate to smart city project, programme and city levels.
- Build on baseline measures established to demonstrate progress against targets.

- Develop city mechanisms to capitalize on data intelligence through evaluation and reporting at smart city project, programme and city intervention levels.
- Build on current methodologies to develop standardized frameworks applicable to cities with different challenges, strategies, and smart city programmes and projects.
- Explore opportunities to measure the impacts of smart city projects and programmes developed at city scale, against existing city Key Performance Indicators aligned with city strategies.

Design of evaluation frameworks should:

- Be flexible and relevant to different city challenges and circumstances;
- Reflect the complexity of city systems;
- Allow for evolution;
- Respond to data-driven mechanisms;
- Reflect the city's smart city vision and strategic objective;
- Include measurable indicators (quantitative and qualitative) that reflect the multi-faceted nature of smart cities rather than focus on arbitrary or easily measured indicators.

Smart city reporting approaches should:

- Develop formal and informal reporting mechanisms to communicate the value of smart city work.
- Establish management structures so that smart city work is embedded in open city structures, supporting reporting through the wider community partnership of all the organisations responsible for delivery of city strategies and plans, and through the wider city stakeholder partnership.
- Develop formal reporting mechanisms to use data intelligence (from smart city analytics and evaluations) more effectively to feed into city performance reporting and formal political reporting processes, meeting statutory reporting obligations.

Further details on the SmartDframe study is available through the report 'A Tale of Evaluation and Reporting in UK Smart Cities' (Caird et al. 2016). To support future city strategies we need to understand the benefits and outcomes of smart city developments for cities and citizens. This report provides a series of contemporary smart city case studies helping to exemplify city practices, offering a timely, insightful contribution to city discourse about best practice approaches to evaluation and reporting of smart city project and programme outcomes in complex city systems.

References

Albino, V., Berardi, U., and Dangelico R. 2015. Smart Cities: Definitions, Dimensions, Performance, and Initiatives, Journal of Urban Technology 2015:22.1.3-21.

Bis (Department for Business, Innovation and Skills) 2013a. The Smart City Market: Opportunities for the UK Research Paper Number 136. October Report by Arup 122pp [accessed 26 August 2016]. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249423/bis-13-1217-smart-city-market-opportunties-uk.pdf

Bis (Department for Business, Innovation and Skills) 2013b. Global Innovators: International Case Studies and Smart Cities. Research paper No. 135 47pp [accessed 26 August 2016]. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249397/bis-13-1216-global-innovators-international-smart-cities.pdf

BSI (British Standards Institution) 2014. PAS181:2014: Smart City Framework – Guide to Establishing Strategies for Smart Cities and Communities, BSI Standards Publication, Published by BSI Standards Limited 52pp [accessed 26 August 2016]. Available at http://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PAS-181-smart-cities-framework/

Caird, S. with Hudson, L. and Kortuem, G. 2016. A Tale of Evaluation and Reporting in UK Smart Cities. The Open University, UK. ISBN 9781473021082. 51pp [accessed 26 August 2016]. Available at http://oro.open.ac.uk/46008/

Cohen, B. 2014 Smart City Index Master Indicators. Survey 7 [accessed 26 August 2016]. Available at the Smart Cities Council website http://smartcitiescouncil.com/resources/smart-city-index-master-indicators-survey

EC (European Commission) 2012. Cities in Europe: The new OECD-EC definition Produced by the Directorate for Regional and Urban Policy RF 01/2012 by L Dijkstra and H. Poelman 16pp [accessed 26 August 2016]. Available at http://ec.europa.eu/regional_policy/sources/docgener/focus/2012_01_city.pdf

Ericsson Ltd. 2014. The Networked Society City Index Developed by Ericsson with Sweco 30pp [accessed 26 August 2016]. Available at http://www.ericsson.com/res/docs/2014/networked-society-city-index-2014.pdf

EU Directorate-General for Internal Policies 2014. Mapping smart cities in the EU Report requested by the European Parliament's Commitment on Industry Research and Energy, Policy Department A: Economic and Scientific Policy, January, PE 507.480 2014. By C. Manville, G. Cochrane, J. Cave, J. Millard, J. Pederson, R. Thaarup, A. Liebe, M. Wissner, R. Massink, B. Kotterink, 196pp [accessed 26 August 2016]. Available at http://www.smartcities.at/assets/Publikationen/Weitere-Publikationen-zum-Thema/mappingsmartcities.pdf

EIP-SCC (European Innovation Partnership on Smart Cities and Communities) 2013. Strategic Implementation Plan 14.10.2013, 22pp [accessed 26 August 2016]. Available at http://ec.europa.eu/eip/smartcities/files/sip_final_en.pdf

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanović, N., Meijers, E. 2007. Smart Cities Ranking of European Medium-Sized Cities, Final Report, Published by Centre of Regional Science, Vienna University of Technology; Department of Geography, University of Ljubljana; and Research Institute for Housing, Urban and Mobility Studies, Delft University of Technology, October, 25pp [accessed 26 August 2016]. Available at http://www.smart-cities.eu/download/smart_cities_final_report.pdf

IDC (International Data Corporation) 2013. IDC Government Insights Business Strategy: IDC Government Insights' Smart City Maturity Model-Assessment and Action on the Path to Maturity | IDC Government Insights' Smart Cities Strategies Business strategy April, 25pp [accessed 26 August 2016]. Available at http://az370354.vo.msecnd.net/publicsector/citynext/whitepapers/IDC%20Government%20Insights'%20Smart%20City%20Maturity%20Model_IDC.pdf

Moonen, T. and Clark, G. 2013. The Business of Cities 2013: What do 150 city indexes and benchmarking studies tell us about the urban world in 2013? November, Editor: R. Feenan, Publisher Jones Lang LASalle IP, INC. 2013, 222pp [accessed 26 August 2016]. Available at http://www.jll.com/Research/jll-city-indices-november-2013.pdf

PricewaterhouseCoopers/Partnership for New York City 2014. The 'Cities of Opportunity Index', 69pp [accessed 26 August 2016]. Available at http://www.pwc.com/us/en/cities-of-opportunity/2014/pdf-download.jhtml

Zygiaris, S. 2013. Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems, Journal of Knowledge Economy 2013;4. 217–231.

Forsell, M., Ovaskainen, M.

Title: Digitalizing a Degree Programme: Case Bachelor Degree of Business Administration at Centria University of Applied Sciences

Pilots, Demos and Experiments Case

Abstract

Digitalization of education has become a very important thematic issue in Finnish educational system. Still, there are only few studies on how to take digitalization as a part of educational practices at universities. Digitalization is still often seen mainly as the use of different techniques and tools like flipped classrooms, videos, MOOCs, digital platforms and communication tools, eBooks, tablets, BYODs etc. However, digitalization is more than mere techniques and technologies, and it is about how the teacher's own theory-in-use about learners, learning, and knowledge changes. Here we present ideas on how to transform organizational culture to create positive attitude towards digitalization and to turn this attitude into a virtual degree programme in less than two years. The empirical part of the paper concentrates on an action research based case study of the preparation and launch phases of a new business study programme at Centria University of Applied Sciences. This pilot programme was developed as a response to the observed need to renew and revitalize the supply of adult oriented business studies. The programme is almost completely based on virtual study solutions, and differs considerably from the earlier programmes. For teachers, the preparation and launch of the programme was a significant challenge, and it involved considerable change processes in organizational culture and teachers' theory-in-use. At the practical level, changes were made both in pedagogical approaches, teaching and study tools, as well as the correspondence with students. The changes were not restricted to the practical level, but were also needed at the level of attitudes, values, and culture. In this paper, the implementation of these change processes is analysed, discussed and reflected in accordance to the well-known 8 step change model. We believe that by emphasizing a cultural change and affecting teachers' theories-in-use, new ways of doing things at educational institutions can be applied at a relatively rapid pace.

Keywords: Digitalization, Change management, Organizational change

Introduction

Finnish higher education (HE) is facing a wicked problem (Rittel & Webber 1973) when the public sector is forced to cut costs, there is a prolonged economic downturn, the number of young student applicants may be decreasing, new fees for foreign students are introduced, and simultaneously the global education business is getting increasingly competitive. This means that HE institutes must be able to renew their offerings to be more lucrative and efficient at the same time. To answer these challenges Finnish educational system is aiming to profile its HE institutes to focus on each institute's strongest offerings and to digitalize education. Also, the funding has been turning to results-based funding.

If we think what these challenging changes, i.e. profiling, digitalization and results-based funding, mean and especially try to find the "cures", we can notice that changes are required in the core believes (see Gersick 1991) on how HE institutes operate. However, organizational changes are typically difficult and slow (Levitt & March 1988, 324).

Studying organizational change depends on the ontological stance taken and how the information can be collected, i.e. epistemology. Van de Ven and Poole (2005) point out that organizations may be viewed as things or processes. Traditionally organizational studies have relied on the "things"-view, studying those BIG-O-concepts of identity, structure, culture, and performance. Still, organizations may also be viewed as processes of organizing. Things are then the products of processes, and the processes should be primary conceptual abstractions. Nevertheless, the "things"-view seems to dominate organizational studies, since it makes it easier for humans to observe the sense of the change.

Van de Ven and Poole (2005) also point out that epistemology of research is based on one's definition of change. Change can be seen as a difference in an organizational entity over time, which can be called the variance definition. Change can also be seen as a narrative describing sequence of events how the change unfolds, and this can be called the process definition of change. Based on these two dimensions of ontology and epistemology Van de Ven and Poole (2005) create a typology of four approaches for organizational change research:

- Variance study of change in organization
- Process study of change in organizations
- Process study of organizing
- Variance study of organizing

By (2005) points out that organizational change itself can be categorized based on three dimensions: the rate of occurrence (discontinuous – continuous), how it comes about (planned – emergent), and scale (fine-tuning – corporate transformation). Both By (2005) and Van de Ven & Poole (2005) see that more research is needed to understand change from a multiple viewpoints. Van de Ven and Poole (2005) see their framework for change studies and the identified approaches as complementary. By (2005) suggests that researchers should do exploratory studies to understand change management and success factors in change.

As we can see, changes in organizations are not only about structure, style, strategy etc. but also some superordinate goals (Waterman et al 1980) guiding the change, such as values and aspirations. We propose that these superordinate goals can be explained as organizational culture, which should be concentrated on, in addition to changing "things" of structure, staff and skills. Schein (1990, 111) defines culture as "(a) a pattern of basic assumptions, (b) invented, discovered, or developed by a given group, (c) as it learns to cope with its problems of external adaptation and internal integration, (d) that has worked well enough to be considered valid and, therefore is to be taught to new members as the (f) correct way to perceive, think, and feel in relation to those problems." Schein (1990) identifies different levels of culture: observable artefacts, values, and basic underlying assumptions. The culture is created, and thus also changed, by primary embedding mechanisms that are the things leaders pay attention to, measure and control, and their reactions

to critical incidences, among other things. Articulation and reinforcement mechanisms are secondary, and they support primary mechanisms. They are e.g. organization's design and structure, procedures, physical space, stories and legends that are told, and formal statements of organizational philosophy. If one aims to speed up organizational change, one should pay close attention to organizational culture's primary and secondary mechanisms.

Below we first present an action research based case study of the preparation and launch phases of a new business study programme at Centria University of Applied Sciences. This pilot virtual study programme in business administration was developed as a response to the observed need to renew and revitalize the supply of adult oriented business studies. The approach here is a process study of change "in organizational entities narrating sequence of events, stages or cycles of change in the development of an entity" (Van de Ven & Poole 2005, 1384), and it can be seen as a planned, continuous, and wide transformation (see By 2005). To conclude the article, at the end we also present some general insights of this research.

Empirical Part: A Case Study of Digitalizing a Study Programme

Centria University of Applied Sciences has been providing bachelor-level business studies in Kokkola since its founding in the 1990s. From early on virtual courses were provided as a part of the studies and first discussions about a virtual degree programme took place years ago, but the plans did not realize. In September 2015, a completely new kind of adult-oriented business study programme was started in Kokkola, implemented almost completely virtually right from the beginning.

For teachers, the preparation and launch of the programme, almost completely based on virtual teaching and study solutions, was a significant challenge. It involved considerable change processes at the practical level in terms of pedagogical approaches, teaching and study tools, as well as the contact and correspondence with students. Also, the changes were not restricted to the practical level, but were also needed at the level of attitudes, values, and culture.

In this paper, the implementation of these change processes is analysed, discussed and reflected in accordance to the Kotter's (1995, 1996) 8-step change model. The development and implementation of the pilot degree programme is analysed and discussed by the principles of action research. The case reporting is divided to change model's steps. The reporting focuses mainly at the pilot degree programme level, but also points out important strategic steps and actions at the university level, which were needed to enable the cascading of the ideas and measures to the degree programme level.

Step 1: Establishing a Sense of Urgency

A number of significant factors were identified to support the start of a new kind of programme, mainly related to the developments in external environment (see above). The university management realized that the digitalization of a study programme leads to a number of challenges and opportunities. It was considered necessary to respond to the growing demand for online courses to maintain and develop the future attractiveness of studies.

At the study programme level, the aforementioned facts were discussed, and potential opportunities & threats observed and analysed, which led to an improved understanding of the need for a change, and established a growing motivation to start the movement towards the change.

Step 2: Forming a Powerful Guiding Coalition
In this phase, important work was done in mapping of strategic opportunities, and thereby reaching a consensus on the plans and actions needed to implement the necessary change steps. Especially the director of education was actively formulating and explaining the vision and raising awareness of the situation. Active measures were first taken to raise the understanding of the opportunities of virtual education at the university management level, and then the measures were spread to the other levels of the organization.

At the degree programme level, already at the early stages of the programme planning, the management actively started to build a team of committed pioneer-minded teachers to lead the pilot process among their colleagues, and to spread a positive spirit and encouraging opinions on the planned change.

Step 3: Developing a Vision and Strategy
As a significant part of the change process, a new strategy for education at Centria was developed, emphasizing the competencies of digital environment (tools, practices, mindset etc.). A new value-based vision was also formulated: to educate professionals with the necessary skills and competencies in a digitalizing economy and society. The strategy also highly emphasizes the need to develop the skills of the personnel, develop technical infrastructure, provide support activities, personnel training etc.

At the degree programme level, a significant strategic decision was made to really turn the business study programme almost completely virtual, recognizing both opportunities and risks. Through value-based discussions, the bases for the practical development of study contents and pedagogical solutions were created. In business education, a vision was set to develop virtual learning practices continuously, and to become a well-known virtual business educator, with an aim to revitalize Centria's adult-oriented education. Also, right from the beginning, attention was paid to make the personnel "buy in" the vision and start to "live" the vision.

Step 4: Communicating the Change Vision
At the university level, the documentation of the new strategy for education and its guiding principles was done and agreed on by the leading teachers.

At the degree programme level, a description of the main principles and general practices of the planned study programme was provided by the management. After that, a participative approach to the development of the curriculum and pedagogical solutions was chosen. All full-time business teachers were given a say, and they were encouraged to participate in the developments. A very large group of teachers was also deliberately chosen to start to implement the virtual teaching right from the beginning. An important aim was to develop the attitude of the programme being "our thing" (and not "their thing") to get all developing the programme together, and to achieve motivation and commitment both at the individual and mutual levels. Open meetings, discussions, sharing and analyses of the experiences, and a lot of dialogue were constantly taking place to communicate the developments, vitalize the vision, encourage the personnel to experiment, and also to keep on the good fighting spirit. The programme management was also trying to act as a good example, showing commitment. A positive atmosphere was continuously tried to keep on.

Step 5: Removing Obstacles and Empowering Broad-Based Action
At the university level, the implementation of the development actions that were defined in the new strategy for education was promptly started and strongly emphasized. On the technical side, substantial measures were a significant improvement of wireless network infrastructure, as well as the provision of new equipment to the personnel. This also eliminated the chance of teachers to use technical barriers as an excuse not to change. Support, education, training and personal guidance in the use of virtual learning environments and technical tools were widely provided to the personnel. For example, a special large-scale virtual teaching skill development programme was implemented. Investments also included the recruitment of new specialized support staff in the form of a special ”digi-team” to progress the digitalization of education.

At the degree programme level, additionally, mental and physical barriers were tried to remove by developing a positive attitude towards virtual learning by providing facts, openly discussing pedagogical questions, as well as worries, reasons for prejudice etc. Solutions were sought both at the mutual and individual levels, and the feeling of individuals to be left alone with problems was actively tried to avoid. Interaction, gathering of experiences, and benchmarking activities with experienced universities in virtual teaching also played an important role here, especially at the beginning. Personal technical support to teachers was also provided. A lot of discussion took place, meetings were regularly held, and sharing of ideas and experiences took place to encourage teachers to bravely try new things in the virtual environment. This was important to raise and maintain individual and mutual commitment. At the cultural level, a very important factor was also the creation of the atmosphere where risks can be taken, potential mistakes are seen as opportunities to learn, and the personnel is given freedom to try non-traditional practices without fears and with the support of the management.

Step 6: Generating Short-Term Wins
As pointed out by Kotter (1995, 1996), for atmosphere, it is also important to be able to show progress and achievements during a change process. It can be argued that also in this particular case, active and open sharing of the cumulative positive experiences strongly contributed to the feeling of success. Especially after the first virtual lectures, it was very important to spread the feeling that teachers were able to manage, and that the experiences were positive both to the teachers and students. Good practices, as well as problems and pieces of advice to avoid problems, were also openly shared to help the colleagues to generate best possible results in their courses. An active collection of student feedback was also connected to the development of practices. Feedback has been mainly very positive, which has further improved the atmosphere, and strengthened the idea of being on the right track. From the viewpoint of management, open sharing of experiences has also been connected to mutual and personal praise and encouragement to continue and further develop potentially successful practices. Nevertheless, concrete reward systems to promote development activities, trials and experiments, and also to show appreciation of positive student feedback, are still in need for further development.

Step 7: Consolidating Gains and Producing More Change
At the university level, the progress towards the set change vision has been continued by expanding the scale and scope of the digital change. E.g., the development of the next virtual study programmes was started right after the launch of the first programme, and these programmes started in January 2016. This can also be seen as a message from the management: ”We are serious

with digitalization and our vision, and we are committed to make it happen in the whole organization". To promote continuous development, sharing of experiences has been widely done within the university. The organizational structure of Centria has also been changed, and care has been taken to maintain the virtual focus also in the future.

At the degree programme level (the pilot), the next phases of implementing the programme have been planned based on the experiences. Also a new virtual degree programme in business is planned to be started soon by the same key actors with the help of some new experts.

Step 8: Anchoring the Changes in the Culture

At the university level, digitalization and the development of virtual education have been set as priorities and permanent elements of Centria's educational strategy. Digitalization is constantly discussed and actively promoted, also by the help of specialized personnel. Technical infrastructure is also constantly developed, and further personnel development programmes and activities have been launched. Lately, the focus here has also been moving from general to specific, further emphasizing the personal needs of a certain teacher in her/his particular teaching topics/courses.

At the degree programme level (business studies), virtual teaching practices have been widely adopted, and continuous activities are taken to enhance further development of virtual teaching practices and pedagogical solutions. Virtual teaching has become a normal way of doing teaching work, and there is a high and widely recognizable acceptance and motivation to start new virtual programmes.

Summary and Conclusions

Overall, there are signs that at Centria, the change process to digitalize education and start virtual study programmes, started only a couple of years ago, has been successfully progressing to the level of a true cultural change. The process is still undergoing, and as Kotter (1995, 1996) points out, "the final victory" must not be declared too early. Nevertheless, the results are already visible, and it seems that Centria is on a way of a potentially very successful and lasting change, which may have profound and permanent impacts on Centria's education as a whole.

Based on the experiences of the first years, and the planning and implementation processes of the pilot programme in business education, a number of general lessons learnt can be pointed out:

- To influence culture, one must pay attention to the artefacts. To enable change, this is also important from the viewpoint of showing concrete commitment of the management, increasing motivation and getting rid of excuses. In the case of Centria, the measures included e.g. the recruitment of a dedicated virtual tutor for teachers, increased resources for virtual study counselling, significant investments in technical infrastructure, and the launch of a special digi-team responsible for the development of virtual education. Attention is needed here both in terms of resources, tools, teacher training and education, support activities etc.
- Establishment of a pioneering attitude and a positive atmosphere towards change are important. In the studied case, a successful use of artefacts (e.g. new tools and resources, personnel training programmes) and a participative approach can be pointed out as important factors here.

- Creation of a positive learning culture and ability to make mistakes. When new practices are developed, mistakes should be seen as the best way to learn. In the case study, this kind of cultural approach was emphasized.
- Sharing, caring, and continuous communication are needed. In the case study, the feeling of not being left alone was emphasized, and a variety of support activities were provided both at the team level and individual level.
- Active and continuous leadership is needed. The experiences of the case study strongly support the common idea of the change process research that a committed and continuous management, but especially also leadership, are key contributors to a potentially successful change.

References

By, R.T. 2005. Organizational Change Management: A Critical Review. Journal of Change Management 2005; 4. 369-380.

Gersick, C. 1991. Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm. Academy of Management Review, 1991; 1. 10-36.

Kotter, J. P. 1995. Leading Change: Why Transformation Efforts Fail. Harvard Business Review 1995; March-April. 59-67.

Kotter J.P. 1996. Leading Change. Harvard Business School Press. Boston, Massachusetts, U.S.A.

Levitt, B. & March, J. 1988. Organizational Learning. Annual Reviews of Sociology 1988; 14. 319-340.

Rittel, H. & Webber, M. 1973. Dilemmas in a General Theory of Planning. Policy Sciences 1973; 4. 155-169.

Schein, E. 1990. Organizational Culture. American Psychologist 1990; 2. 109-119.

Van de Ven, A. & Poole, M. 2005. Alternative Approaches for Studying Organizational Change. Organization Studies 2005; 9. 1377-1404.

Waterman, R. Peters, T. & Philips, J. 1980. Structure is not Organization. Business Horizons 1980; 3. 14-26.

Fyen, W.

Title: The Leuven Community for Innovation Driven Entrepreneurship (Lcie): A Student-Driven Initiative to Foster Entrepreneurship and Entrepreneurial Skills at a Research Intensive University

Pilots, Demos and Experiments Case

Abstract

With the advances in digital learning platforms, e.g. Massive Open Online Courses, the omnipresent internet, low-cost 3D printing capabilities as well as the easy accessibility to IT and hardware components, students now more than ever can seize the opportunity to convert their ideas into a potentially sustainable business. It is therefore not surprising that universities can and should play an important role to leverage their student population's entrepreneurial potential. At the University of Leuven, this vision has been thoroughly adopted as part of its long term educational policy. Moreover, the university has taken an innovative approach to implement this policy by actively engaging with its student community. Launched as a university-wide, student-driven and student-owned initiative, the Leuven Community for Innovation driven Entrepreneurship (Lcie) has created a vibrant and dynamic community of entrepreneurial students, professors, researchers and alumni. Acting as an innovation engine, this initiative has allowed the university to apply novel principles of entrepreneurship (such as agile development, Minimum Viable Product, customer involvement, ...) to develop and consolidate initiatives to foster and support entrepreneurial activity across academic disciplines. At the same time, it can build upon the credibility and the robustness of the processes articulated and introduced by Leuven Research & Development --- i.e. the Technology Transfer Office --- and the critical mass of its university's entrepreneurial professors.

In this paper we give an overview of the strategy that was unfolded and developed gradually and was ultimately adopted when launching the Lcie initiative. We highlight the major achievements obtained during its first two years of operations. These include: i) the governance of the Lcie initiative as a dynamic network based on personal engagement, ii) the creation of a university wide cross-disciplinary certificate for entrepreneurship, iii) the testing of new teaching formats focusing on interdisciplinary problem solving using design thinking, iv) the development of specific coaching sessions for entrepreneurial students v) the creation of a network of university facilities supporting entrepreneurship, such as incubator spaces, a fablab, a creativity lab, vi) the setup of 'IusStart', an educational initiative run by PhD law students to provide legal support to student-entrepreneurs, vii) the setup of 'ID-Start', an educational initiative run by students in marketing, communications and arts to provide marketing, communication and branding support to student-entrepreneurs viii) the setup of TechStart, an educational initiative run by PhD students from the engineering faculty to provide technological advice to startups.

Key words: LRD, KU Leuven, Lcie, entrepreneurship, university, students

Introduction

In today's knowledge society, universities are recognized as key players in talent development and the economic growth of regions (Etzkowitz 2001). An important driver of this growth is the capacity to successfully commercialize academic research. For that reason, many universities have set up Technology Transfer Offices (TTOs), responsible for supporting this process (Shane 2004). At the University of Leuven (KU Leuven, Belgium), Leuven Research and Development (LRD) has been established as a TTO in 1972 and has been instrumental in creating an entrepreneurial culture within the academic community (Edmondson 2015). At present, the technology transfer activities are responsible for one third of the university's research funding. They include industry collaboration, licensing and protection of Intellectual Property, regional development and spinout creation (Shane 2004). The latter consists of providing services to university researchers in setting up new ventures based on their research results and intellectual property. However, up until recently, the university undergraduate students have not been particularly targeted with respect to entrepreneurship. This means that an enormous untapped potential still resides within the academic classrooms. In this paper we describe the approach that was taken in order to develop an institutional framework for student entrepreneurship.

Institutional context

Since entrepreneurship is very culture dependent, many practices require a certain amount of tweaking to fit the local context. We therefore present some of the specific challenges and opportunities as they existed at the KU Leuven at the time this initiative was launched.

At present, the KU Leuven enrolls some 60,000 students (based on data of academic year 2015-2016). They are spread over 16 faculties that are divided into 3 main groups: i) social sciences and humanities, ii) science and technology and iii) biomedical sciences. In that respect, the student population is significantly different than what would be encountered at e.g. a typical technical university. This aspect has important consequences on the way entrepreneurship education needs to be introduced since the impact on student's entrepreneurial intent from entrepreneurship activities depends on their background (Maresch, Harms, Kailer & Wimmer-Wurm 2016). A first challenge in setting up a framework was to make it inclusive, reaching students from all backgrounds, while still providing enough focus into each of the disciplines. At the same time, this indicates the important potential for interdisciplinary work.

Secondly, as indicated by Cotterill (2015), setting up entrepreneurial learning at a university level often leaves universities struggling with complex internal processes that result in an important focus on quality assurance processes instead of on student learning effect. An important part of this complexity arises from the many regulations and structures imposed upon universities often hampering boundary-spanning actions and processes, as well as the tradeoff academic staff needs to make regarding their 3 key responsibilities being i) teaching, ii) research and iii) services to community.

A third important contextual factor is the fact that this initiative has been run in parallel with a newly adopted education policy plan that put 'disciplinary future self' at the forefront (Gosselink & Pollefeyt 2014). This concept highlights the importance the university attaches to each individual being able to look for and improve his/her talents to the best of their abilities. This

new policy plan also resulted in entrepreneurial skills being much more in the forefront in various faculties, if this was not already the case so.

Student involvement and engagement

As suggested by Jansen, van de Zande, Brinkkemper, Stam & Varma (2015), student entrepreneurship practice and education needs to be launched at a university wide level. Moreover, many authors also emphasize the importance of involving the university technology transfer office as one of the primary stakeholders in the process (Jansen et. al. 2015, Lackéus & Williams Middleton 2013, Hartmann 2014). For that reason, it was decided to set up the initiative at KU Leuven by the technology transfer office as a faculty-independent but community-driven entity, thereby allowing to exploit the human capital that was formed over its more than 40 years of existence in working with a variety of faculty members, central and supporting staff.

Secondly, and there the concept differs from most approaches, the university decided to have students play an active role in how the system would be set up. Although this concept seems very much in line with standard entrepreneurial practices of 'direct customer involvement' (Blank 2012, p. 8), research has indicated that it is not easy for universities to have a 'clean slate' approach (Cotterill 2015). Fortunately, the KU Leuven has had a long standing tradition of active student engagement and participation at various levels, although entrepreneurship was not one of the key topics of policy making so far. Students engage through various types of student-organizations. Some are linked to certain faculties (e.g. engineering faculty, faculty of economics and business, ...) while other student-organizations have been set up around certain themes, such as renewable energy or entrepreneurship. During the early phases of starting the initiative, many student-organizations have been consulted to check their interest. It was found that many of them, although 'entrepreneurship' was typically not one of their key focus areas, were very much interested to play an active role on behalf of their student population. Table 1 indicates the student-organizations that have played an active role in the creation of what became to be called 'Leuven Community for Innovation driven Entrepreneurship' ('Lcie'). In this name, the term 'Community' was deliberately chosen over the often used word 'Center' for such a university-wide initiative to stress the importance of the bottom-up character of the approach. For the student-organizations linked to a certain faculty, the corresponding number of students of their respective faculty is also indicated (for academic year 2015-2016). For the other organizations no numbers are given as they typically span across several faculties and moreover would result in double counting. Interestingly, the student population reached through the various student bodies is over 60% of the entire enrolled population, which is considered extremely high given the initiative was less than 2 years old at that time. It is also very striking to notice the variety in backgrounds of the students involved. In fact, one of the key remarks for the students was that for them most of the value lied within the collaboration with students from other disciplines, an aspect that will be discussed also later in this paper.

Table 1: overview of the student organizations that have been involved in an active manner in the first 2 years of operation of the Leuven Community for Innovation driven Entrepreneurship.

Organization	Website	Faculty	Enrolled students in faculty (Academic Year 2015-2016) [%]
Academics For Companies (AFC)	afcleuven.be/en	-	-
Academics For Technology (AFT)	www.aftleuven.be	-	-
Core	www.thinkcore.be	-	-
Ekonomika	www.ekonomika.be/home/en	Economics and Business	9,060 [15.1%]
Industria	www2.industria.be/en	Engineering Technology	5,819 [9.7%]
Landbouwkring (LBK)	https://www.landbouwkring.be/en	Bioscience engineering	2,514 [4.2%]
Medica	www.medica.be/	Medicine	8,260 [13.7%]
Vlaams RechtsGenootschap (VRG)	www.vrg.be/en	Law	5,328 [8.9%]
Vlaamse Technische Kring (VTK)	www.vtk.be/en/	Engineering Science	5,169 [8.6%]

Besides the student-organizations, several PhD students (sometimes under the impulse of requests from entrepreneurs) started to take collective initiatives in order to employ their skills to the benefit of entrepreneurship at large. As a matter of fact, discussions on the topic of entrepreneurship with the students and how they experienced it at their university, showed a need for many of the aspects that have been compiled by Jansen et. al. (2015) in their SEEM (Student Entrepreneurship Education Model) which they divided in 3 phases: i) stimulation, ii) coaching and iii) incubation. In that respect, 'stimulation' refers to the activities aiming at simulating entrepreneurship with students. Several research studies have indeed indicated that stimulation of entrepreneurship increases the entrepreneurial intent of students, which is a very good proxy for entrepreneurial activity (Fishbein & Ajzen 1975 p. 369). 'Coaching' refers to the activities aiming at helping student-entrepreneurs converting a nascent idea into a business plan. 'Incubation' refers to the support offered to student-entrepreneurs who have decided to start their own venture. Although the authors admit that this framework is just a proposition based on a limited set of observations, we think it provides a good starting point to classify the various components that have originated as a result of the student-driven activities. It must be mentioned that many faculties are also taking significant steps in supporting entrepreneurship in their curriculum.

Results so far

Some 2 years after launching the initiative, Lcie has evolved into a university-wide 'brand' of student entrepreneurship with a diverse set of stakeholders. Besides the central departments of the university (including the research coordination office, the technology transfer office, the university library, the university student advise center, the university ICT department and the alumni services department), various faculties have been engaged as well as their respective student organizations mentioned in Table 1. Moreover, partnerships have been closed with several external stakeholders in the field of innovation and entrepreneurship.

The most notable achievements of this way of working are:

i) From the point of view of **governance**, a structure was set up where most people involved do not participate ex-officio but driven by personal enthusiasm and drive to stimulate entrepreneurship. This format is inspired by purpose driven companies (that are often very profitable), which Laloux referred to as 'evolutionary' or 'Teal' organizations (Laloux 2014, p. 43). We believe this way of working allows for a specific type of intrapreneurial dynamics in the often complex structures of the organization. Moreover, the system allows a rapid buildup of human capital as the people involved share several common traits but at the same time form a diverse representation of the university population. The resulting governance structure that was adopted mirrors the key stakeholder groups: i) a steering committee, chaired by the university General Manager is involved in long term strategic decision making, ii) a workgroup 'Lcie-academy' – an interdisciplinary group of professors lecturing on entrepreneurship - is involved in educational aspects of student-entrepreneurship and iii) an 'Lcie student-council' where students are invited to openly discuss curricular aspects of entrepreneurship, propose themes for collaboration and have a low-threshold access to university staff.

ii) **The creation of a university-wide cross-disciplinary certificate for entrepreneurship.**
A balanced selection from existing entrepreneurship courses was made by the Lcie-Academy workgroup and compiled into the 'Lcie Academy'. Students taking at least 18 ECTS worth of credits in this package become entitled to receive an entrepreneurship certificate. The courses were chosen with a focus on hands-on experiences and interdisciplinary team formation in mind. In its first 2 years, the selection was done 'ex-post', meaning students could request a certificate after completing the necessary courses. As from the third year on, the certificate will be implemented 'ex-ante', meaning that students (through the university ICT enrollment system) can select the necessary courses and apply for the certificate from the start. By making these visible in the ICT system, the university clearly indicates the importance it adheres to entrepreneurship. Moreover this approach allows for longitudinal tracking and hence in the longer term, policy making.

iii) **The testing of new teaching formats focusing on interdisciplinary problem solving using design thinking.**

Based on the experiences of project based training using the design thinking methodology in Aalto University (The Economist 2016) and Graz University of Technology (Fallast 2007), students from KU Leuven took the challenge of implementing a student-driven version, referred to as PiP: Product Innovation Project. Backed by 3 faculties (economics and business, engineering science and engineering technology) and 3 student-organizations linked to these faculties, the students auto-selected a multi-disciplinary team and found a sponsor that provided a challenge (being RVO-society, an organization that is dedicated to promoting the importance of science with young people – www.rvo-society.be). Within the course of 1 year, the selected PiP-team developed a novel solution for patients dealing with tremor as a result of a neurodegenerative disorder. Besides going through one of the steepest learning curves of their entire academic career, they were also able to

attract commercial interest for their development, have persuaded several faculties to continue the course (and embed it as a regular part of the elective coursework) and are working on a student-driven governance system to manage the process in subsequent years. The success of this format illustrates the importance of an interdisciplinary character of educational formats and the interest of students in it as it allows to create a context that sparks their creativity (Blauth, Mauer & Brettel 2014 and Glen, Suciu, Baugh & Anson 2015).

iv) **The development of specific coaching sessions for entrepreneurial students.**

As indicated by Jansen et. al. (2015), student-entrepreneurs need easy access to suitable coaching to turn their idea into a suitable business plan. Inspired by the network of entrepreneurs around the university of Cambridge, Leuven already in the end of the 1990s set up a network of entrepreneurs (Leuven.inc: www.leuveninc.com) as a meeting place for high-tech entrepreneurs. Together with this organization, specific coaching modules for student entrepreneurs have been developed, which not only accelerates the maturation of their business idea, but also brings them in contact with other entrepreneurs at an early stage. This component is valued highly by starting student-entrepreneurs.

v) **The creation of a network of university facilities supporting entrepreneurship.**

The work of Jansen et. al. (2015) indicated that one of the most valued aspects of university support for student-entrepreneurs is access to facilities such as meeting rooms and workplaces. At the KU Leuven the clustering of the faculties into 3 science groups also entails that activities of each of these groups are largely clustered into a different area of the city. For that reason it was decided to provide facilities for student-entrepreneurs in a decentralized way, across the various campuses. The facilities include a so-called fablab, an initiative of the mechanical engineering department of the university, providing students with the necessary prototyping tools in line with the international fablabs as initiated by MIT through its Centre for Bits and Atoms (Blikstein & Krannich 2013). In addition, students with an interest in entrepreneurship get access to a 'creativity lab' where they can have meetings and work on their business plan. Furthermore, students that have decided to start an entrepreneurial venture can get office space at an incubator facility that is shared with young startup companies such that they can come in contact with peer entrepreneurs. It is worthwhile mentioning that both the Creativity Lab as well as the incubator space have been completely designed and renovated by students themselves – very much in line with the participatory Lcie philosophy that puts responsibility and ownership in the hands of the students (not 'for' students, but 'with' students).

vi) **The setup of 'IusStart'.**

IusStart is an educational initiative started and run by PhD law students to provide free legal support to student-entrepreneurs, along the lines of the legal clinics as described by Jones and Lainez (2014). It initially started as an extra-curricular activity whereby master students, under the guidance of PhD students, were put into small groups and asked to apply their skills in the context of a practical case to help out a student-entrepreneur. The advice written by the law students is checked for accuracy by practicing

lawyers from a variety of law firms that are willing to donate some of their time to this initiative. After several successful years of running the program, steps are being taken to turn it into an elective program for law students who want to obtain practical experience during their studies.

vii) **The setup of 'TechStart'.**
Along the same lines as IusStart, PhD students from the engineering science faculty decided to join forces and started offering technological advice to starting entrepreneurs or existing young startups. By working in close cooperation with some of the professors of the faculty, engineering students participating in the TechStart initiative can apply for an elective, thereby earning study credits for applying their engineering knowledge in an entrepreneurial context.

viii) **The setup of 'ID-Start'.**
Besides legal and technology advice, it was quickly discovered that beginning student-entrepreneurs were also in need of creative skills. The term creative is hereby used in the broad sense, encompassing marketing, communications, design and branding. The ID-start project is a collaboration with several institutes from the higher education network formed around the KU Leuven (http://associatie.kuleuven.be/eng), namely LUCA School of Arts, Thomas More and University College Leuven-Limburg (UCLL). After piloting for a few academic years, some strategic partnerships with several teachers are starting to emerge as human capital is built up in the successful cases that furthermore play an important function as role models.

Conclusions and recommendations
Operationally, this approach has shown that entrepreneurial students are a driving force for institutional change (other cases see e.g. Cotterill (2015)). Furthermore, basic concepts from modern entrepreneurship are shown to be equally valid in an intrapreneurial context (i.e. introducing entrepreneurship within a large and complex organization such as a university). By leveraging a suitable network of entrepreneurially minded students, staff and faculty it is possible to set up conditions for developing 'minimum viable products' (such as the PiP project pilot case) and start an innovation cycle by learning from every iteration and thus improving continuously.

Strategically, leveraging the entrepreneurial spirit of students also helps in stimulating entrepreneurship in a broader sense. Too often, entrepreneurship is associated with starting a business, while society equally values entrepreneurial attitudes or application of technical skills in an entrepreneurial context. In that sense there are multiple benefits in the creation of initiatives such as IusStart, TechStart and ID-start: in such collaborations not only the student-entrepreneurs or startups benefit from having an outside look on their case and see their case advanced by legal, technology or creative input, but also for the participating 'student-advisors', it is a low-threshold introduction into the world of entrepreneurship. Moreover, the process has positive spillovers to the educational system by bringing the entrepreneurial attitude more to the forefront: unlike traditional formats where students are actively coached by professionals, this way of working establishes peer-to-peer learning processes in which students can apply their skills in an entrepreneurial context.

Evidently, these results represent only a snapshot given the recent launch of this project. Several new initiatives are currently in the pipeline with the aim of diffusing entrepreneurial attitudes throughout the entire curriculum.

Acknowledgements
The authors want to express their gratitude to all the students and student-organizations that have played an instrumental role in starting this initiative, as well as to all teachers and professors involved in IusStart, TechStart and ID-Start and in setting up entrepreneurial courses within their respective faculties. Secondly, our gratitude goes to the various staff members throughout the university for their support of the initiative.

The authors also acknowledge financial support of the province of Flemish Brabant for setting up this initiative.

References

Blank, S., 2012, The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company, Pescadero: K&S Ranch, Inc.

Blauth, M., Mauer, R. & Brettel M. 2014, Fostering Creativity in New Product Development through Entrepreneurial Decision Making, Creativity and Innovation Management 23 (4). 495-509

Blikstein, P. & Krannich, D. 2013, The Makers' Movement and Fablabs in Education: Experiences, Technologies, and Research, In Proceedings of the 12th International Conference on Interaction Design and Children (IDC '13). ACM, New York, NY, USA, 613-616

Cotterill, S.T. 2015, Tearing up the page: re-thinking the development of effective learning environments in higher education, Innovation in Education and Teaching International; 52 (4). 403-413

Edmondson G. 2015, Creating a virtuous circle in technology transfer – The case of KU Leuven, Science Business Publishing

Etzkowitz, H. 2001, The second academic revolution and the rise of entrepreneurial science. Technology and Science Magazine, IEEE 20, 18-29

Fallast, M. 2007, Success Factors in the Implementation of an Interdisciplinary Product Innovation Project, Thesis at the Institute of Industrial Management and Innovation Research, Graz University of Technology

Fishbein, M. & Ajzen, I. 1975, Belief, Attitude, Intention and Behavior, An Introduction to Theory and Research, New York: Addison Wesley

Glen, R., Suciu, C., Baughn, C.C. & Anson, R. 2015, Teaching design thinking in business schools, The International Journal of Management Education 13. 182-192

Gosselink, R. & Pollefeyt D. 2014, Vision and policy plan education and students 2014-2017, accessible from https://www.kuleuven.be/english/education/policy/vision (accessed on 17/07/2016)

Hartmann, D. 2014, Turning Technology into Business Using University Patents, Technology Innovation Management Review 4 (12). 37-43

Jansen, S., van de Zande, T., Brinkkemper, S., Stam, E. & Varma, V. 2015, How education, stimulation, and incubation encourage student entrepreneurship: Observations from MIT, IIIT, and Utrecht University, The International Journal of Management Education 13. 170-181

Jones, S. R. & Lainez, J. 2014, Enriching the Law School Curriculum: The Rise of Transactional Legal Clinics in U.S. Law Schools, Washington University Journal of Law and Policy (43). 85-127

Lackéus, M. & Williams Middleton, K. 2015, Venture creation programs: bridging entrepreneurship education and technology transfer; Education & Training 57 (1). 48-73

Laloux, F. 2014, Reinventing Organizations: A Guide to Creating Organizations Inspired by the Next Stage of Human Consciousness, Brussels: Nelson Parker

Maresch, D., Harms, R., Kailer, N. & Wimmer-Wurm, B. 2016, The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business study university programs, Technology Forecasting & Social Change 104. 172-179

Shane, S. 2004, Academic Entrepreneurship: University Spinoffs and Wealth Creation, Edward Elgar, Cheltenham.

The Economist 2016, Flying high; higher education. (Jun 25). The Economist, 419,

Hautamäki, J.

Title: Enhancing the Regional Impact of Universities of Applied Sciences
Pilots, Demos and Experiments Case

Abstract
The improvement of regional competitiveness is at the core of enhancing the regional impacts of universities of applied sciences. It involves cooperation in regional development, adapted to regional conditions, to support the region's businesses and foster the well-being of its working age population. Regional development requires adapting to evolving circumstances and opening up to future outlooks. The essential thing is to bring together the key parties and the sources of futures information, which have an essential role with the change, to create strategic visions, to make foresight plans and to develop regional capabilities. The aim of the article is to manifest Lahti University of Applied Sciences (Lahti UAS) roles as a regional developer. Roles are chancing and nowadays the ability to manage local resources, produce innovations, and generate new capabilities are required.

The research task of the article is, how to enhance the regions' competitiveness by boosting cooperation focused on collaboration between local companies, communities, authorities, stakeholders, education and research. At universities of applied sciences, regional development is seen as competence-focused activity that emphasises the creation and application of new, innovative knowledge. In 2013 the future knowledge related to structural change in the Lahti Region was created by Lahti UAS for identifying the risks could be focused in Lahti Region in future and for recognizing the development targets, which could be able to prevent the realisation of the risks. In 2014 the future knowledge was exploited in definition of the roles of Lahti UAS in regional development.

Universities of applied sciences can enhance their regional impact in various ways. They contribute to this development by taking certain roles in regional development and supporting experimental activities and monitoring innovations emerging bottom-up. From the regional development perspective, the role of higher education in regional competitiveness is based on the idea that competence is the main competitive factor for businesses and communities and one of the factors influencing the well-being of the local workforce. Therefore Lahti UAS has decided to operate in the Lahti Region as a forerunner, as a knowledge promoter, as an international promoter, as a broker, as a partner and as an innovator.

Keywords: Regional Impacts, Regional development, Renewal of Regions, University Role

Introduction
Regional development takes place increasingly often as multilateral collaboration between local, national and international organisations and experts operating in the region. In practice, the regional development

encompasses regional policies of industry, employment, education and innovation implemented in the form of long-term collaboration and measures, with emphasis on the renewal of the region. Societal and regional impacts are delivered through the institution's interlinked core tasks: education, RDI activities and regional development services. Therefore universities of applied sciences have many kind of roles and impacts in regional development.

The improvement of regional competitiveness is at the core of the regional development task of universities of applied sciences. It involves cooperation to increase companies' and communities' competitiveness and to foster the know-how and well-being of its working age population. Therefore regional impact can be enhanced by sharpening and systematizing the services offered to region's businesses and communities and the RDI methods applied in this work. It enables capacity for the improvement of capabilities to respond and adapt to the impacts of changes in regions' operating environment (Martin, 2012).

The roles of universities of applied sciences as a regional developer
To enhance the regions' competitiveness, efforts are focused on boosting cooperation between enterprises, local authorities, education and research, and on competitive factors affecting business, such as the competencies of the workforce and the promotion of multi-skilling, job mobility and longer careers (Benneworth, Charles, Hodgson & Humphrey, 2013). In the Regional Development Programme of Lahti UAS, the promotion of competitiveness of the Lahti Region is based on the rationale that skills are the main competitive factor of businesses and communities and part of the wellbeing of their workforces (Lahti UAS, 2015). The programme incorporates the view that the future success of companies and communities will be based on international activity, solutions arising from new knowledge, innovation, and unique competencies. This will facilitate the region's success and increase its attraction.

According to the programme, the task of Lahti UAS is to produce new approaches and solutions required in the region in cooperation with local education providers, regional development agencies, businesses and communities. Cooperation is based on the know-how of each stakeholders and aimed at combining curiosity and creativity with studying and workforce development. The main aim is to promote regional vitality. Therefore it is important to place students to the focus of the efforts to enhance regional impact and ensure that studies lead to competencies, which are aligned with the regional competence development needs (Lahti UAS, 2015).

To make this happen, Lahti University of Applied Sciences operates regionally for its customers by creating future directions and forecasting the upcoming, by regenerating the region's skills and knowledge base, and by acting as an intermediary organisation promoting cooperation. To this end, Lahti UAS aims to help its customers and partners by leading the way as a forerunner, as a knowledge promoter, as an innovator, as an international operator, as a partner, and as a broker (Lahti UAS, 2015).

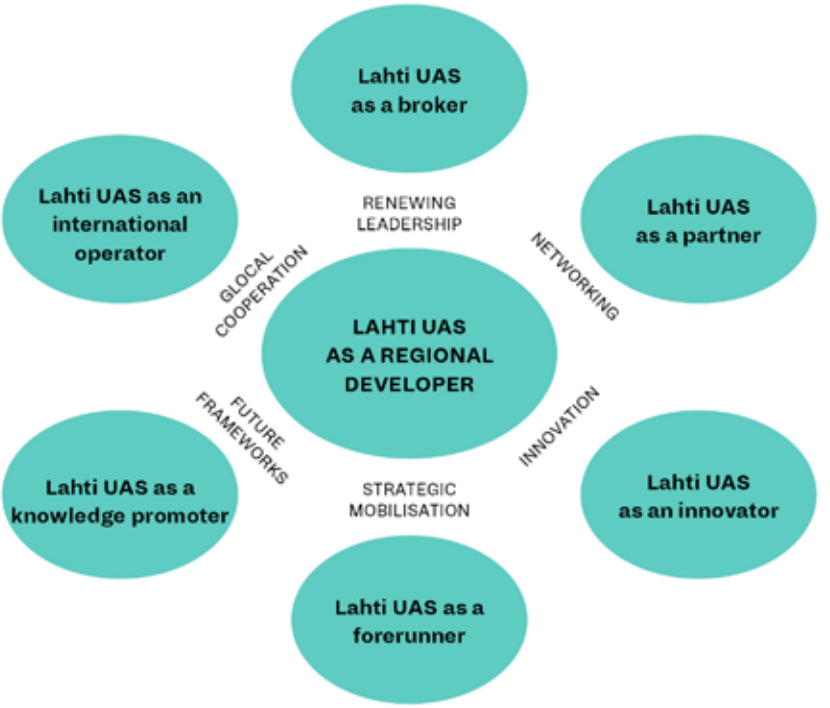


Figure 1. The Roles of Lahti UAS in Regional Development

Mobilisation of the regional development programme of Lahti UAS
Regional development is all about adapting to evolving circumstances while opening up to new forms of cooperation and future outlooks (Sotarauta & Karppi, 2013). In Lahti UAS future knowledge has been exploited in creating regional development program, which has become one of the main strategic programs including to university's strategic base.

Lahti UAS as a Forerunner
Lahti UAS has taken an active role in the creation of alternative paths of progress and the renewal of the region's strategic base. University works with strategic partners to find a common understanding of where regional cooperation efforts should be targeted and what kind of prerequisites should be created to facilitate sustainable growth of the region's competitiveness and well-being.

Strategies are mobilized through multi-level and concrete forms of cooperation to identify appropriate development resources and to consolidate, optimize and target these resources. Therefore it is very important to keep separated strategies of regional stakeholders in the line with regional strategies. It enables support and mobilisation for the objectives outlined in the region's development plans and economic competitiveness strategies. Moreover collaborative foresight activities of various stakeholders area means to create a shared image of the future (cf. Ministry of Employment and the Economy, 2012).

Lahti UAS as a Knowledge Promoter
Maintaining regional competitiveness calls for foresight planning of skills and competence to a greater extent in a way that takes note of the profiles of regions and the global development trends. The aim of foresight planning is

to produce knowledge for the support of strategic planning and decisions (Hautamäki & Vesasto, 2013). The essential thing is to bring together the key stakeholders and the sources of futures information, which have an essential role with the change, to create strategic visions, to make foresight plans and to develop regional capabilities (Hautamäki, 2015).

The experts of foresight activities collect foresight information from the regional stakeholders, as well as business clusters and education. In the process, the mutual future knowledge is examined and collectively analysed in order to be utilised in creation of new strategies and scenarios of regional stakeholders (Hautamäki & Vesasto, 2013). Moreover foresight planning supports the creation of innovation initiatives and prerequisites for innovations at regional level. Strategic foresight requires joint efforts that enable university to refine new knowledge. New kind of knowledge base is created for sustainable business growth, for new growth sectors, for employment and well-being at work, as well as for versatile and high-quality work and living environments. Essential is to manifest future signals and anticipated changes in business and in skill needs for the benefit of the companies and communities.

Lahti UAS as an Innovator

The ability to manage and generate local resources, produce innovations, and generate new capabilities in mobilising and aligning the region's resources and competences are required (Sotarauta & Karppi, 2013). To this end, the ability to shape and establish new approaches, competencies and paradigms is vital (Horlings, 2012; Martin, 2012). Lahti UAS develops customised learning environments that are used for business development and test innovative, smart and sustainable solutions and practices in real-life processes. Services offered to SMEs and new businesses are at the heart of this role.

Universities of applied sciences contribute to regional development by supporting experimental activities and monitoring innovations emerging bottom-up (Sotarauta & Karppi, 2013). In innovation activities, the focus is on coaching services that are developed and tested together with the customer and which transcend organizational boundaries, as well as other projects and experiments that enable customers to work with students to design new products and services and ultimately improve the sustainability and resource efficiency of the organisations' processes. The aim is to put together and support workplace-oriented learning environments and to take an active role in forming an eco-system of entrepreneurship (Lahti University of Applied Sciences, 2015).

Lahti UAS as an International Operator

According to Gunesakara (2006) universities have to shape regional networking and institutional capacity through staff participation on external bodies and brokering networking between national and international contacts and key regional actors. Lahti UAS offers its customers international expertise and excellent contacts, which can help their global business endeavors. By contributing to knowledge exports, companies can enhance their own business, as Finnish know-how is transferred to other countries where it can be used to resolve global problems.

In glocal cooperation, the focus is on sharing international contacts, introducing good international practices into the region, and on coaching local organisations, especially SMEs, to leverage international opportunities and operate in multicultural contexts. The aim is to support the international networks of the local companies and organisations, as making use of

international contacts of Lahti UAS and assist the international knowledge transfer in the region.

Lahti UAS as a Partner

According to Hautamäki (2015), shared leadership in the development networks controls the dynamics and balance of collaboration taking place in the complex environment, which increases the region's self-renewal capacity due to social processes between the regional experts. Gibney, Copeland & Murie (2009) highlight strategic leadership as a fluid, relational, associational, interactive and collaborative process. Related to strategic leadership Lahti UAS has taken an active role in the developer networks in Lahti Region and the Greater Helsinki Metropolitan Area and builds long-term partnerships for competence and business development.

In network-based cooperation activities, the focus is on agile collaboration, inspiring experiences, encouraging customers to utilise competence services, knowledge sharing, and learning associated with cross-development platforms that offer diverse forms of cooperation, partnership and expertise across different industries and clusters. Customers and alumni are natural components of the higher education community.

Lahti UAS as a Broker

In brokering, the focus is on promoting network-based cooperation on practical level. Cooperation between students and companies, as well as success in everyday development cases promotes collaborative learning between university and working life, and fosters mutual trust and interaction that creates tangible results. When it comes to creating new solutions, the ability to engage in increasingly broad-based collaboration is required, as different companies and stakeholders work together to combine, in diverse ways, the latest knowledge from different industries and evaluate it in terms of the product or service being developed with the customer (Chesbrough, 2003).

Lahti UAS offers knowledge services that help companies and communities develop practice-based and customer-oriented solutions and train multi-skilled experts in workplace-based learning environments. Our services create and establish regional cooperation that enhances our customers' competitiveness and success in meaningful ways that increase productivity. The aim is to reinforce the knowledge services based on the needs of the corporate and organisational customers and to increase the role of continuing education in the skills development of the business and industry and the workforce.

Conclutions and recommendations

Universities of applied sciences can enhance their regional impact in various ways. From the regional development perspective, the role of higher education in regional competitiveness is based on the idea that competence is the main competitive factor for businesses and communities and one of the factors influencing the well-being of the local workforce. Regional impact can be enhanced by sharpening the industry-focus of teaching and learning. This way, attention is focused on the services offered by the institution to the region's businesses and communities and on the RDI methods applied in this work. It is important to place students in the focus of the efforts to enhance regional impact and ensure that studies lead to competencies, which are aligned with the regional competence development needs. The main challenge of Lahti UAS is to develop and focus exact products and services offered to working life organisations without loosing creativity and innovative approach.

Lahti University of Applied Sciences promotes regional vitality and well-being especially in the Lahti region. Societal and regional impacts are delivered through interlinked core tasks: education, RDI activities, and services for local employment sectors. Through its strategic foundation and roles, Lahti UAS has the willingness and increasing ability to serve working life as a regenerating force that promotes the region's competence and competitiveness through continuous learning and open dialogue. In the long term, regional impact is based on the institution's ability to produce competent individuals, but its impacts can also be enhanced significantly by increasing the volume of industry-oriented services and student projects involving research, development and innovation activities that support local businesses and communities.

References

Benneworth, P., Charles, D.R., Hodgson, C. & Humphrey, L. 2013. The Relationship of Community Engagement with Universities' Core Missions. In P. Benneworth (Ed.), University Engagement with Socially Excluded Communities, 85-101. Dordrecht: Springer Science + Business Media.

Chesbrough, H. 2003. Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Press.

Gibney, J., Copeland, S., & Murie, A. 2009. Towards a "new" strategic leadership of place for the knowledge-based economy. Leadership, 5, 5-23.

Gunasekara, C. 2006. Reframing the Role of Universities in the Development of Regional Innovation Systems. The Journal of Technology Transfer 31, 101-113.

Hautamäki, J. 2015. Alueellisen kehittäjäverkoston johtaminen - näkökulmana äkilliseen rakennemuutokseen varautuminen. (The Leadership of Regional Development Network from the point of view of Preparation of Sudden Structural Change). Acta Universitatis Tamperensis 2084. Tampere: Tampere University Press.

Hautamäki, J., & Vesasto, M. (Eds) 2013. Proactive Approach to Structural Change. A Publication of Lahti University of Applied Sciences C, 134. N-Paino Ltd.

Horlings, L. 2012. Value-oriented leadership in the Netherlands. In M. Sotarauta, L. Horlings & J. Liddle (Eds), Leadership and change in sustainable regional development, 252-270. London: Routledge. CPI Group Ltd.

Lahti University of Applied Sciences. 2015. The Regional Development Programme 2020. The Strategic Programmes of Lahti UAS.

Martin, R.L. 2012. Regional Economic Resilience, Hysteresis and Recessionary Shocks. Journal of Economic Geography, 12, 1-32.

Ministry of Employment and the Economy of Finland. 2012. Finland´s national regional development targets for 2011–2015. An economically, socially and environmentally sustainable Finland. Publications of Regional Development 6/2012.

Sotarauta, M. & Karppi, I. 2013. Aluekehittäminen ja alueellisen muutoksen hallinta. In Karppi, I. (ed.) Governance: Hallintaa uusin muotoiluin, 97-118. Tampere: Tampere University, School of Management.

Järvenpää, A-M., Salminen, V.

Title: Competence Portfolio Assessment for Regional Development – Case Riihimäki Railway Station Area Development

Review Article

Abstract

Riihimäki is a dynamically growing small city, located within easy reach of the Helsinki-Tampere highway. It has also an active railway station, which is at this moment under renovation. The station area is under complete modernization. That needs multidisciplinary development activities and democratic innovation.

Digitalization is rapidly increasing and municipalities and supporting enterprises must find new ways to innovate for business advantage and new functionality. Mobility as a service (MaaS) platform development creates great opportunity for new service innovations on station area.

Smart Services research center at Häme University of Applied Sciences (HAMK) is making applied research and development through the way of building up research and learning environment at customer sites. It serves commercial and industry strategy and the objective is to increase competitiveness of the region. The objective is to offer transdisciplinary development support for public, industrial and commercial life by creating new opportunities and responding on business transition challenges.

This article concentrates on analysing of the role of Smart Services research and development centre supporting the co-evolution of municipal and industrial enterprises and value networks and through that increasing competitiveness of the region. For that purpose, it is important to know the overall capability of HAMK and research and development centre in that. It is important to manage the overall competence structure as a competence portfolio.

This article introduces a conceptual case study on how to use competence portfolio during the transdisciplinary development and modernization of Riihimäki City station area. HAMK launches Riihimäki station area as research and learning environment for municipal officers as customer, business partners as solution providers and HAMK students and knowledge carriers as working environment. Mobility as a service, MAAS- platform is applied on that environment. Open data published by municipal offices, public companies and business units is used for creating new services.

In the future the competence portfolio model serves as adaptive complex system when building multi-competence groups to tackle with the co-evolution challenges of customer enterprises. When some new competence is needed for challenges of business co- evolution, HAMK education and training system serves for the purpose of adaptive lifelong learning. The adaptive system is interrelated between regional needs, applied research and

education, learning from each other's and tuning their operations according the challenges.

Keywords: Competence portfolio, digitalization, mobility services, co-innovation, research and learning environment.

Introduction

It is widely recognised that the service business is a fast growing business area. It is seen that as example the engineering industry is currently living in the middle of co-evolution from being the product provider to offering product related services and customer value. It is acknowledged that there is a strategic paradigm shift from "ownership" to "access" and the potential sustainable growth of the business lies in services created and captured. Through digital transformation, the use of new technologies like cloud, mobile, big data, and social networks with increasing intelligence and automation enterprises can capitalize on new opportunities and optimize existing operations to achieve significant business improvement. But to transform themselves, they must have the right digital assets, suitable capability and fitting competence and right mindset to succeed in co- evolution and not fall in disruption. Knowledge is scattered and distributed in business networks. Competence areas have become more complicated and single human capacity cannot cope with all the needed competence to create new opportunities for businesses. That needs democratic innovation culture and co- innovation and co-evolution processes. The opportunities digitalization offers (etc. Internet of Things, Industrial Internet) have to be managed by offering development support for various fields of businesses on business modelling, eLeadership, eWork, competence networking, operation networking and data networking. There is a great challenge on turning digital systems and services and even data used as usable as possible. The process of data (life cycle and big data) transferred on information and tacit knowledge and finally as life cycle care and services have to be managed to change it as business opportunity or completely new entrepreneurship and business. It is tuff for human being and his mindset and capability, organization and team structures to manage scattered topics during business co- evolution.

Häme University of Applied Sciences, HAMK, has a highly international environment with an innovative atmosphere and close co-operation with the Häme region's private business and public partners. HAMK is active in applied research and development and has research centres to accomplish it. One of those centres is Smart Service Research centre. Its task is to create and execute, together with co-operation network, well addressed research and development activities for regional and enterprise development needs. Smart Services- Research unit supports cross-sectorial utilization of digital technologies and service business development. Similar solutions can be adapted in various lines of business. Research unit supports business transition of regional public and private sector partners and functions on following lines of business:

- Flexible logistics and smart traffic
- Industry digitalization and life cycle services
- Environment business and services, circular economy, resource efficiency
- Wellbeing solutions and services
- Smart building, home and environment
- New working environment and life-long learning.

Riihimäki is a dynamically growing small city, located within easy reach of the Helsinki-Tampere highway. It has also an active railway station, which is at this moment under renovation. The station area is under complete modernization. That needs multidisciplinary development activities and democratic innovation. Research and learning environment is a platform for co-operating with companies and developers and form innovation ecosystem for smart mobility and digital everyday services. This article introduces Riihimäki Railway station area development which HAMK is supporting by creating a research and learning environment where students, researchers and ecosystem partners can execute multidisciplinary activities and development project. The main focus will be in smart mobility and digital everyday services.

This article describes the customers need for development and introduces the case model how HAMK can utilize its competences for regional development activities in Riihimäki railway station area. This article defines as well the vision for development between HAMK and the customer, municipality of Riihimäki city. This article provides information about HAMK's competences, role of Smart Services research centre and development ideas for creating the research and learning environment. Article can be used for marketing the co-operation inside HAMK to construct the competence portfolio and outside HAMK to find companies and developers for co-operation. The idea for the co-operation is to build an innovation ecosystem.

The main actors in the Riihimäki research and learning environment are:

- Smart Services research unit
- Municipality of Riihimäki City
- Degree programme of Traffic and Transport Management
- Degree programme of Information and Communication Technology
- Degree programme of Business Information Technology
- Growth Corridor Finland network
- VR Group
- Finnish Transport Agency
- Property owners
- Companies

The research and learning environment will provide research platform for researching mobility, customer experience and smart technologies. The aim is to find out citizens needs for mobility services and generating information to develop services as well as develop research methods. Smart mobility and digital everyday services are important for environment because of the resource efficiency. Smart mobility reduces the use of privately owned cars and everyday digital services reduces the need for travelling.

In this article we introduce the competence portfolio model and a conceptual case study on how to use it during the transdisciplinary development and modernization of Riihimäki City station area. That involves multidisciplinary development activities and democratic innovation. Mobility as a service, MAAS- platform will be applied on that environment. Open data published by municipal offices, public companies and business units is available to be used for creating new services.

Theoretical background

As universities become bigger players in R&D and economic development, their relationship with industry, research parks and regions needs to be carefully rethought. On some level, the very notion of a university as solely a center of research and teaching needs to be re-examined (Townsend et al, 2008). For regional knowledge ecosystems to become more resilient, they will need to encourage universities that are responsive to well-articulated regional needs. Structuring the engagements around mechanisms that produce tangible benefits for the universities will be crucial. 21st century learning environments (2016) is the support systems that organize the condition in which humans learn best – systems that accommodate the unique learning needs of every learner and support the positive human relationships needed for effective learning. Learning environments are the structures, tools, and communities that inspire students and educators to attain the knowledge and skills the 21st century demands of us all. DiMartino (2007) emphasize real-world learning and allow students to pursue alternative approaches outside the classroom to acquire knowledge and skills. Chevalier and Buckles (2013) make a concerted effort to integrate three basic aspects of their work: participation (life in society and democracy), action (engagement with experience and history), and research (soundness in thought and the growth of knowledge). Action unites, organically, with research and collective processes of self-investigation. Bdker (2004) has concentrated on participatory IT design. Schuler and Namioka (1993) have introduced basic methodologies with principles and practices.

Nonaka & Tageuchi (1995) introduce that knowledge is created by flow of information and is anchored in the beliefs and commitment of its holder. Chesbrough (2003) declares innovation practices over the enterprise boundaries and in value networks by open innovation. In the open innovation model, the boundary between a firm and its surrounding environment is more porous; enabling innovation to move easily between the two. In existing theory it can be found similar type of concept in human –machine interaction research called participatory design. Skyttner (2005) introduces new systems theory with self –organization and evolution. Jamshid (1999) introduces that system thinking is the art of simplifying complexity. It is about seeing through chaos, managing interdependency, and understanding choice. Concepts are important to explain chaos. Sanchez (2004) have proposed an open systems model of firms. Improving of organizational competence also requires increasing managers' own cognitive flexibilities to imagine new strategic logics for creating and realizing new kinds of value-creating product offers and new ways of managing processes for creating and realizing new and existing product offers. For research centre to be capable to collaborate with industrial companies, it is important to know the overall capability of research and development unit (Salminen et al, 2015). The experts making applied research with customers have to have content and process knowledge of customer site, they have to be capable to work in teams on co-operative and distributed way with other experts in value network.

Research questions and research approach

The main research questions are:

1. What is the role of research center in local area development facilitation?

2. How to create research and learning environment with customer and with ecosystem partners?

3. What does digitalization mean on station area development as mobility service context?

4. How to integrate education resources at research and learning environment and how to manage the competence portfolio?

We have used in this research participatory research approach by involving customers, technology supplier, network partners and research and education resources on the collaborative work on research and learning environment. The results have been analysed by qualitative methodology.

What is the role of research centre in local area development facilitation?
The role of Smart Services research center is to create and maintain research and learning environments with customer and ecosystem partners. For doing this, research center must create a shared vision for development focus areas with the customer. Research and learning environments will be used for innovating with the customer and for implementing customer oriented, transdisciplinary, research and development projects. Development activities in development projects will integrate research and education. Research center's task is to coordinate degree programs for development activities and to generate competence portfolio to support customer and solving problems.

Development activities in the Riihimäki station area is managed by HAMK's Smart Services research centre. Research centre is dynamic environment for applied research, development and innovation services for business enterprises, wellbeing organizations and everyday life. Research centre creates research and learning environments for transdisciplinary innovation and co-operation. It supports also new digital work environment and lifelong education and generates knowledge and expertise in the field of digitalisation and services.

There are several self-organised research groups in research centre. These groups have continuous conversation with actors in the region in order to understand the regional development needs and to convert these needs in to development actions. These groups execute regional development and research projects for customer by multidisciplinary approach. Groups has theoretical and practical research competence and they create and use research and learning environments for doing interdisciplinary team work. Research groups generates transdisciplinary innovation and demonstration. Groups has networks with industrial, commercial and municipal customers as well as research and university partnerships.

The impact of research centre is applied research and regional development (figure 1). Development needs comes from the region which will be deployed with research and development projects. Education provides transdisciplinary resources for research and development. Transdisciplinary projects develop new competences and generates new information for education. Region needs new professionals and education transfers competences for the region with thesis and services.

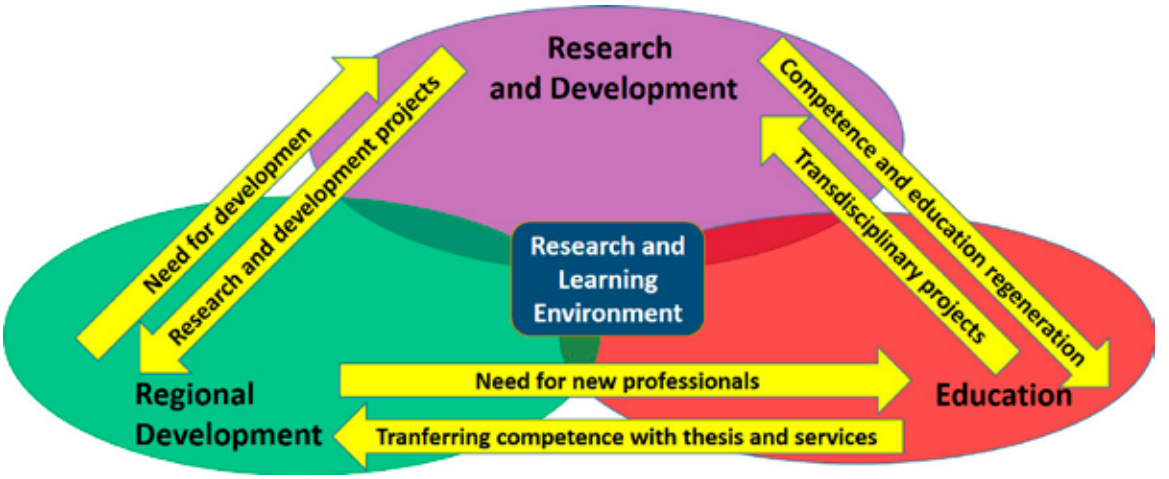


Figure 1. Role and impact of research and development.

How to create research and learning environment with customer and with ecosystem partners?

Rail traffic and its attractiveness is important to the customer, municipality of Riihimäki city. Development of user experience is the main priority for the customer. Riihimäki City has researched station are challenges from the point of view of citizens. Citizens are feeling insecure in the area and accessibility needs development and new solutions. Parking places for bicycles and cars needs development. There are a lot of empty space in the buildings, which needs new concepts and ideas. There is need for services in the area and it provides good opportunities for developing a service environment.

Riihimäki station area consist of the railway station, old engine houses, business center Liikerata and parking areas. The station will provide a research and learning environment for smart traffic and flexible logistics. There will be executed research about trip chains, accessibility and user experience for digital mobility services (e.g. MaaS). Analyzed information will be used to develop agile multimodal trip chains and digital services. In order to develop services, open data will be utilized as well as produced. The station area will provide a service environment for everyday services too.

Ideas for creating the research and learning environment was generated in the workshop with the customer, property owners in the area, research center, teachers and students. Ideas were organized in four groups: 1) data and digital services, 2) multimodal transport services, 3) new functions 4) events and activities.

Data and digital services includes collecting, analyzing and visualizing data as well as utilizing and providing open data. Accessibility can be developed by testing new technologies, feeling of insecurity needs access control services and monitoring. Agile trip chains need management of multimodal transport services. Development activities will be focused for car and bicycle parking, eBike-service for commuter traffic and piloting of mobility services.

There is need to find new concepts for the business center Liikerata. The first step in development is to determine customer requirements for everyday services in the station area. New functions in the area could be a hub for startups, showroom for new technologies, pilot of shopping bag service,

landscape design and energy efficiency in renovation. With events and activities can be collected neighboring democracy data for decision making and visualizing actions in the area for citizens. Transdisciplinary innovation session will be organized.

Research and learning ecosystems need many actors like municipality of Riihimäki City, Growth Corridor Finland network, technology companies, railway company, Finnish Transport Agency, property owners, real estate surveillance companies, landscape designers, station are developers from other regions and research and education institutions.

What does digitalization mean on station area development as mobility service context?
Digitalization means from-data-to-service process of collecting, analyzing and visualizing data and making decisions for creating services (figure 2). Interesting data is e.g. flow of people and goods, transportation information, trip chain management, geographical information and open data. Collection and utilizing data provides an opportunity to develop everyday digital services for customers' needs.

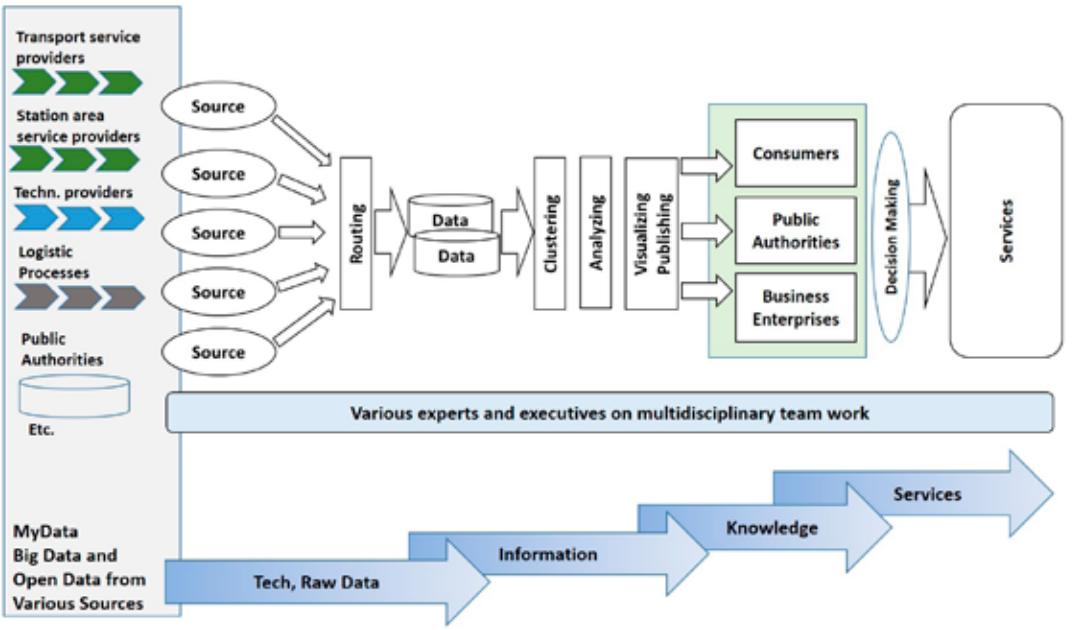


Figure 2. Digitalization on station area development as mobility service context.

How to integrate education resources at research and learning environment and how to manage the competence portfolio?
Research centre supports customers by knowledge transfer, examination methods, research and development activities and testing. HAMK has about 7000 students and 600 staff members in 7 campuses. There is 27 bachelor's degree programmes and 9 master's degree programmes. Building a competence portfolio need analysing HAMK's competences in several degree programmes. The objective is to integrate education in research and regional development activities. Focus is not just in the development in

Riihimäki station area, but the idea is to generate information and innovations to be utilized in other regions especially in Helsinki - Hämeenlinna - Tampere corridor.

Integrating HAMK's wide competences in a transdisciplinary way needs identifying the competences in the competence portfolio (figure 3). In the beginning we have identified the core competences that are needed in the research and development actions. Competences are focused for developing smart mobility in the point of view of customer. Core competences comes from three bachelor's degree programme and supporting competences comes from various master's and bachelor's degree programme.

Core competences are:

1. Traffic and Transportation Management: land use and traffic planning, traffic surveys, traffic and transport planning and smart traffic.

2. Information and Communication Technology: application development, smart systems, mobile networks and applications.

3. Business Information Technology: business analytics and business intelligence.

Figure 3. Competence portfolio.

Conclusions and recommendations

Creating the research and learning environment will be started with the workshops' development ideas and mapping these ideas in competence portfolio. Development ideas will be executed by students and the concept model will be introduced to actors who will benefit of being part of the ecosystem. The concept model will be developed further and implemented in co-operation with ecosystem partners.

Key action will be introducing the concept of the research and learning environment to earlier recognized actors and to identify their interests for the environment. Important task is to benchmark other development activities and ecosystems concerning station areas in other regions as well as research and learning environments which is created by higher education institutions and ecosystem partners.

By student activities during semester 2016-2017 the area and its potential will be recognized more detailed level and the information will be produced in order to generate research project in the future.

All of these actions will help step-by-step to build up research activities with the ecosystem partners in the research and learning environment as well as integrating education in real actions in the environment. Competence portfolio model will be developed further as an answer to development needs of ecosystem partners and research project.

References

Townsend, A. Soojung-Kim Pang A., Weddle, R. (2008) The Next Twenty Years of Technology-Led Economic Development IFTF Report Number SR-12361, pp. 38.

21st Century Learning Environments (2016) www.p21.org/storage/documents/le_white_paper-1.pdf (06.06.2016), pp. 3.

DiMartino, J. (2007). “Assessment or Mastery?” Edweek, April 25, 2007(read 06.09.2016). http://www.edweek.org/ew/articles/2007/04/25/34dimartino.h26.html?qs=@0+Jo+dimartino

Chevalier, J.M. and Buckles, D.J. (2013) Participatory Action Research: Theory and Methods for Engaged Inquiry, Routledge UK, pp. 452.

Bodker K. (2004) Participatory IT Design: Designing for Business and Workplace Realities. MIT Press, Boston, pp. 305.

Schuler D., Namioka A. (1993) Participatory Design: Principles and Practices. Lawrence Erlbaum Publishing, pp.12.

Nonaka, I., Takeuchi, H. (1995) The Knowledge-Creating Company. Oxford University Press, New York, pp.6.

Chesbrough H. (2003) Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Publishing Corporation, Boston, pp.xxiv.

Skyttner, L. (2005), General Systems Theory: Problems, Perspectives, Practices. World Scientific Publishing, Singapore, pp.4.

Jamshid, G. (1999) System Thinking: Managing Chaos and Complexity. A Platform for Designing Business Architecture. Butterworth- Heinemann, Woburn, MA, USA, pp.8.

Sanchez, R. (2004) Understanding competence-based management Identifying and managing five modes of competence. Journal of Business Research, 2004, vol. 57, issue 5, pages 518-532.

Salminen, V., Kantola, J., Vanharanta, H. (2015) Competence portfolio assessment of research and development center for regional development. 6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015), Elsevier Publishing, Procedia Manufacturing 3, pages 701 – 708.

Medkova, K., Fifield, B.

Title: Urban Mines – The Mines of Circular Economy
Review Article

Abstract
Global population and demand for resources is rapidly growing, although sources of virgin materials cannot. Natural treasures, which we take for granted, occurring in geological mines are, in fact, limited. However, there are other mines full of resources, richer than any natural deposits can offer, which we do not yet fully appreciate. These mines are anthropogenic; they are called urban mines. In general, urban mines refer to materials in products, buildings, and urban infrastructures. And unlike the rather scarce geological mines, there is an abundance of locally accessible urban mines in every country, in fact, in every city. Urban mining can play a key role in a sustainable resource supply and the transition towards a more circular economy.

This paper aims at discussing this concept of urban mines and its potential benefits to the economy, society and environment based on available examples and cases. How much can we gain? Urban mines is a relatively new idea, and not much research has been done regarding their size, time and location availability. We are only beginning to fully appreciate the potential riches of our contemporary urban mines.

This paper also reflects on the idea of future urban mines described as a possible solution for effective and efficient urban technospherical materials management. It is a long-term and complex challenge. However, imminent actions are necessary. Among other solutions, smart design functions as a link between all segments of the chain; from product and material design to system, infrastructure and business model design. By considering sustainable design thinking and urban mines as an approach to managing the equilibrium of material flows and stocks in the future, we can support growth without consuming all of our natural resources. This paper discusses what has been done so far, points to the current barriers, and proposes directions for future development.

Keywords: Urban mining, future urban mines, circular economy, data mining, material recovery, technosphere mining, sustainable resource supply, smart design.

Introduction
In general, circular economy addresses the economic, environmental and also social areas of our lives. It strives towards using resources more wisely as they become more scarce or are more difficult and less profitable to extract. There are several access challenges: technological, economic and environmental, and impacts related to health and safety. Furthermore, geopolitics and location play a role as well, as the supply of some materials depends on a few mines worldwide. (UNEP 2013, 4)

If the urban population doubles in the next three to four decades, then new cities, infrastructures and more food, products and services will be required.

The circular economy proposes, by maximizing the preserved value and cascading materials across industries, that we extend the material circularity longer and increase effectiveness and efficiency, and thereby, reduce raw materials demand. (Medkova 2015; Towards the Circular Economy Vol 1 2013; Wheels of Metals 2014)

This paper is based on a literature review. As the topic of urban mines is new, the sources are rather limited.

What Is Urban Mine?

Manufactured products are richer in precious metals deposits than in their original ores. It also requires less energy to refine those materials from products. Professor Nanjyo of Tohoku University of Japan coined the term Urban Mine in the 1980's. Using this term, Professor Nanjyo classified designated sites for storing discarded products, in order to mine these valuable metals. Originally, these urban mines sites were proposed for end-of-life vehicles, packaging waste, WEEE (Waste Electrical & Electronic Equipment), batteries, used paper and construction rubble. Designating urban mines were part of the Japanese move to a circular economy, aiming at lower virgin material use and thus creating more sustainable environment. (Yoshida & Yoshida 2011)

In another study, Prof. Nishiyama showed that "80% of the world's mercury, 75% of silver, tin, and lead, 70% of gold and zinc, and 50% of copper and manganese have already been used aboveground" (NIMS NOW 2008, 2).

The urban mines concept is still in its infancy. Ambiguity about the term exists because of differences in how the term is used. Some people might understand urban mines as synonymous with recycling or recovery. For instance, urban mining is often associated with metal recovery, especially from WEEE and referred to literally as gold mines of e-waste, due to a higher concentration of gold and other rare metals than in the primary ores.

Another use of the term refers to all materials that are present in our cities. Originally, an approach to recapturing metals from products could, in fact, be extended to examine the recapture value of other materials readily at hand in our urban environments. Currently, we are limited to economically feasible materials recovery by our limited understanding of how to reprocess complex materials, which are embedded in the elements of structures. (UNEP 2011)

These reprocessed recovered materials are referred to as flows and stocks. Urban mines are stocks of materials, which are contained in buildings, old factories, bridges, infrastructures, or various applications and networks, such as cables, unused rail tracks or old telephone poles. Additionally, discarded products, such as mobile phones, TV's or old vehicles, are also stocks. And finally, there are stocks contained in ships and vessels, planes and army equipment, spaceships and abandoned satellites in space. (Yoshida & Yoshida 2011) All of these categories represent types of technospherical urban mines, providing resources, which are less energy intensive to reprocess and minimize environmental risks.

In addition to metals, other obvious materials could be considered for urban mining. These materials are plastics, wood, glass and biological materials. A less obvious opportunity for urban mining can be found in urban agriculture. Cities have been regarded as "one-sided consumer of natural resources", however, cities are also producers and possible suppliers of local resources, such as biowaste and water, with respect to circular economy flows (Giseke, Gerster-Bentaya, Helten, Kraume, Scherer, Spars, Amraoui, Adidi, Berdouz,

Chlaida, Mansour & Mdafai 2015, 31).

These materials have already been mined, refined and processed. They are an easy source of materials. By not understanding the concept of material stocks and flows as a system, we do not fully utilize the potential of urban mining.

Thinking in Systems, Material Stocks and Flows

Thinking in systems, sometimes called systems thinking, is at the core of the circular economy concept. This means looking at the complex systems of elements, relationships, and interactions as a whole, not as individual elements.

Another way of looking at systems thinking within the circular model is the concept of material stocks and flows. We can define a material stock as an urban stock of materials contained in products, applications, and infrastructures accumulated in society. These materials could be presently being used or not, however, they have not yet reached the waste stage. A flow of materials can be described as a combination of a material inflow into the stock and a material outflow out of the stock. In other words, the amount of a material extracted for building the stock in a year (inflow) and the amount of a material recovered out of the stock in a year (outflow). The difference between the inflow and outflow composes the stock. (Circular Economy 2015)

The stock grows if the inflow is bigger than the outflow out of the stock and this is what we are expecting to happen, because the population and demand will grow. If the outflow is bigger than the inflow into the stock, the stock depletes. The stock's dynamics drive the material flow (inflow/outflow). When the inflow equals the outflow, the stock reaches equilibrium. And that means, the inflow here, is to maintain the level of a stock and compensate the waste outflow out of the stock. When the circular economy reaches the equilibrium stage, the outflow becomes a new secondary material inflow, with a close to zero need for virgin materials. (Circular Economy 2015)

Types of Stocks

There are three different types of stocks: In-use, Non-use and Prospective stocks (Figure 1). Each stock has its characteristic dynamics and understanding these dynamics is crucial for steering society towards more sustainable development and circular economy.

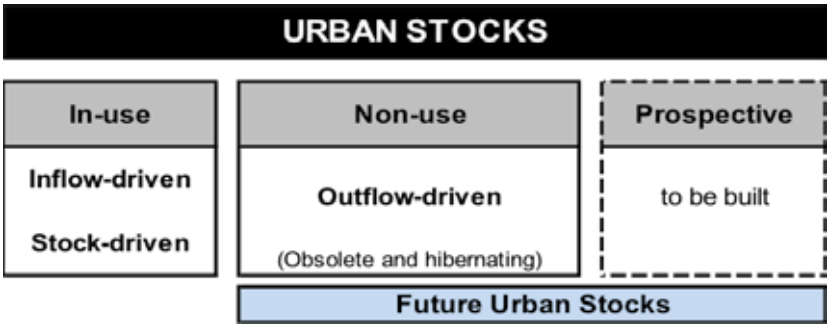


Figure 1: Types of Urban Stocks

In-use stocks consist of Inflow-driven and Stock-driven stocks. Inflow-driven stocks have a very short life span of several weeks or months, and a stock as such is almost not formed. A typical example can be packaging, such as beverage cans, which are discarded immediately after use. The inflow equals the outflow only over a short time delay. On the other hand, stock-driven stocks are stocks of goods and materials, which we aim to accumulate or maintain at a certain level to become saturated stocks; for instance, infrastructures, buildings, and cars. In this case, the outflow equals the inflow of some years ago. The time difference equals the utilitarian lifespan or a residence time of an application. (Wheels of Metals 2014)

Non-use stocks are outflow-driven stocks, including goods and materials which are not used anymore and have become obsolete. These obsolete goods and materials are like waste but they have not entered the waste stage yet, instead, they are hibernating and waiting to be mined. One of the reasons can be that these hibernating anthropogenic stocks have a potential to be recovered, however, it is not economically feasible at the time. Examples of this would be materials in tailings, government repositories, industrial stockpiles, and landfills (UNEP 2010,12). Other examples of non-use stocks could be old cables or tubes left in the ground, abandoned buildings and cars, or old electronic devices, left in drawers, attics and basements. (Wheels of Metals 2014)

Prospective stocks are stocks of applications still in a planning phase, including new cities, infrastructures and goods that will meet the rising demand of rapidly growing population and urbanization in the coming decades.

Both, non-use stocks and Prospective stocks form Future Urban Stocks; the future material deposits to be mined from the anthroposphere. Especially here, the future mining plans and databases, smart product design applications, residence time estimates as well as product or material passports can be and ought to be implemented already in the planning and designing phase, to improve the efficiency and effectiveness of future urban mining. Here, the role of non-use urban stocks is substantial. It can provide needed resources for building future cities and connected applications.

An inspirational example comes from the Netherlands, where several buildings were renovated and combined with new ones. Not only is this building complex energy positive, and 80% of original materials were reutilized, furthermore, 80% of the current structure materials can be reused again beyond the structure's end of life. And even here, material passports play a critical role in the circular economy by providing "information on all of the materials used within the building, including their lifespan and potential opportunities for reuse". (Egerton-Read 2015)

Urban Mining Benefits

Urban mines are positioned where people live. This brings environmental, socio-economic and logistical advantages.

Recovering secondary materials from urban stocks can partially mitigate global resource scarcity and secure domestic supply and thus create material independence over import. By minimizing traditional mining and logistically using locally available resources as secondary materials, a huge amount of energy, water and emissions can be saved. The energy and emissions requirement of secondary metals in comparison with primary produced metals is between 50 to 99% (Corder & Golev 2015). In the case of energy

intensive aluminium, 95% of energy can be saved, thus avoiding 9 tonnes of carbon dioxide per tonne of recycled material (Cianciullo 2016).

Products and Applications

A study (2013) by the Ellen MacArthur Foundation revealed that 65 billion tonnes of materials were extracted from nature in 2010, and consumption is expected to reach 82 billion in 2020. Europe itself generated 2.7 billion tonnes and only 40% of this amount was reused, recycled or composted. UNEP presented examples of annual value losses for some metals; USD 52 billion for copper, USD 34 billion for gold, USD 15 billion for aluminium and USD 7 billion for silver. (Towards the Circular Economy Vol 1 2013)

Electronic products are made from valuable resources and materials, including metals, plastics, and glass, all of which require energy to mine and manufacture. Up to 60 elements of the periodic table occur in electronics in general. According to the United Nations University, the global quantity of e-waste generated has risen from 33.8 Mt in 2010 to 41.8 Mt in 2014. The forecast for 2018 reaches 50 Mt of e-waste. (UNU 2014, 22-24)

The estimated material value of global e-waste hit almost 48 billion Euros in 2014. More detailed analyses are in Table 1. The vast majority of these valuable materials are either in use, hidden or even lost in our urban mines, including landfills. Only 6.5 Mt of e-waste was documented and recycled in 2014. (UNU 2014)

Table 1: Global Urban Mines, based on UNU 2014

		Material	Kilotons	Million Euros
Metals		Iron, Steel (Fe)	16,500	9,000
		Copper (Cu)	1,900	10,600
		Aluminum (Al)	220	3,200
	Presious Metals	Gold (au)	0.3	10,400
		Silver (Ag)	1.0	580
		Palladium (Pd)	0.1	1,800
Plastics		PP, ABS, PC, PS	8,600	12,300
				€ 47,880

In general, WEEE waste contains 40-50 times higher concentration of precious metals and minerals in comparison with natural ores. In the case of mining gold from gold ore, the yield is three to five grams per ton. In comparison, from one ton of urban ore, such as PC circuit boards, the yield is 200 to 250 grams per ton; in the case of mobile phones, it is possible to extract even 300 to 350 grams of gold per ton of phones. (Grant 2016, 22)

What Needs to Be Done

To some extent, urban stocks are utilized in recycling paper, metal, glass and bio-waste. However, there is no mining plan and database for urban mining actions in the future. Quantifying urban stocks is important. The UNEP (2010) report confirmed that available data is limited or non-existent. Some information about in-use stock and lifetimes exist only for five metals, aluminium, copper, iron, lead, and zinc and there is scattered information about 19 other metals. The same methods used by mining companies to explore potential mines

and prepare a mining plan by exploring the geological properties, mineral concentrations, economic viability and environmental aspects, should be applied in investigating urban mines potential. (UNEP 2010; Wheels of Metals 2014, Circular Economy 2015)

There are three considerations in urban mining. First is the size and location of the stock. Secondly, it is the time horizon, in other words, the lifespan, indicating when the various material stocks will be available for mining. The lifespan is different for different applications; for buildings the material can be locked for 50 years or even more, for a car the time may be in between 10 and 20 years, and packaging material can be available within weeks or months. Thirdly, it is the quality, concentration, and sort or composition of materials present in the stock. (Circular Economy 2015)

In Figure 2, the position of urban mining within the circular economy concept is depicted. First, primary materials are extracted from the geological mines and turned into materials and products, which are then accumulated in different types of material stocks in our society. In order to successfully mine them, the dynamic of material flows needs to be understood. Then, the harvested materials from urban mines can become secondary materials for production. However, urban mining goes beyond recycling; it includes other activities promoted by circular economy, such as reusing, repairing, remanufacturing, recovering and recycling, which are represented by the green spiral in the figure. Urban mining can provide a supply of products or their parts for remanufacturing and repair. It could also function as a collection point for products, which can be resold. This could only happen thanks to smart products and material design which ease repair, remanufacture and eventually recycling. Here, the product-material passport and urban mining plan are fundamental. An urban mining plan should be embodied in master urban plans of potential future stocks. Circular economy aims at minimizing leakages, however, some material loss will always appear. Therefore, the need for primary material will still exist, however, at a reduced level. Figure 2 depicts the importance of other supporting aspects, not only in urban mining but in a circular economy in general.

Urban mines can be a valuable part of a circular society by redistributing and repurposing resources within all the loops of the technical and biological cycles of the butterfly model, presented by the Ellen MacArthur Foundation. (Ellen MacArthur Foundation 2016)

Efficient urban mining technologies and new smart technical solutions for retrieving materials from complex waste streams need to be planned for and implemented. Collection systems and incentives for returns of, for instance, consumer products, industrial machines and equipment and vehicles need development. In order to make the system work, we should not ‘fix it’ in retrospect. We have to look at the beginning of the whole process before products and materials are born, the design phase. (Medkova 2015)

The design involves not only new applied technology, but overall conceptual change on products and materials used, so they can be easily reintroduced into the system. Developing smart production and material design extends the product life cycle and eases the refurbishment and dismantling for recycling. The same applies to developing recyclable materials. Smart design can be achieved only when all the players are part of the co-design; designers, engineers, economists, environmentalists, as well as producers, manufacturers, and consumers. (Medkova 2015, 67 -78)

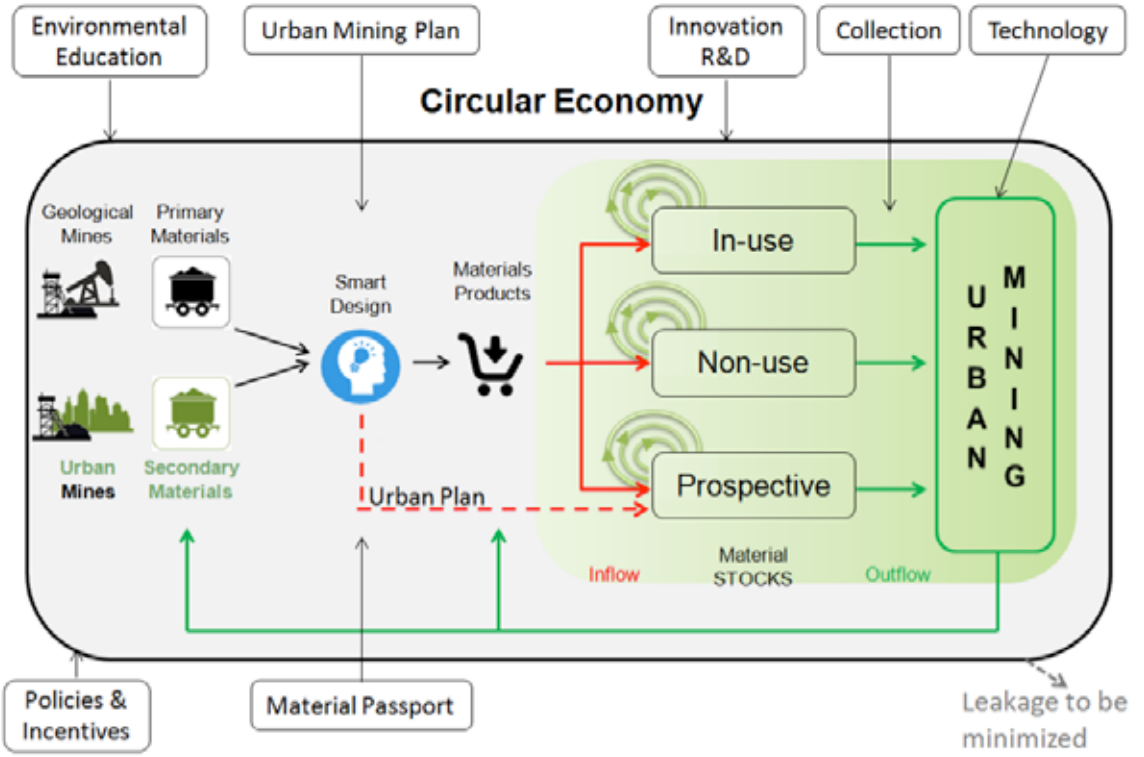


Figure 2: Urban Mining within the Circular Economy

Technology and Technical Challenges

Material complexity complicates recovering of materials from urban wastes, obsolete products or buildings. Also, the trend towards utilization of complex materials in everyday products has boomed. For instance, the complexity of the elements in Intel's computer chips has risen from 12 elements in the 1980's up to 61 elements in the 2000's. Subsequently, there is a challenge in regaining these elements from the complexity of materials. (Wheels of Metals 2014)

Extraction, recovery and reprocessing methods from urban deposits ought to be established. Simultaneously, meaningful business opportunities for developing mining equipment, technologies, services and follow-up processes are engendered. (Corder & Golev 2015)

Urban mines consist of a complex amalgamation of valuable materials as well as some hazardous materials and substances. Hazardous substances such as heavy metals(mercury, lead, cadmium) and chemicals (ozone depleting substances or flame retardants) complicate reutilization(UNU 2014, 50-51).

Innovation in Practice

Researchers at VTT, the Technical Research Centre of Finland, have developed a biological fungi filter that could recover up to 80% of gold from e-waste (Happich 2014). A British initiative, Clever, proposes the use of cellulose for circuit boards and for precious metals extraction applying enzymes (Urban Mining 2014).

Another inspiring example is one from the French company Veolia Environment of extracting rare earth metals (such as platinum) by sweeping the streets of London. According to Veolia, the yearly value gained from UK streets is about

$123 million and a considerable amount of rare elements could be recovered each year; more specifically about 1.5 tonnes of platinum, 1.3 tonnes of palladium, and 0.8 tonnes of rhodium. (Taneja 2015)

Conclusions

Urban mining sustainably develops our society. Urban mining is a smart resource management solution. A prerequisite for efficient technosphere mining requires a careful mining plan and strategic data cataloguing. Understanding location, size, concentration and availability of materials stocks and flows support a systematic coherent collection and secondary resource redistribution system.

Design thinking further facilitates the recapturing of complex materials embedded in our urban infrastructure. Support policies and incentives play important roles in the transformation towards more sustainable life. Finally, human safety and environmental responsibility need to be maintained during the urban mining process.

Together with smart consumption, urban mining plays a key role in the economic opportunities presented in the circular economy framework.

References

BBC. 2014. Who What Why: How Much Gold Can We Get from Mobile Phones?. Magazine Monitor. BBC [accessed 8 April 2016]. Available at: http://www.bbc.com/news/blogs-magazine-monitor-28802646.

Cianciullo, A. 2016. The Circular Economy Race: Aluminium in Pole Position. Renewable Matter [accessed 12 April 2016]. Available at: http://www.renewablematter.eu/art/155/The_Circular_Economy_Race_Aluminium_in_Pole_Position.

Circular Economy: an Introduction. 2015. Delft University of Technology. edX online MOOC course [accessed 11 November 2015]. Available at: https://www.edx.org/.

Corder, G. & Golev, A. 2015. Australia's Urban Mining Opportunity. Circulate [accessed 12 April 2016]. Available at: http://circulatenews.org/2015/11/australias-urban-mining-opportunity/.

Egerton-Read, S. 2015. A Vision for Circular Architecture. Circulate. 2015. [accessed 8 April 2016]. Available at: http://circulatenews.org/2015/12/liander-a-vision-for-circular-architecture/.

Ellen MacArthur Foundation. 2016. Circular Economy System Diagram. Ellen MacArthur Foundation [accessed 12 April 2016]. Available at: http://www.ellenmacarthurfoundation.org/circular-economy/interactive-diagram.

Giseke, U., Gerster-Bentaya, M., Helten, F., Kraume, M., Scherer, D., Spars, G., Amraoui, F., Adidi, A., Berdouz, S., Chlaida, M., Mansour, M. & Mdafai, M. 2015. Urban Agriculture for Growing City Regions: Connecting Urban-Rural Spheres in Casablanca. Oxon: Routledge.

Grant, R. 2016. "The 'Urban Mine' in Accra, Ghana." In: "Out of Sight, Out of Mind: The Politics and Culture of Waste," edited by Christof Mauch, RCC Perspectives: Transformations in Environment and Society 2016; 1. 21– 29 [accessed 6 April 2016]. Available at: http://www.environmentandsociety.org/sites/default/files/2016_1_grant.pdf.

Happich, J. 2014. Mushrooms Recover Gold out of Mobile Scrap. EE Times. [accessed 12 April 2016]. Available at: http://www.eetimes.com/document.asp?doc_id=1321899.

Medkova, K. 2015. Towards Circular Economy: EU, Finland and Lahti Region Perspectives. Bachelor's Thesis [accessed 11 November 2015]. Available at: http://www.urn.fi/URN:NBN:fi:amk-2015110916096.

NIMS. 2008. Concept and Technology for Utilizing "Urban Mines". National Institute for Materials Science. NIMS NOW International. Vol. 6, No. 5. [accessed 8 April 2016]. Available at: http://www.nims.go.jp/publicity/nimsnow/vol06/vk3rak0000001aaa-att/NIMSNOWVol6No5.pdf.

Taneja, M. 2015. Urban Mining: Extracting Value from Urban Waste. The Smart Cube. [accessed 18 April 2016]. Available at: http://www.thesmartcube.com/insights/sourcing/item/urban-mining-extracting-value-from-urban-waste.

Towards the Circular Economy Vol 1: Economic and Business Rationale for an Accelerated Transition. 2013. Ellen MacArthur Foundation. [accessed 20 February 2016]. Available at: http://www.ellenmacarthurfoundation.org/business/reports/ce2012.

UNEP. 2010. International Resource Panel Work on Metal Stocks in Society. United Nations Environment Programme [accessed 16 February 2016]. Available at: https://d396qusza40orc.cloudfront.net/metals/1_UNEP_report1_Stocks_100920.pdf.

UNEP. 2011. Recycling Rates of Metals. United Nations Environment Programme [accessed 16 April 2016]. Available at: http://www.unep.org/resourcepanel/Portals/24102/PDFs/Metals_Recycling_Rates_110412-1.pdf.

UNEP. 2013. International Resource Panel Work on Global Metal Flows. United Nations Environment Programme [accessed 9 February 2016]. Available at: http://www.unep.org/resourcepanel/Portals/50244/publications/UNEP_Synopsis_131008.pdf.

UNU. 2014. The Global E-Waste Monitor. Quantities, flows and Resources. UNU-IAS. Institute for the Advanced Study of Sustainability. Germany [accessed 8 April 2016]. Available at: https://i.unu.edu/media/unu.edu/news/52624/UNU-1stGlobal-E-Waste-Monitor-2014-small.pdf.

Urban Mining. 2014. Extracting Gold form Cell Phones. Urban Mining. [accessed 8 March 2016]. Available at: http://urbanmining.org/2014/11/extracting-gold-cell-phones.

Wheels of Metals: Urban Mining for a Circular Economy. 2014. MOOC. Coursera. [accessed 15 February 2016]. Available at: https://www.coursera.org/course/metals.

Yoshida, F. & Yoshida, H. 2011.Multiple Conditions of Urban Mining. Hokkaido University of Scholarly and Academic Papers. Presented at the Sixth International Conference on Waste Management and Technology, 30 August - 1 September 2011, Suzhou China. [accessed 10 April 2016]. Available at: http://eprints.lib.hokudai.ac.jp/dspace/bitstream/2115/54738/1/ICWMT6.pdf.

Ojasalo, J., & Kauppinen, H.

Title: Scenarios for Innovation Platforms in Smart Cities: Results from an Empirical Study

Research Article

Abstract

The purpose of this article is to propose different alternative scenarios for innovation platforms that enable collaborative innovation between a city and external actors. External actors include companies, 3rd sector organizations, research institutions, and citizens.

This study belongs to a larger 2-year research project on Innovation Platforms in Smart Cities, in the Urban Research and Metropolitan Policy Program (in Finnish: "Kaupunkitutkimus ja Metropolipolitiikka"). Innovation platform is defined as an approach that systematically facilitates external actors' innovation with purpose to develop solutions to the platform owner's problems and needs – it is an approach for attracting, facilitating, and orchestrating other organizations' innovation to solve platform owners' problems (Ojasalo 2015a). The platform owner in the current study is a city. Platform owner can be somebody else as well. The concept of innovation platform is very similar to the concept of innovation intermediary. An intermediary is a third party, a firm or a person that acts as a mediator and offers intermediation services between two other parties. An innovation intermediary is an organization that acts as an agent or broker in any aspect of the innovation process between two or more parties (Lichtenthaler & Ernst, 2008; Tran, Hsuan & Mahnke, 2011). The idea of Smart Cities essentially includes the development and application of approaches that foster the innovation in the cities (Komninos 2006; Zygiaris 2013). Thus, innovation platforms and intermediaries are an integral part of development of Smart Cities.

The literature dealing with innovation platforms as well as innovation intermediaries is scarce so far, and lacks context specific and practice oriented approaches. Indeed, there is a clear knowledge gap which is addressed by the present empirical study.

This qualitative explorative study is based on data from in-depth interviews and co-creative multi-actor workshops, as well as service design process and development methods. While certain elements of innovation platforms may be general, our study finds relevant to consider and analyze several alternative scenarios for innovation platforms. Different scenarios have different characteristics, and potential for application in various contexts. This article proposes three different scenarios for innovation platforms that enable collaborative innovation between a city and external actors. This study has both scientific and practical value. The scientific value of this study relates to new empirically based scenarios on approaches fostering innovation collaboration between a city and external actors. Moreover, the results of this study emerge from particularly rich data, gathered from cities, companies, and 3. sector organizations, thus allowing the utilization of the different perspectives in the analysis. This study extends the knowledge of public innovation, innovation networks, and Smart Cities. The results of this study also help cities in their pragmatic development and policy making by

offering alternative scenarios for enhancing external actors' innovation for cities' needs.

Keywords: Open innovation platform, Collaborative innovation, Innovation Intermediary, Urban development, Smart City

Introduction

The concept of "innovation intermediary" is used in the scientific literature and defined by several authors (Howells 2006; Fung & Weil, 2010; Bakici, Almirall & Wareham, 2013). A closely related term "innovation platform" is widely used by practitioners, particularly in public government, like EU, cities and regional bodies. Despite the frequent use this term in various contexts, its meaning remains rather vague in the documents them. The concept of "innovation platform" is defined by few researcher (Consoli & Patrucco, 2008; Patrucco, 2011; Ojasalo, 2015a, b).

Innovation intermediaries and platforms are needed because the systemic setting for innovation runs only with the necessary intermediaries in place that make interactions and matching of partners possible (Katzy, Turgut, Holzmann & Sailer, 2013). They help to minimize asymmetric information between actors related to innovation on the market (Spulber, 1999). In many cases, innovation intermediaries have become a public priority to support especially resource-limited SMEs. For example, SMEs often face great barriers to participate in EU's R&D-programs, such as administrative, financial, internal, and external barriers (Gilmore, Galbraith & Mulvenna, 2013). Innovation intermediaries are often strongly publicly funded and have non-profit structure. However, there are some examples of innovation intermediaries which have a commercial structure and operate on the basis of rewards they receive for exchange deals between knowledge and technology supplier and customers (Katzy et al., 2013). Both innovation intermediaries and platforms typically utilize the ideas of open innovation (Chesbrough, 2003), innovation networks (Ojasalo, 2008), public private partnership PPP (Abadie & Howcroft, 2004) or public private people partnership PPPP, and technology transfer (Bessant & Rush, 1995). Examples of innovation platforms are shown below (Table 1). Ojasalo (2016) provides a detailed discussion on innovation platforms and intermediaries.

Table 1. Examples of innovation platforms and intermediaries

Innovation Platform	Website
Innokylä	https://www.innokyla.fi/
Turbiini	http://turbiini.net/
Lahen D (Ladec Oy)	http://www.ladec.fi/yrityksille/kasvua-uudistumista-hakevalle/erotu-muotoilulla!/lahen-d
Lahticity.fi	http://www.lahticity.fi/
Waag Society	https://www.waag.org/en
iMinds	https://www.iminds.be/en
Vancouver City Studio	http://citystudiovancouver.com/
SCOPE	http://www.bu.edu/hic/research/scope/
Open Alps	http://www.open-alps.eu/
Darpa	http://www.darpa.mil/
SLL Innovation	http://sllinnovation.se/
Allianz Digital Accelerator	https://digital-accelerator.com/
Espoo Innovation Garden	http://www.espooinnovationgarden.fi/en
Tredea	http://www.tredea.fi/
Uusi Tehdas/New Factory	http://newfactory.fi/

Method

This article stems from stems from a larger 2-year research project on open innovation platforms in Smart Cities. The project addresses several objectives. One of them was to develop alternative scenarios for innovation platforms that enable collaborative innovation between a city and external actors. External actors include companies, 3rd sector organizations, research institutions, and citizens. The results shown in this article relate to this research objective. The research method is qualitative based on data from in-depth interviews and co-creative workshops (Gummesson, 2000). The data of this article include 38 in-depth interviews. The interviews were audio recorded and transcribed for later analysis. The interviewees also had a chance to make drawings during the interviews. The drawings were photographed, collected, and interpreted in the analysis. The data were analyzed by open coding and selective coding, in terms of the grounded theory method (Glaser, 1978). In addition, these data collection and analysis methods were integrated in 4E-service design process as well as foresight and futures thinking (Figure 1). In other words, the empirical data was used in service design process and with various service design methods.

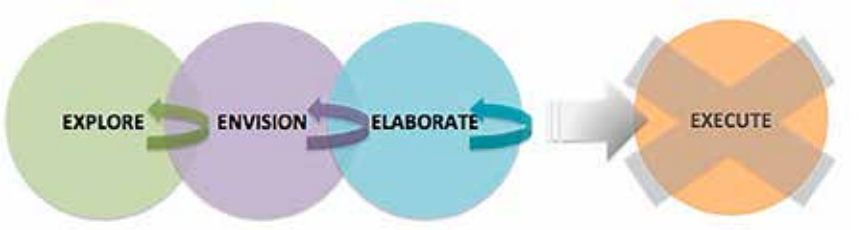


Figure 1. Service design process and methods of the study

The following service design methods were used in the process.

- Desk research (Martin & Hantington 2012, 154) on 15 existing innovation platforms (or innovation intermediaries) shown earlier (Table 1).
- In-depth interviews as described earlier.
- Empirical case studies (Eisenhardt, 1989) on the following innovation platforms: Amsterdam Smart City, Helsinki Kalasatama Innovator's Club (Figure 2), Amsterdam Rooftop Solutions, DOLL Living Lab in Albertslund Denmark (Figure 3), Living Labs Approach e.g. Shanghai Sino-Finnish Center (Figure 4) and Amsterdam Living Lab (Figure 5), Genova Smart City Association, Sentilo Barcelona, The Miami Foundation, Urban Mill Espoo, Forum Virium Helsinki, Digi Espoo, and Helsinki Business Hub.

Figure 2. Kalasatama Innovator's Club meeting

Figure 3. DOLL Living Lab area (Picture from DOLL Living Lab website 2016)

Figure 4. Shanghai Sino-Finnish Center (picture by Jukka Ojasalo)

Figure 5. Amsterdam Living Lab (picture by Jukka Ojasalo)

- Co-creation workshops with the cities of Helsinki, Lahti, Vantaa and Espoo, as described earlier (Figure 6).

Figure 6. Results from one of the co-creation workshops (picture by Heini Kauppinen)

- Affinity diagramming (Martin and Hanington 2012, 12) (Figure 7)

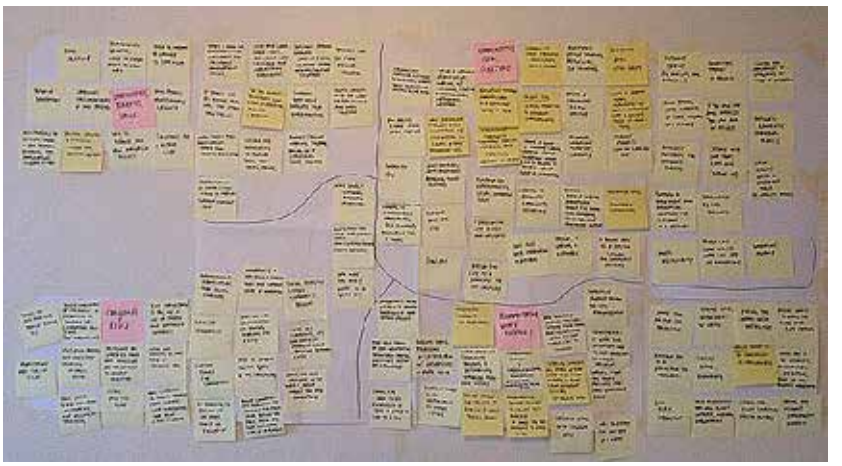


Figure 7. Affinity diagramming during envisioning stage (Kauppinen 2016, 53; picture by Heini Kauppinen)

- Open coding and selective coding of transcribed qualitative data (Glaser, 1978).
- Mindmapping (Liedtka & Oglivie 2011, 81; Martin & Hanington 2012, 118; Moritz 2005, 205)
- Brainstorming (Moritz, 2005, 210; Design Council 2015, 17; Liedtka & Oglivie, 2011, 101)
- Stakeholder mapping (Phillips 2003, 158, 26-27; Conaway 2012, 38; Stickdorn & Schneider 2012, 143)
- Customer journey maps (Liedtka & Ogilvie 2011, 61; Design Council 2015, 11; Stickdorn & Schneider 2012, 151). Customer journey maps are reported next, as a result of the study.
- Validation workshop with participants from the cities of Helsinki, Lahti, Vantaa and Espoo

Scenarios for innovation platforms in smart cities: empirical results

Scenarios can be described in various ways and in service design they are often referred to as de-sign scenarios. According to Pillkahn (2008) scenarios are hypothetical views of the future illustrating a cross-section in an established context while also offering guidance and describing development paths. The goal of design scenarios is to make design ideas explicit and concrete, as well as to create common understanding of a potential future service or a situation. Based on the current empirical study, scenarios for three different innovation platforms that enable collaborative innovation between a city and external actors are suggested next (Kauppinen, 2016).

SCENARIO 1: POP-UP OPEN INNOVATION PLATFORM - THINK OUTSIDE THE BOX

Movable and physical space

A pop-up open innovation platform consists of construction elements, for instance building containers, which are used for creating a movable platform. Hence, it is a physical platform that is not tied to one place. The pop-up can be set up in different city areas for a certain time, and can handle the challenges of a certain city area or a certain theme. More of these pop-ups can be set up, for example, one for each district, or for different challenges or themes. The transferable innovation platform embraces the identity of the area where it is set up on each occasion and can be branded according to the identity of that certain city district. It is engaging the citizens and communities of that certain city district especially, as well as companies, 3rd sector organizations and re-search institutions that have, or wish to have, operations in the area. Some city areas might have challenges that are typical only for that certain area. The pop-up platform becomes part of a city culture and function, and citizens, companies, third sector organizations and research institutions can also participate in planning of the themes and building of the container concept. It can, thus, be used for purposes of branding and communication of innovation collaboration activities. Furthermore, it allows for copying the ideas or created solutions from one city district to another.

Showcase and more

The pop-up platform is a showcase type of a platform, where a city and possible partners can make their innovation activities open for all to see, experience and participate in. A city and external actors can showcase their upcoming and ongoing innovation projects, and provide information about how collaborative innovation works. Opportunities and benefits as well as

other information about collaborative innovation are showcased and success stories presented. A city's challenges can be presented, gathered, and solved via the pop-up platform. It can also act as a place where initial ideas or service concepts are tested. The pop-up platform can help in actions such as finding partners, hosting events, building innovation communities, presenting challenges and competitions, testing and experimenting, and showcasing services. External actors are welcome to showcase their own services and ideas as well as to participate in different activities. External actors can also act as partners in operating the pop-up platform. Additionally, a certain city organization can showcase and test its innovation operations or processes within the pop-up platform. The platform can have changing participants and innovation partners. The physical space can include, for in-stance, working spaces, information desk, idea sharing spaces, prototyping lab, showcase area, and a cafe or restaurant.

Experimentation

The pop-up platform can be an experimentation project itself, lasting for a year or two. This way a city can gather best practices, learnings and elements that work and don't work in innovation collaboration, as well as help creating a network and a working model for an innovation plat-form. An innovation platform like this allows smaller scale innovation collaboration to take place and enables the growth of innovation collaboration between a city and external actors. It is a place where learning and sharing happens.

Attractive

In combination with the physical space, digital platform and tools are exploited to make the concept more efficient and appealing. It is important that the platform gathers publicity and is visible in different media. Social media especially can be heavily utilized. Furthermore, the physical space itself has to be very active to keep up the buzz. Different events are hosted at the platform. Due to limited space, live streaming of the events and posting the videos and material online afterwards is utilized, making them open for all. City's employees can make use of the space as a remote working point. There can be rotating schedules for employees from different departments to work at the platform, which allows for interorganizational encounters. Additionally, employees are able to connect with the external actors. The pop-up platform has the ability to create encounters, even unexpected encounters, as well as mutual understanding. It also helps in opening up the city's processes to external actors and finding the right people for collaboration. In essence, it is a place that attracts the attention of everyone in a city.

Figure 8 illustrates an example of a customer journey for pop-up platform scenario. In this case the customer is a company that seeks to test its new digital service with potential users at the pop-up platform. The customer co-operates with the platform operator to organize a pop-up space. The journey goes through the stages from service idea to service launch and each of the touchpoints is described in the customer journey. A moodboard for pop-up platform scenario is shown in Figure 9.

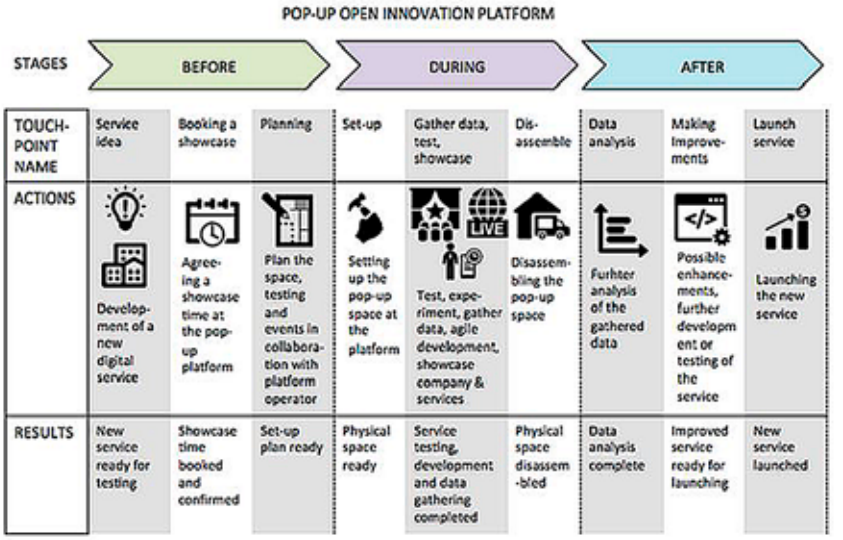


Figure 8. Example of customer journey for pop-up platform scenario (Kauppinen, 2016, 75)

Figure 9. Moodboard for pop-up platform (Kauppinen, 2016, 78)

SCENARIO 2: BOTTOM-UP APPROACH - A CITY AS AN OPEN INNOVATION PLATFORM

People have the power

A city organization isn't necessarily always the identifier of a city's challenges, but challenges, ide-as and innovation can form bottom-up. Bottom-up approach has the well-being of the citizens and empowerment of communities as a starting point. Through this approach a city's challenges are solved as citizens are doing well, are active, and are developing solutions to challenges. Creativity is invoked by activeness and experiences. This enables more bottom-up innovation, vigor, and raises entrepreneurial spirit. It contributes to creating a better habitat and more sustainable solutions, which in turn solve also some of the challenges that cities are facing. Startups, SMEs and 3rd sector organizations especially can develop new services in co-operation with

the citizens and it is easier for them to get involved in innovation collaboration this way. People are able to work on challenges they feel are important, and the more they are enabled to affect, the more they are likely to be interested in taking part. Innovation communities consisting of citizens can be utilized and new innovation communities formed. They can participate in different development activities and help companies, for instance, by testing new services or taking part in research.

Social enterprise as a facilitator

The motor behind this type of bottom-up innovation is a social enterprise, or organization, specialized in community engagement and activities. It can act as an expert that facilitates the operation and provides help by, for example, organizing events, finding partners or sponsors, providing in-formation of city bureaucracy, or small funding to carry out the development projects and experimentations. Community coordinators are appointed to each area. Innovation collaboration needs to have a clear focus on each occasion, for instance, certain challenge or theme in certain city districts or community. Citizens can also be trusted to lead their own projects. Social enterprise as a facilitating organization leads the innovation activities and makes sure that they get publicity and attract citizens as well as other actors to get involved in innovation activities.

A city as an enabler and a partner

The bottom-up approach embraces the thought that the whole city is turned into an open innovation platform, where a city's empty or public spaces such as libraries, city hall, parks, sports venues or museums are utilized for the purposes of innovation activities. This enables, for instance, creation of communal working spaces, meeting places, organized events, or multifunctional work-shop spaces. In addition to physical spaces digital tools are exploited for communication and net-working purposes. Digital tools also help in finding information, for instance, about free spaces, upcoming events, or innovation communities. A city as an enabler can be the partner removing obstacles that bottom-up innovation might face. Furthermore, it is vital for a city to be an active partner and participant in these bottom-up innovation activities as it enables recognizing weak signals. It would be useful for a city to build a systematic process for capturing ideas that arise from bottom-up innovation. The process should be able to gather ideas, process them, enable experimentation, development and implementation into practice as well. Furthermore, this bottom-up approach can also have other actors such as research institutions as partners.

The next example is an illustration of a customer journey in the bottom-up platform scenario (Figure 10). In this case, the customer is a citizen who gets an idea how to develop a greenroof solution for the community. The customer journey describes the different touchpoints, actions and results from the idea emergence to the scaling of the solution to a city's other communities. During the journey the customer collaborates with other citizens, community coordinator, facilitating organization and other experts. A moodboard for bottom-up platform scenario is shown in Figure 11. Moodboard is a collage of different images and materials to illustrate a certain mood or atmosphere and to create an overall impression of a service experience or of the service environment (Moritz 2005, 227). The moodboard helps explaining some unconscious, sensual and intangible values a service might have that are difficult to be described by words. The use of a visual representation helps to establish a shared understanding of the mood and atmosphere of a service inside the design team. (Moritz 2005, 227)

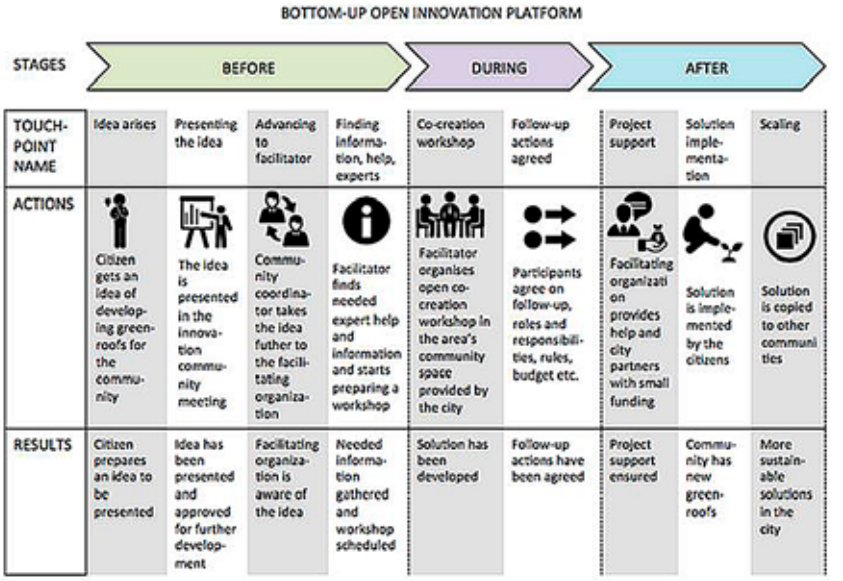


Figure 10. Example of customer journey for bottom-up platform scenario (Kauppinen, 2016, 76)

Figure 11. Moodboard for bottom-up platform (Kauppinen, 2016, 78)

SCENARIO 3: ONE-STOP-SHOP - OPEN INNOVATION ECOSYSTEM

Digital platform

One-stop-shop open innovation platform allows for the utilization of existing resources and existing innovation platforms, networks, and intermediaries while allowing new collaboration to form. As a variety of innovation platforms exist already, a digital platform combines these spaces, events and operators under the same platform creating an open innovation ecosystem. The main purpose of this approach is to enable a one-stop-shop principle to all innovation

activities, where all who are interested can find different activities by a city, by themes or by city districts, as well as plat-forms, projects, events, talent pools, networks, challenges and competitions, funding possibilities, success stories, partners, previous innovation cases, education possibilities and so on. There is a possibility to include tools such as user profiles, networking, co-creation workspace, project planning, reporting, or innovation models to enable innovation collaboration via the digital platform. Connection to procurement and pre-commercial procurement are useful elements as well. A city can provide information and data for external actors via the digital platform. Through different focus areas it is easier for different actors to find partners with the same interest. The aim is also to make different actors aware of the existing resources and enable a better use of the resources.

Innovation intermediary

An innovation intermediary is the connecting force behind the digital platform. Skilled intermediary to orchestrate the operations is needed. An innovation intermediary exists physically in the back-ground. The intermediary has to be active and keep the operation and information up to date. It has to be able to facilitate multi-actor network, be the interpreter and matchmaker in the inter-face between different actors. Thus, the intermediary also strives to form physical contacts be-tween actors. It is also the responsibility of the intermediary to consolidate the information in the platform to form a reasonable ensemble in order to avoid confusion and information overload.

National innovation network

The one-stop-shop approach creates an innovation collaboration network that can be build up nationally. Thus, the digital platform as well as the innovation intermediary can be owned by several cities allowing the sharing of resources. Digital platform together with innovation intermediary enable encounters and collaboration between different actors. This approach empowers collaboration of cities, and saving and sharing of resources in the long term.

An example of customer journey one-stop-shop platform service situation is shown in Figure 12. The customer in this case is a start-up company who wants to find partners and new possibilities for innovation collaboration. The start-up gets help from both the digital platform as well as the innovation intermediary. The journey goes through the different touchpoints starting from a need to find partners and ending in searching for new opportunities with the new-found partners. A moodboard for bottom-up platform scenario is shown in Figure 13.

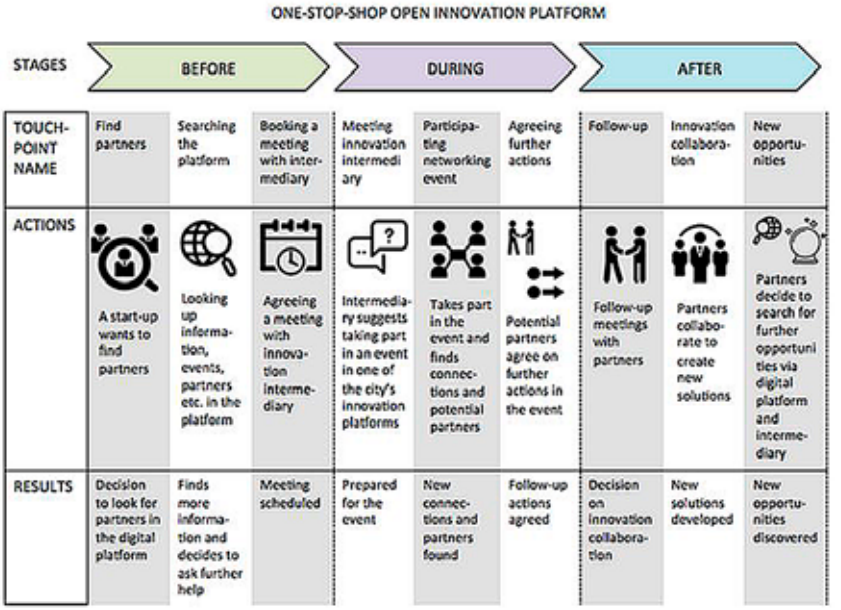


Figure 12. Example of customer journey for one-stop-shop platform scenario (Kauppinen, 2016, 77)

Figure 13. Moodboard for one-stop-shop platform (Kauppinen, 2016, 79)

Conclusions

As a result of this research, three different scenarios were developed for innovation platforms that enable collaborative innovation between a city and external actors. They were pop-up open innovation platform, bottom-up approach, and one-stop-shop. The results of this study can be used by cities in their pragmatic development and policy making for enhancing external actors' innovation for their own needs. They can be used for engaging citizens and other actors in co-creation for urban development. They offer concrete ways to build up innovation networks and ecosystems for development of Smart Cities and Smart Regions.

References

Aoki, M. (2001). Types of relational financing and the value of tacit knowledge. In Aoki, M. Greif, A. and P. Milgrom, P. (eds.), Toward a comparative institutional analysis. Cambridge, MA: MIT Press. 307–309.

Abadie, R. & Howcroft, A., 2004. Developing PPPs in New Europe. Price Waterhouse Coopers.

Bakici, T., Almirall, E. & Wareham, J. 2013. The role of public open innovation intermediaries in local government and the public sector. Technology Analysis & Strategic Management 2013; 25(3). 311-327.

Bessant, J., and H. Rush. 1995. Building bridges for innovation: The role of consultants in technology transfer. Research Policy 1995; 24. 97–114.

Chesbrough, H. 2003. Open Innovation: The New Imperative for Creating and Profiting from Technology: Boston, MA: Harvard Business School Press.

Conaway, Roger N. 2012. Communication in Responsible Business: Strategies, Concepts, and Cases. Business Expert Press.

Consoli, D. & Patrucco, P.P. 2008. Innovation platforms and the governance of knowledge: Evidence from Italy and the UK. Economics of Innovation and New Technology 2008; 17(7): 701–18.

Design Council. 2015. Design methods for developing services. Accessed 17.3.2015. Available online at: http://www.designcouncil.org.uk/sites/default/files/asset/document/Design methods for developing services.pdf

Eisenhardt, K.M. 1989. Building theories from case study research. Academy of Management Review 1989; 14(4). 532-50.

Fung, A. & Weil, D. 2010. Open government and open society, In Lathrop, D. & Ruma, L. (eds.), Open Government: Collaboration, Transparency, And Participation in Practice. Sebastopol, CA: O'Reilly Media, 105–112.

Gilmore, A. Galbraith, B. & Mulvenna, M. 2013. Perceived barriers to participation in R&D programmes for SMEs within the European Union. Technology Analysis & Strategic Management 2013; 25(3). 329-339.

Glaser, B.G. 1978. Theoretical Sensitivity. California: The Sociological Press.

Gummesson, E. 2000. Qualitative Methods in Management Research. 2nd ed. California: Sage Publications.

Howells, J. 2006. Intermediation and the role of intermediaries in innovation. Research Policy 2006, 35. 715–728.

Kauppinen, H. 2016. Enabling Collaborative Innovation in a Smart City: Creating Scenarios of Open Innovation Platforms. Espoo: Laurea University of Applied Sciences.

Katzy, B., Turgut, E., Holzmann, T. & Sailer, K. 2013. Innovation intermediaries: a process view on open innovation coordination. Technology Analysis & Strategic Management 2013; 25(3). 295-309.

Komninos N. 2006. The architecture of intelligent cities; Integrating human, collective, and artificial intelligence to enhance knowledge and innovation. 2nd International Conference on Intelligent Environments. Athens: Institution of Engineering and Technology.

Lichtenthaler, U. & Ernst, H. 2008. Innovation intermediaries: Why internet marketplaces for technology have not yet met the expectations. Creativity and Innovation Management 2008; 17. 14–25.

Liedka, J. & Ogilvie, T. 2011. A Design Thinking Tool Kit for Managers. USA: Columbia University Press.

Martin, B. & Hanington, B. 2012. Universal Methods of Design. 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions. USA: Rockport Publishers.

Moritz, S. 2005. Service Design, Practical Access to Evolving Field. Köln International School of Design. Available online: http://stefanmoritz.com/_files/Practical%20Access%20to%20Service%20Design.pdf

Ojasalo, J. 2008. Management of Innovation Networks —A Case Study of Different Approaches. European Journal of Innovation Management 2008; 11(1). 51-86.

Ojasalo, J. 2012. Challenges of Innovation Networks: Empirical Findings. International Journal of Management Cases 2012; 14(4). 6-17.
Ojasalo, J. 2015a, Open Innovation Platform in a Smart City: Empirical Results. The Journal of American Business Review, Cambridge 2015; 4(1). 195-202.

Ojasalo, J. 2015b, Open Service Innovation Platform in a Smart City. In P.D. Renata & L. Beltrametti (Ed.), Proceedings of the 10th ECIE European Conference on Innovation and Entrepreneurship. Genoa, Italy. 521-528.

Ojasalo, J. 2016, Building An Open Service Innovation Platform For a City's Needs: An Empirical Study On Smart Cities. In: L. Gómez Chova, A. López Martínez, I. Candel Torres (Ed.), INTED2016 Proceedings, 10th International Technology, Education and Development Conference. Valencia. Spain: IATED Academy. 6172-6181.

Patrucco, P.P. 2011. Changing network structure in the organization of knowledge: the innovation platform in the evidence of the automobile system in Turin. Economics of Innovation and New Technology 2011; 20(5). 477-493.

Phillips, R. 2003. Stakeholder Theory and Organizational Ethics. San Francisco, USA: Berrett-Koehler Publishers, Inc.

Pillkahn, U. 2008. Using Trends and Scenarios as Tools for Strategy Development. Erlangen, Germany: Publicis Corporate Publishing.

Spulber, D.F. 1999. Market microstructure: Intermediaries and the theory of the firm. Cambridge: Cambridge University Press.

Stickdorn, M. & Schneider, J. 2012. This is Service Design Thinking: Basics - Tools – Cases. Amsterdam: BIS Publishers.

Tran, Y., Hsuan, J. and Mahnke, V. 2011. How do innovation intermediaries add value? Insight from new product development in fashion markets. R&D Management 2011; 41.80–91.

Zygiaris, S. 2013. Smart City Reference Model: Assisting Planners to Conceptualize the Building of Smart City Innovation Ecosystems. Journal of the Knowledge Economy 2013; 4(2). 217–231.

Puhakka-Tarvainen, H.

Title: Smart Specialization through Working Life Oriented Higher Education
Pilots, Demos and Experiments Case

Abstract
The purpose of this paper is to describe how re-direction of higher education towards working life orientation gives a fruitful ground for smart specialization to grow.

Higher educational institutes (HEIs) and especially universities of applied sciences (UASes) aim to educate students having the key skills for working life when graduated. Anyway, the working life is changing so rapidly that more reactive and flexible ways to upskill competences are urgently needed, and the emphasis should be put on skills required not presently but far in the future.

Finnish universities of applied sciences were set up in mid 1990s to strengthen the role of professional higher education and to fill the gap between academic universities and working life. In two decades, the UASes have found their role and become active generators of regional welfare across Finland. Universities of applied sciences educate professionals for society and business needs, and have a high input both in regional development and research, development and innovation (RD&I) approaches.

In general, the Ministry of Education and Culture is responsible of sharing the educational responsibilities and resources among the 24 Universities of Applied Sciences in Finland. Ministry gives the framework for how to play, but the UASes have all the cards to implement the education and RD&I activities to fulfil and predict the working life needs and maximize the regional benefit. The UASes role is the most to serve the regional stakeholders and especially the small and medium sized enterprises. Professionals graduating from universities of applied sciences should have learnt the skills, with which they can survive in the working life for the next 30-40 years. Predicting the future is not easy, but should be done somehow. The curriculum development process takes place usually even 6 years before the first students graduate based on the new curricula, and the world has changed a lot in between! Thus, more flexible and reactive ways to increase knowledge and competences should take place.

Karelia University of Applied Sciences is part of two network projects, in which the aim is to fulfil the requirement of reactivity in higher education. Firstly, the aim of Finnish ESF (European Social Fund) project AVOT is to develop open higher education towards working life needs. Special emphasis is put on finding out the actual and future needs in companies and other working life organisations, and re-packing the study modules to fill the knowledge gaps of workers. Tutorial aspect as well as flexibility in ways of studying are taken seriously into account. Working life oriented open education is piloted in eight HEIs in the fields of bioeconomy and environmental studies; social and health care; and ICT.

Secondly, Erasmus+ Knowledge Alliances funded transnational project ERDI – Empowering Regional Development and Innovation – is supporting the regional smart specialization by co-creation of working life oriented higher education. The project is coordinated by Karelia and supported by 16 partners from Slovakia, Hungary, Czech Republic, the Netherlands and Canada. The common umbrella for the development is bioeconomy, and the co-creation covers curriculum and pedagogical development, digital learning tools, innovative business models and regional knowledge alliances.

The innovativeness in this approach is based on the strong regional working groups, where HEIs and working life organisations work jointly to find the key competences to be improved through higher education. Cross-sectorality, multidisciplinarity and internationality help the thinking to find new ways. For predicting future competences, the Future Wheel tool is applied. Both projects mentioned will exist until year 2018.

Keywords: working life, future competences, Universities of Applied Sciences, curriculum development, bioeconomy

Introduction

The role of universities of applied sciences (UASes) in the Finnish society is based on law (Finlex 2014) and the detailed framework for education is given by the Ministry of Education and Culture. The UASes should concentrate on providing higher professional education, apply working-life oriented research, development and innovation (RD&I), and boost the regional businesses – thus, play a central role in fulfilling the regional smart specialization strategies. The specific aim is that graduated students should have adopted all the key working life skills in their sector and in addition an ability for lifelong learning and developing working life. Anyway, as the working life is changing more and more rapidly, more reactive and flexible ways to upskill competences both for under- and post-graduates will be urgently needed. An emphasis should be put on skills required not presently but far in the future.

In general, the curriculum development process for UAS degrees takes place six - seven years before the first students applying the curriculum graduate. Meanwhile, the world and working life have been changed a lot. Thus, more flexible and reactive ways to increase knowledge and competences should take place. One way for this is to develop alternative ways of studying and especially to seek the ways for predicting the future professional framework and key competences required. The actual development work for such studies at Karelia University of Applied Sciences is based on European Union funded projects AVOT (Turun yliopisto 2016) and ERDI (Karelia-ammattikorkeakoulu 2016a), and the pilot platform are the studies related to bioeconomy sector (Forestry, Energy and Environmental Engineering).

Smart Specialization in North Karelia

North Karelia region is situated in the easternmost part of Finland and European Union (Pohjois-Karjalan maakuntaliitto 2014, 6-7). It is a sparsely populated region of 165 000 inhabitants, and the regional economy is strongly dependent on natural resources and business across the Russian border. Thus, forest bioeconomy is nominated as one of the three main development sectors of the regional Smart Specialization strategy. The region is already European forerunner in the use of renewable energy and aims for completely fossil fuel free by year 2030. The other specialization areas Technology and materials and Russian know-how support also the development of forest bioeconomy.

The smart specialization goal New era of natural resources, related to forest bioeconomy, is in more detailed divided in following sub-topics. The interest of development is especially focused on decentralized biorefinery, wood based materials, forest technology and harvesting, bioinformatics, and sustainable multiuse of natural resources (Figure 1). As a whole, North Karelia is the world's leading expertise hub in forest bioeconomy and aims for developing that status even further.

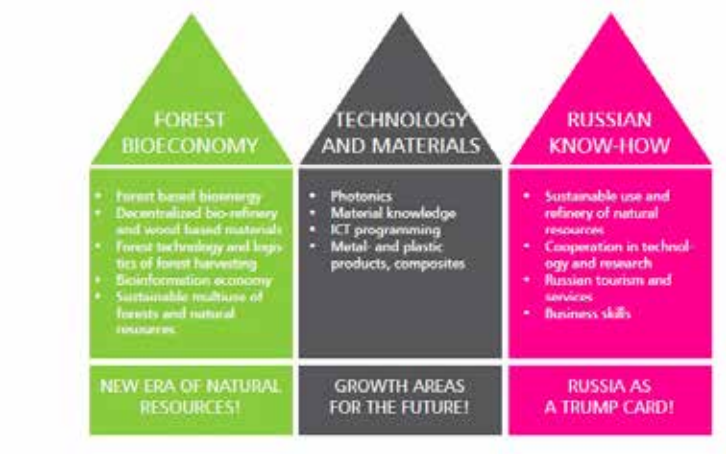


Figure 1. The Smart Specialization strategy foci of North Karelia region, Finland (Pohjois-Karjalan maakuntaliitto 2014, 8).

At Karelia UAS's approach, the concept of bioeconomy is understood wider to include all the aspects of bioeconomy defined by the Finnish Bioeconomy Strategy (Ministry of Economic Affairs and and Employment 2014, 3). The definition includes all the economies, which use renewable natural resources to produce food, energy, products and services, for example forestry and forest industry, agriculture and food processing, environmental technology and protection, waste treatment, energy production, wood construction, and ecosystem services (Figure 2).

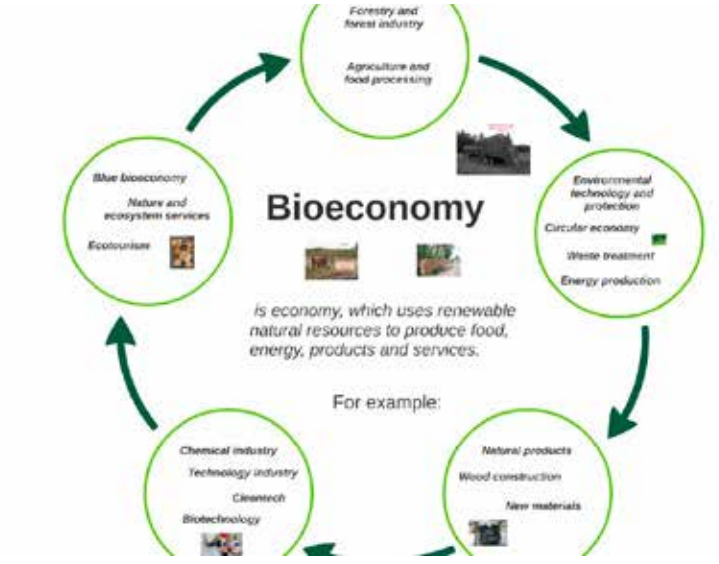


Figure 2. Bioeconomy definition and sectors applied by Karelia University of Applied Sciences.

Working life oriented curriculum development work at Karelia UAS

The key issue for predicting the crucial competences for future working life is the close cooperation with the businesses and other working life organisations. Also, relevant methods and tools for co-creation are needed. As universities of applied sciences have the strong regional focus, the future competences are also discussed at regional level in multiorganisational working groups. Cross-sectorality, multidisciplinarity and internationality support the finding of new ways to improve higher education and serve better the development of regional labour market.

Working life oriented curriculum development work related to bioeconomy studies at Karelia UAS was piloted in 2014 for the development of Forestry, and Energy and Environmental Engineering Bachelor's degrees. The approach was quite successful, which motivated for future development work. Since that, Karelia UAS has been part of two network projects, in which the aim is to fulfil the requirement of reactivity in higher education. Firstly, the aim of Finnish ESF (European Social Fund) project AVOT is to develop open higher education towards working life needs (Turun yliopisto 2016). Secondly, Erasmus+ Knowledge Alliances funded transnational project ERDI – Empowering Regional Development and Innovation – is supporting the regional smart specialization by co-creation of working life oriented international higher education (Karelia-ammattikorkeakoulu 2016a). At AVOT project, the special emphasis is put on re-packing the existing study modules to fill the knowledge gaps of workers and provide the education openly for all persons independent of the educational background. At ERDI project the value added is the international cooperation and cross-fertilization of ideas among regions and business with similar working life challenges.

A common methodological approach used in both projects is called the Future Wheel. JAMK University of Applied Sciences from Jyväskylä has been a pioneer of applying this method in Finland (Hakala & Hopia 2015). The improved method is a great pedagogical tool for higher educational institutes to vision future working life and learn future thinking. Tool helps HEIs to concretize cooperation with the working life organisations and systematically collect information and needs for future competences.

The core idea of the method is to collectively draw a future vision of a joint theme in smaller groups. The output of each group is discussed between all the participants after every step of the wheel. As a joint output, a future wheel is documented to the whiteboard or similar by using colourful notes (Figure 3). The aim of the Karelia's Future Wheel workshops was to vision the bioeconomy working life in year 2030. Two workshops took place during the spring 2016. First workshop took place among the AVOT stakeholders in January in Joensuu, Finland, and the second one among the international ERDI partnership in March in Pardubice, Czech Republic.

Figure 3. Output of Karelia UASes Future Wheel workshop. Each colour remarks different question/step of the Future Wheel (Question 1: orange, Question 2: yellow, Question 3: pink).

The first question for the smaller working groups was to vision, how the world would look like in 2030 especially in terms related to bioeconomy sector. The general vision was that energy consumption will most likely be based on renewables, and the use of fossil fuels would be decreased significantly. Also, energy and environmental technologies would have developed a lot. Biofuels would have replaced oil in transport and electric vehicles have become very common. Wood construction and new materials will exist more and more, as well as new innovations related to clean drinking water and decreasing climate change. General public would be much more conscious about bioeconomy, environment and green solutions. Circular economy would be a basic concept and a term of "waste" would have been disappeared from everyday use, as all the materials would be recycled and reused.

After summarizing the first question's output, the working groups started to think about the competences, which would be needed to work in such a world visioned in the first step of the future wheel. Two different aspects raised up from the results; on the other hand basic multidisciplinary knowledge will be required, but on the other hand there would be also a need for very deep and highly specialized knowledge. This causes a dilemma, whether the HEIs should concentrate on improving the learning and knowledge search skills of graduates, or should they specialize on providing top level know-how from pre-defined, narrow focus areas.

The bioeconomy related competences visioned in step 2 varied from basic knowledge on natural sciences to field-specific skills, but also general working life skills such as networking and multicultural skills were emphasized (Figure 4). It was noted that the need for competences depends also on the sector and the level of duty. For an electric engineer it is enough to learn the basics for green economy to be able make green energy installations. On the other hand, for a doctor of forestry in global company it would be useful to learn the differences between regional economies and culture instead.

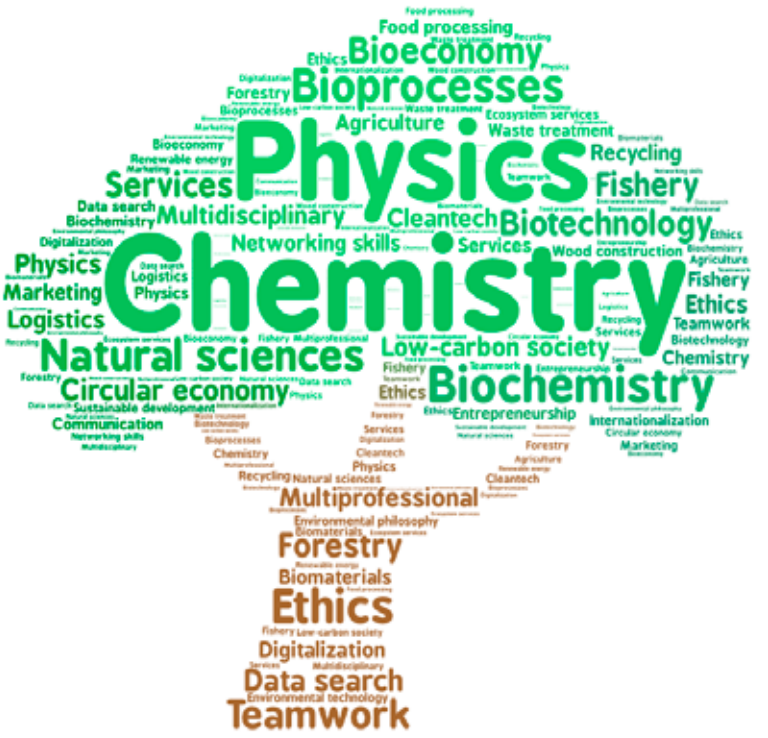


Figure 4: Summary of the key competences for future labour force at bioeconomy sector. Summary is based on the output of Karelia UASes Future Wheel workshops.

Thus, the next and last question is, how Higher Educational Institutes could respond to these very wide and variable competence requirements? How we would be able to teach those competences to our learners? A joint conclusion was that in the future individual study paths and personal study plans will become even more common than today. Degrees will be tailored based on student's background level. New competences will be complementary to existing knowledge and a concept of continuous development and lifelong learning will be emphasized. Mentoring and coaching will be preferable teaching methods instead of lecturing. Curriculum development is based on co-development of multidisciplinary stakeholder and expert groups, and study assignments should be more and more related to real life cases.

Conclusions and recommendations

Higher educational institutes meet great challenges when trying to provide proactive and high quality education in acceleratingly changing world and to meet the requirements of regional smart specialization goals. The conventional curriculum development work is a slow process and new tools for defining the future key competences will be needed. In Karelia University of Applied Sciences network projects AVOT and ERDI the approach has been to apply the Future Wheel tool (Hakala & Hopia 2015) to vision the key competences of the growing bioeconomy sector in year 2030.

As a result of the Future Wheel workshops with working life organizations, a wide variety of important competences were listed (Figure 4). On the other hand, general competences as networking and multicultural skills were emphasized, but also very deep knowledge of specific areas were required. It is a huge challenge for HEIs and especially UASes to fulfil these requirements and provide proactive education for highly skilled future labour

force. New, more rapid ways of providing education needs to be developed in addition to conventional degree programmes. Short courses, open university and specialization studies already exist in Finland, but may be developed further. E.g. in AVOT project, the goal is to re-pack the existing bioeconomy related open online courses from all the Finnish HEIs to a single portal easily accessible to all potential students (Karelia-ammattikorkeakoulu 2016b).

In addition, new pedagogical approaches will be needed, including e-learning, project learning and study assignments based on real-life cases. The key issue is to integrate all the studies to the working life and widen the cooperation with businesses and other organizations to cover all the steps from joint curriculum development to co-creation of studies, mentoring, case studies and RD&I work. An example of this integration is Karelia UASes open innovation platform Sirkkala Energy Park (Figure 5), a mobile energy production system, which serves both learning, RD&I work, business experiments as well as raising awareness among general public.

Figure 5. Sirkkala Energy Park mobile energy production system as an example of open innovation platform at Karelia University of Applied Sciences.

During these first Future Wheel workshops we have just scratched the surface of the future key competences in bioeconomy, and the work will continue during the coming years. New platform for testing the method is the national network project for developing specialization studies in bioeconomy, due to be piloted in autumn semester 2017. Karelia UAS leads the curriculum development process related to forest bioeconomy, following the focus of the regional smart specialization strategy.

Acknowledgements
The experimental part of this study has been co-funded by the European Union Erasmus+ Knowledge Alliances programme and the European Social Fund.

References

Finlex. 2014. Ammattikorkeakoululaki [accessed 10 July 2016]. Available at: http://www.finlex.fi/fi/laki/ajantasa/2014/20140932

Hakala, A. & Hopia, H. 2015. Tulevaisuuspyörätyöpaja – mitä, miksi, milloin. UAS Journal 2/2015 [accessed 26 September 2016]. Available at: https://arkisto.uasjournal.fi/uasjournal_2015-2/hakala_hopia.html

Karelia-ammattikorkeakoulu. 2016a. ERDI project website [accessed 10 July 2016]. Available at: www.erdiproject.eu

Karelia-ammattikorkeakoulu. 2016b. Biotalousasiantuntijan osaamissalkku -opintotarjottimen kotisivu [accessed 30 July 2016]. Available at: https://biotalousasiantuntijalle.wordpress.com

Ministry of Economic Affairs and and Employment. 2014. Sustainable growth from bioeconomy – The Finnish Bioeconomy Strategy [accessed 26 September 2016]. Available at: http://www.biotalous.fi/suomi-kehittaa/biotalousstrategia/

Pohjois-Karjalan maakuntaliitto. 2014. North Karelia's Smart Specialization Strategy [accessed 30 July 2016]. Available at: http://pohjois-karjala.fi/en/web/english/strategies

Turun yliopisto. 2016. AVOT project website [accessed 26 September 2016]. Available at: http://avothanke.fi

Wadhwa, NC.

Title: India Embarks On a Smart Cities Mission
Pilots, Demos and Experiments Case

Abstract
Historically, all the developed countries traversed rural-urban continuum and have a rich plateau in terms of urbanization. Similarly, now developing countries are on the trajectory of urban growth. Expectedly 93% of urban growth will occur in developing nations with 80% of urban growth, occurring in Asia and Africa. The significance of urban development is going to be great in future at global level.

Keeping in view the paradigm shift in urban development, urban reforms have gained momentum in India. In this background, Government of India launched "Smart Cities Mission" in June 2015 whereby 100 smart cities are to be developed.

A Smart City is an urban development vision to improve quality of life through infrastructure upgradation and improve the efficiency of services and meet residents' needs by use of technology. Projects of Smart City features, smart technologies and programmes have similarly been implemented in various cities like Milton Keynes, Amsteradam, Barcelona, Southampton, Stockholm etc. Selected Indian cities would naturally look for innovative improvements to justify their selection as smart cities.

The objective of Smart Cities Mission is to bring about fast economic growth and improve quality of life through local area development and utilizing latest technology for providing smart solutions. It further promotes cities that provide core infrastructure, clean and sustainable environment and give decent quality of life. Duration of this programme is five years with financial support coming in equal proportions from Central Government and the State Governments with investment of nearly One Thousand Billion Rupees. Balance requirement is to be met from private sector through public-private partnerships. As per mandate of Smart Cities Mission, a smart city has to focus on evolving strategy for financial infrastructure, efficient management of urban infrastructure, preparing action plan for ensuring inclusiveness, arranging responsive governance through smart solutions and utilizing technology for providing on line services to citizens in seamless manner.

A Smart City has to be more than an assembly of high tech gadgetry. It should be delivering best means of mobility, healthy environment, a better quality of life and an efficient governance. All these require strict demand side management. Smart cities should not be the ones that splurge but the ones that use their resources judiciously aspiring for sustainable future.

This paper highlights the initiatives and challenges for the Smart Cities Project being undertaken in India.

Keywords: Smart Cities; Smart Regions; Smart Cities Mission, India

Introduction

It has been estimated that cities occupy 0.5% of earth surface to support 54% of world population. Cities, considered engines of growth for the economy of every nation, contribute towards 80% of global economic output. At global level in almost all developed countries, the pattern of development has been transformation from a rural area to sub urban and finally to big developed cities. The same trend is now noticed in developing countries in a big way. (Singh, Mahavir, The Tribune, Feb 1, 2016)

Cities & Regions require comprehensive development of physical, institutional, social and economic infrastructure for improving the quality of life and attracting people and investments to the cities. Developing nations are now experiencing huge urban growth which constitutes around 93% of Urban growth at global level. It is further estimated that 80% of this urban growth may occur exclusively in Asia and Africa. In the Indian context, it is estimated that 31.16% of population is living in urban areas and generates 63% GDP. (Census, Government of India, 2011)

The significance of urban development cannot be undermined in India in this background. The paradigm shift in urban development in India was noticed with the launch of Jawaharlal Nehru National Urban Renewal Mission in 2005. The launch of National Urban Renewal Mission is a water shed in the history of urban development in India whereby urban reforms gained momentum. It envisaged an investment of Rupees 1,000 Billion over seven years in 65 identified cities. The focus was on million plus cities, State capitals and cities of historical, tourist and spiritual importance. It consisted of two sub missions: Urban Infrastructure & Governance and Basic Services to urban poor. This programme was launched during 2005-06 and implemented through urban local bodies by providing financial help from State Governments & Central Government.

On the basis of experience gained through National Urban Renewal Mission, a High powered Expert Committee appointed by Ministry of Urban Development, Government of India, gave its recommendations in 2011 for giving extra push to urban development with investment of Rupees 40,000 Billion over next 20 years. As a sequel to these recommendations, a Mission for Rejuvenation and Urban Transformation has been set up in 2015 which would cover 500 cities – towns with population of 1 lakh and above, heritage cities, cities on river fronts and with 10 cities from hilly areas. Under this Mission, a set of urban reforms and capacity building will lead to improvement in infrastructure, service delivery and mobilization of resources which will make municipal functioning more efficient, transparent and accountable. The process for notifying the list of these cities is already under process.

Smart Cities Mission

To put urban growth and development on fast track and to provide an extra push to it, the Government of India, on the recommendation of the same High Powered Expert Committee, further decided to go in for a 'Smart Cities Mission' with the purpose of developing Smart Cities to create replicable models which will act like light houses to other aspiring cities. Development of Smart Cities, in fact, is a step towards development of regions. In this background, Govt. of India launched 'Smart Cities Mission' (SCM) in June, 2015 whereby 100 cities are to be developed within a period of 5 years. During this period, financial support in equal proportion of Rs. 100 Crore each by State Government and Central Government each year will be provided to Smart Cities as grant in aid in addition to their local resources and nearly one thousand billion Rupees would be spent on Smart City Projects.

In fact, there is no universally accepted definition of a Smart City. It means different things to different people and conceptualization of Smart City, therefore, varies from city to city and country to country, depending on level of development, willingness to change and reform, resources and aspirations of the city residents. A Smart City would have a different connotation in India, than say Europe. Even in India, there is no single way of defining a Smart City. However, due to wide range of smart technologies that have been implemented under Smart City label, it is difficult to spell out a precise definition of a Smart City.

To guide cities in the Smart Cities Mission, in the imagination of any city dweller in India, the picture of smart city contains a wish list of infrastructure and services that describes his or her level of aspirations. Keeping aspirations and needs of citizens, urban planners ideally aim at developing the entire urban ecosystem, which is represented by comprehensive development– institutional, physical, social and economic infrastructure. Usually, being a Smart City is a long term goal and cities can work towards developing such comprehensive infrastructure incrementally adding on layers of smartness.

The objective of Smart Cities Mission is to promote cities that provide core infrastructure and give quality of life to its citizens – a clean and sustainable environment – application of smart solutions. For sustainable and inclusive development, the focus is on compact areas, which will act like a catalyst and inspire development in the whole region. This bold new initiative marks a big departure from the traditional Municipal body led model of urban development to one marked by corporate features, such as a CEO, who can even be taken from the private sector through a Special Purpose Vehicle route for raising funds and execution of the development plans. Unlike in the past, when the burden of development was on the States and the Central Government, this time over 60% resources are proposed to be generated by cities concerned.

The selection of cities has been influenced by their capacities to deliver as determined on the basis of their past performance and financial strength. To begin with, only selective areas in the cities proposed by Municipal bodies in consultation with the people will be developed or re-developed and later on this will work as a catalyst. The selected areas will entail re-development of at least 50 acre or green field development over 250 acre or taking up 500 acre for retrofitting within a period of 2 to 5 years. Redevelopment is replacement of existing built up area with a new layout plan with mixed land use of higher FAR and high ground coverage. It will further ensure enhanced infrastructure and increased density. Retrofitting on the other hand is introducing planning in an existing built up area to make it more efficient and liveable. Since existing structures are to remain largely intact in this model, therefore more intensive infrastructure service levels and good number of smart solutions will be introduced into existing structures. In Greenfield development, the project area would be previously vacant and the same would be developed using innovative planning with provision for affordable housing, especially for the poor. Greenfield projects are usually planned around cities to meet the needs of expanding population.

Each aspiring city competes for selection as a Smart City in competition called ‘City Challenge’ and there are two stages in the selection process. The first stage is shortlisting on the basis of scoring criteria laid out on different parameters and highest scoring potential smart cities will be shortlisted and recommended for Stage II of the challenge. This will happen within the particular State itself and number of potential Smart Cities recommended by different States would depend on number of Smart Cities allotted to States

on the basis of an equitable criteria giving equal weightage (50:50) to urban population of the State and the number of statutory towns in the State. The second stage involves shortlisting by the Central Government keeping in view various relevant aspects like model chosen, Pan City dimensions with smart solutions, consultations held with city residents and other stake holders and how the aspirations are matched with the vision and the proposal for financing the smart city plans, including revenue model to attract private participation. An evaluation criteria has been in fact, worked out by Ministry of Urban Development based on professional advice and this acts as guidance to the cities for preparing proposals.

Smart Solutions

The core infrastructure element in the Smart City would include adequate water supply, assured electricity supply, sanitation including solid waste management, efficient mobility and public transport, affordable housing, robust IT connectivity and digitalization, good governance, especially e-governance and citizen participation, sustainable environment, safety and security of citizens, particularly women, children and the elderly and health and education.

As far as smart solutions are concerned, an illustrative list is given below. However, cities are free to add more applications.

Source: Mission Statement & Guidelines, Ministry of Urban Development, Government of India, June 2015.

Though the Mission will cover 100 cities and its duration will be 5 years from FY 2015-16 to FY 2019-20, the Mission may, however, be continued thereafter in the light of evaluation to be done by the Ministry of Urban Development and incorporating the outcome into the Mission for future development of regions. It is further expected that on the basis of early experience in implementing Smart City Project, there could be mid term corrections and changes for optimum utilization of funds and for giving this programme a big push to achieve mile stones in the stipulated time-frame.

The elements that must form part of a Smart City proposal are assured electricity supply with at least 10% of the Smart Cities energy requirement coming from solar, adequate water supply including waste water recycling and storm water re-used, sanitation including solid waste management, rain water harvesting, smart metering, robust IT connectivity and digitalization, pedestrian friendly path ways, encouragement to non-motorized transport, intelligent traffic management, non-vehicle streets/zones, innovative use of open spaces, replacing overhead electrical wiring with underground wiring, encouraging free public areas and ensuring safety of citizens. In the case of re-development and Green Field models, in addition to essential features mentioned in the Smart City proposal, at least 80% buildings should be energy efficient and green buildings. Additionally, there should be provision for 15% affordable housing category in Green Field projects.

Since cities would be competing with one another for selection under Smart City Mission, they have to prepare their smart city proposals with great care with smart solutions which are smart enough. The preparation of Smart City proposal is a collaborative effort because the objectives and funds of all Government departments, public sector undertakings, private agencies and the citizens are dovetailed during the process of preparing the Smart City Proposal.

Strategy

The strategic components of area based development are City Improvement (Retrofitting), City Renewal (Re-development) and City Extension (Green field development) plus a Pan-city initiative, in which smart solutions would be applied covering large parts of the city. The Smart City proposal of each shortlisted city is expected to include either retrofitting or re-development or green field development model or a mix thereof and Pan city feature with smart solutions. Pan City is an additional feature to be provided so that all the city residents feel there is something for them in it also and it proves to be really inclusive. Plan to cover entire city would entail no time line target.

The Mission has not prescribed any particular model and the approach is not 'one-size-fit-all'. Each city has to formulate its own concept, vision, mission and plan for a smart city, that is appropriate in its local context, resources, needs and aspirations. The Smart City Proposal would, therefore, essentially contain vision plan for mobilization of resources and intended outcomes in terms of infrastructure upgradation on smart applications.

The implementation of the Mission at city level will be done by a Special Purpose Vehicle (SPV) created for the purpose. The SVP will plan, appraise, approve, release funds, implement, manage, operate, monitor and evaluate smart city development projects and it will be headed by a full time CEO and will have nominees of Central Government, State Government and Urban local bodies. The State public urban body shall ensure that a substantial revenue stream is made available to SPV to make it self-sustainable and evolve its own credit worthiness for raising additional resources from the market. The

execution of the project will be done through joint ventures, subsidiaries, public-private partnership (PPP), turnkey contracts etc.

Smart City proposals will have convergence with other Government schemes and Mission for Rejuvenation and Urban Transformation, Clean India Mission, Digital India, Skill Development, Startups India, Make in India, Housing for all, Museums and Educational/Cultural Centres. In addition, any future development programme launched by any Government agency could be got similarly dovetailed with Smart City Project, if it has the potential of boosting and strengthening the Smart City solutions after getting concurrence from the competent authority.

Challenges

Keeping in view the bold new initiative and lot of innovative approaches being implemented through mission mode, there are likely to be challenges during implementation and the same could be visualized as –

- Non participation of all stake-holders in the planning and development process.
- Difficulty in raising of necessary funds from local sources & credit financing institutions.
- Non-availability of experts for various sub projects/smart solutions.
- Difficulty in developing heavily populated older cities.
- Difficulty to enlist private sector participation for urban reforms since private sector is interested mostly in green field projects and not interested in brown field projects.

In fact, more problems would come to notice as and when the implementation process moves on. However, some of the suggestive solutions are:

- To ensure participation of people in SCM, the use of ICT, especially mobile based tools will be used by Special Purpose Vehicle to identify and utilize the services of smart people in detailed citizen consultations in governance and reforms.
- Technical assistance will be ensured from expert agencies within the country and from foreign Governments/UNO agencies, which are being net worked by Ministry of Urban Development, Government of India.
- Consulting firms empanelled by Government agencies and chosen by SPVs would help in planning for financial resources to be generated from within the Cities concerned and from identified credit financing agencies in addition to project financing from State/Central Government.
- To enlist support of private sector, urban reforms must include rental housing, affordable housing, in-built mechanism for providing land through innovative land pooling schemes, Additional FAR (Floor Area Ratio), Fast track approvals, low licensing costs and other levies.
- SCM must allay fears through citizens engagement that smart cities would not become islands inhabitated by urban elite wherein urban poor would become mere service providers.
- Core area development must not create gated community and ghettoes for poor in peripheral areas.

- Smartness of planning the city be judged on the basis of planning for all walks of life and not for those who can afford.
- Liveability and affordability of cities with focus on improvement in the quality of life would necessarily call for bigger financial assistance from public sector agencies.

Impact

Since different Smart City Projects would provide for smart solutions relevant to key components of their Development Plans, however, as per objectives of the Mission document, some typical impacts of development initiatives in Smart Cities would be -

- Competitiveness and cooperative federalism.
- Involvement of smart citizens, planners, executors and other stake holders.
- Lot of hype, competitiveness, brain storming, knowing and identifying problems, needs and aspirations of city.
- Urban local bodies and bureaucrats getting activated and political leaders, inspiring stake holders for going in for smart solutions.
- Promoting mixed land use to make land use more efficient.
- Housing and inclusiveness as prominent achievements.
- Creating walkable localities and reduce congestion, air pollution.
- Boosting local economic resources and refurbishing of road network to make it more suitable for pedestrians and cyclists.
- Preserving and developing open spaces – parks, play grounds, recreational places for raising quality of life.
- Promoting public transport and motorized activity.
- Making governance citizen friendly and cost effective – relying on online services.
- Accountability and transparency in public services.
- Reducing cost of services and providing services without having to go to Municipal offices.
- Giving an identity to the city based on its main economic activity, art and culture, health/education, sports, culture and industries etc.
- Applying smart solutions – using fewer resources, cheaper services, conserving water and electricity.
- Encouraging developers for energy efficient buildings, recycling of waste water, solid waste management, green buildings, solar energy and energy conserving measures.

Recommendations and Conclusion

The contributions from ‘Smart City Mission Transformation – Mission Statement & Guidelines, Ministry of Urban Development, Government of India June 2015, are sincerely acknowledged.

It is a new promising initiative of bold nature, on the basis of which the Government of India is hoping to bring about a transformational change in the developmental process of cities. It may, however, require lot of mid term appraisals and corrections to ensure its success and in that direction some

relevant recommendations made below may help in realizing the full potential of this Mission approach:

- The success of a Smart City Project is dependent on involvement of citizens in all important activities. A detailed study would be required in each Project to judge the participation level of citizens at all crucial stages of planning, execution and appraisal of a Smart City Project.
- Many Smart City Projects, which have not been selected by the Selection Committees during elimination rounds based on different criteria points, would also need a detailed study to identify the major reasons for not having been approved. This study can throw light on those deficiencies and guide those towns to the path of Smart City Mission through alternative routes.
- The shortlisted Smart Cities are grappling with the task of arranging 60% balance funding of project money from their own resources, in addition to grants from State/Central Governments. Smart Cities' specific in depth studies and analysis could help the project authorities for early arranging of required local resources and timely completion of projects.
- Appraisal studies mid way could help the project authorities to make mid term corrections for successful and timely completion of Smart City Projects.
- Effectiveness of e-governance solutions being very important part of Smart City Project would need independent studies to check the level of transparency and accountability ensured through smart solutions. It is, therefore, another very important area for researchers.
- Case studies could be undertaken to suggest alternative models of Smart City Project in which remaining more towns could be included to ensure regional development on a larger scale in a given time-frame.
- To ensure better and larger participation of private players in the Smart City Mission, further studies could suggest more attractive proposals for private sector participation to be included in Smart City Projects.
- The performance of Special Purpose Vehicle (SPV) is a crucial factor in the success of Smart City Programme and case studies are needed to appraise and evaluate the working of various types of Special Purpose Vehicles adopted by different Smart Cities.

On the basis of complete analysis of the main objectives of the Smart City Mission and its key components and prominent features, it can be safely concluded that the conceptualization of Smart City Project, is a very innovative, progressive and bold step to create examples that could be successfully implemented and repeated in the region, thus catalyzing creation of more smart cities and smart regions. The Mission's objective is to promote cities that provide core infrastructure, give decent quality of life to citizens, provide a clean and sustainable environment and smart solutions through use of technology which is very well reflected through targeted goals. The Mission has already created lot of hype, competitiveness, brainstorming, knowing and identifying the local problems, needs and aspirations of citizens and made the local urban bodies, bureaucrats, political leaders highly integrated and activated in inspiring stake holders. There is real active involvement of smart citizens, planners and executors which will result into infrastructure upgradation with special emphasis on cleaning, dressing and beautifying of towns and going in for smart solutions through e-governance. This will further bring meaningful and unprecedented accountability and transparency in addition to raising quality of life. This big ticket project of Government of India is certainly going to put India on the fast track to join league of developed nations in the near future.

References

Centre for Internet & Society. Big Data of Governance in India; A discussion on the role of Big Data in Governance in India with a focus on Digital India, UID Scheme of Smart Cities Mission.

http://cis-india.org/internet-governance/blog/background-note-big-data

Maheshwari, P. A Giant Step towards living smartly. International Journal of Management & Social Science Research Review Vol. I, Issue 17, Nov 2015.

Ministry of Urban Development, Government of India. Atal Mission for Rejuvenation and Urban Transformation (AMRUT), New Delhi 2015.

Ministry of Urban Development, Government of India. Jawaharlal Nehru National Urban Renewal Mission – Towards better cities, New Delhi 2005.

Ministry of Urban Development, Government of India. Smart Cities Mission Statement & Guidelines, June 2015.

Singh, Mahavir. Smart cities need intelligent planning. The Tribune, New Delhi, February 1, 2016.

THEME B. Citizens and Urban Sustainability

Citizens and Urban Sustainability theme introduces key topics of sustainable and humanity urban development which enables to create a better living environment for citizens while preserving the life support systems of the planet. This theme provides a holistic approach to promote environmental sustainability and human wellbeing. It presents an overview of the digital innovations for smart urban living, the clean technologies and transfer processes as well as diverse methods for promoting wellbeing and social cohesion. Moreover, this theme includes case studies, methodologies and development results which have applied collaborative and user-driven living lab practices within the urban development.

Urban planning is a central tool for promoting better living environments in cities. Cities are facing new challenges such as the renewal of built environment and the transition of services as well as the integration of sustainability factors, such as urban climate, energy efficiency and green areas, into the planning process. Successful processes require also suitable project management and citizen participation to reach their targets. Digitalisation is adapted to facilitate effective, integrated urban planning and citizen participation. In this track, we call for innovative approaches and tools for sustainable urban planning.

Clean technologies includes all products, services, processes and technologies which promote the sustainable use of natural resources and reduce the environmental impacts. These can relate e.g. to material and energy efficiency, energy production and reduce of airborne emissions, clean water and waste water treatment as well as recycling activities and waste management.

Albats, E., Mensonen, A., Penttilä, M., Kanak, A., Ergün, S., De Kezel, J., De Roeck, D., Thiran, P., Ergün, Ö. Ö.

Title: Collaborative City Design: State-of-the-Art and Future Perspectives

Research Article

Abstract

Continuous city growth leads to various urbanization-related challenges such as ecology, infrastructure, society and economy. As these changes have a direct impact on city inhabitants, there is a clear need for citizens to be involved in city design. The concept of 'the smart city' emerged in response to these challenges and gave birth for an entire market of 'smart city' solutions. To facilitate these solutions, a central need remains, however, to develop a single platform, which is able to integrate all relevant city and stakeholder related data sources. Besides factual and measurable data, a major challenge lies in integrating and utilizing data generated through co-design methods and processes, which allow an improved urban development process through stakeholder participation. This paper presents results of the research project C³PO (Collaborative City Co-Design Platform), which aims at developing such a platform, and is a result of the work done by a project consortium formed by professionals from Belgium, Turkey and Finland. In the paper we picture the state-of-the-art in city co-design: define its stakeholders and challenges and present an overview of the tools, technologies and platform characteristics required to address these challenges. We also review the options of business models for city co-design platform.

The insights presented are based on qualitative exploratory research, in-depth analysis of the existing literature on the topic, analysis of secondary sources (websites of city development projects and city planning documentation) as well as an analysis of three types of primary data. These primary data sources include interviews with 27 city developers from Belgium, Finland, Spain and Turkey, data gathered from 50 participants of workshops organized in Belgium, Finland and Turkey as well as insights resulting from dedicated project consortium sessions. We analysed the data using manual text mining and compared results gathered between the different countries involved. Based on this analysis, we firstly defined seven groups of stakeholders and seven central challenges related to the city co-design process. Secondly, 76 platform requirements were defined, including stakeholder requirements, functional and non-functional requirements. Thirdly, a review of several existing tools and technologies has been done in the three key areas: cooperative urban design process, urban semantics, visualization and interaction. Lastly, four business model related options for city co-design platform were created.

Keywords: city co-design, state-of-the-art, platform

Introduction and research problem

Collaborative city design (co-design hereinafter) is an approach to design a city involving all stakeholders (e.g. citizens, municipalities, tourists, businesses, public institutions) throughout the design process in order to ensure that the result meets the stakeholder's needs (King, Conley, Latimer & Ferrari, 1989, 5-6). It is an emerging topic both in theory and practice (Castelnovo, Misuraca & Savoldelli, 2015, 1). However, there are still many aspects of co-design,

particularly in urban context, which require additional exploration. Among these are the challenges that city stakeholders face during the city co-design processes, the tools to be used to address these challenges, the data sources required for city co-design, the solutions for data integration and optimizing stakeholders' interaction (Nevens, Frantzeskaki, Gorissen, & Loorbach, 2013, 116-118; CreativeCities, 2015, 1; Smart Cities, 2010, 1; Botero & Saad-Sulonen, 2008, 266-267). Additionally, recent studies highlight a need in elaborating business models for city co-design solutions (Walravens & Ballon, 2013, 72-74; Zanella, Bui, Castellani, Vangelista & Zorzi, 2014, 22).

All the work presented in this paper is a part of the European project C³PO (Collaborative City Co-Design Platform, https://C³POprojectblog.wordpress.com/) – a three-year project started in January 2015, which aims at developing a cloud platform for city co-design. C³PO project consortium is formed by professionals from Belgium, Turkey and Finland. The C³PO platform relies on three main building blocks:

1. Semantic description of multi-dimensional information on urban co-design (ontologies)

2. Scalable computing platform

3. Cooperative and participative urban design process.

These three building blocks offer efficient multi-dimensional information access and orchestration of different applications (visualization, simulation, data acquisition, co-creation and participation). Thus, the research and development is related to several topics, including cooperative urban design process, urban ontology and 3D visualization. Throughout this paper, we picture the state-of-the-art in city co-design, define the critical points to be addressed in this domain and introduce ways to tackle these points.

A platform for city co-design should integrate different stakeholders, data sources and tools. This leads to following research questions:

RQ1: Who are the stakeholders in city co-design and what are their interests and influences throughout a co-creative process?

RQ2: What are the main challenges in city co-design and related needs of the stakeholders?

RQ3: What tools, technologies and platform characteristics should address the stakeholders' challenges?

During the development of a platform, we also evaluate its potential business value, resulting in a fourth research question:

RQ4: What are the alternative business models for city co-design platform?

Background

Urban development challenges and co-design trends

According to World Urbanization Forecast (United Nations, 2014, 1) cities are growing rapidly. This continuous growth is also supported by immigration flows. As a consequence, the pressure of different urbanization challenges (ecological, infrastructural, social and economical) and costs of the city maintenance will continue increasing. The concept of 'smart city' emerged in response to these challenges and gave a birth for the entire market of

smart city solutions, where many companies are nowadays operating (IBM, Oracle, Google, Cisco, etc.). It is forecasted that in the next decade, over $100 billion will be spent on core technologies to support smart city development worldwide. The 'smart city' market is expected to be worth $1,5 trillion by 2020, opening tremendous opportunities for business (Frost & Sullivan, 2014, 1).

The notion of citizen involvement in city planning has evolved drastically throughout the years. Now we are at the stage, where opening of public and private data complemented by simulation tools enables all stakeholders to envision and react upon novel urban development projects. By urban development here and after we imply the complex process of the social, cultural, economic and physical development of the cities, for which practice of co-design is one of the enhancing tools. That include developing new city areas and renovating existing ones from the planning stage to realization and from complex infrastructure co-development to co-designing particular buildings. Using visualization and simulation tools, the designed environment can be presented in a variety of ways, throughout different stages of the co-design process. However, there is still a need in the platform, which is able to integrate all relevant data. An important element here is to, besides factual and 'countable' data (such as population, pollution, traffic etc.), include data gathered via tools built upon co-design methods. These 'co-design tools' allow stakeholders to be involved in a more active way throughout the process, however the data generated by these tools is very unpredictable (e.g. images, audio fragments, opinions, etc.). Development of the envisioned 'C3PO platform' requires research and development in three main areas: (1) cooperative urban design process, (2) urban ontology and (3) visualization and interaction. We discuss them in the following subchapters.

Cooperative urban design process

There exist 5 key elements of the urban co-design process: (1) involvement (who do we need to participate?); (2) Stakeholders and their representativeness (what kind of groups are represented in the process, by whom and how?); (3) Expertise (who possesses information and what kind of information is seen relevant and valuable?); (4) Knowledge and understanding about the planning process; and (5) Interest or motivation to be involved in the planning process (Bäcklund, 2007, 19-22; Häikiö, 2005; 20-22; Laine and Peltonen, 2005, 398-403; Leino, 2006, 12-18). All these elements must be included in the cooperative urban planning and co-design processes. According to Fu & Lin (2014, 614) the urban co-design process include five main stages: (1) Exploration (including stakeholder analysis); (2) Integration (including participatory research for city challenges); (3) Ideation (to generate concept based on analysed data and built models); (4) Implementation (including framing service ecosystem and project pilots); (5) Evaluation (testing with public). The co-design platform must communicate and visualize clearly, what the exact process is and in what phases different stakeholders can participate. The technical solutions provided must support people's personal aims and their motivation to be involved, and therefore, enable effective communication along the process, delivering relevant information in amount sufficient for each particular stakeholder at every process step. And last but not least, stakeholders' input must be turned into actionable elements for the urban design and development process (De Roeck & De Kezel, 2014, 16).

Urban ontology

In order to meet the requirements of such solutions, several XML-based standard protocols for exchange of urban information exist. Each protocol describes a specific dimension of urban information (e.g., OGC - geospatial and location standards by the Open GIS Consortium; aecXML - BIM information

which uses Industry Foundation Classes (IFCs), LandXML - a data structure widely used in infrastructure planning which the IFC does not yet cover, etc.). Tentative ontologies have also been developed in areas related to GIS/ BIM applications. Such ontologies present a semantic background where stakeholders can deduce useful information from huge amounts of city data.

Visualization and interaction

In terms of visualization, some tools for mobile augmented reality are applied to visualize architectural assets. However, they typically suffer from problems with accuracy and stability (being based on just compass and GPS), poor rendering quality (visualization not adapted to real world lighting conditions, not accounting for reflections, etc.) and incorrect occlusions (foreground objects hidden by virtual objects) (Li, Zhang & Tretter., 2001, 9-12). Improved performance can be obtained by applying computer vision (for tracking), image analysis (for rendering) and 3D reconstruction (for occlusions). In addition to augmented reality (AR), virtual (VR) or mixed reality tools may present graphically richer solutions. With recent developments in smart glass, smart phone/tablet technology, public awareness on VR, AR or mixed reality has been increasing. In spite of the rapid developments in visualization and interaction technologies, there are still exist issues such as handling complex 3D models in real time on consumer level mobile devices. Making possible the effective transmission and sharing of complex 3D scenes on various terminals, and under different bandwidth constraints, requires the deployment of effective compression technologies (Li, Zhang & Tretter, 2001, 3). The requirements to be fulfilled are: (1) scalable/progressive transmission; (2) high speed decoding; (3) support of arbitrary topologies and geometries. However, the majority of the existing techniques fail from supporting the whole set of the above-mentioned requirements. In particular, they are dedicated to manifold structures and thus inappropriate for more generic topologies.

Our research and the C³PO platform development are devoted to addressing the challenges in the areas of the city co-design process, urban ontology, visualization and interaction related topics discussed above.

Business models for city co-design solutions

Recent developments in Internet of Things (IoT), collaborative tools result in rapid changes and business model innovations. When it comes to business models, specifically for solutions and products oriented towards smart city development, the related fields of technology have been rapidly growing but still are very immature (Zanella et al., 2014, 22). Thus, in line with the development of new solutions, we also explore the potential business opportunities for such solutions.

Research design

We have carried out a qualitative exploratory research, based on in-depth analysis of the existing literature on the topic, analysis of secondary sources (websites of city development projects, city planning documentation, etc.) as well as based on analysis of three types of primary data.

The first source of primary data is 27 interviews conducted with city developers in Brussels and Kortrijk (Belgium), Oulu and Kouvola (Finland), Pendik (Turkey) and Vittoria and Bilbao (Spain) in 2015. The interview questions were developed based on the literature review and included the questions on the following themes:

- current city development projects,
- city developer' activities,
- challenges that city developer faces in the project,
- stakeholders involved into particular city development project,
- project progress tracking,
- tools and methodologies used for managing the project and enabling stakeholder involvement,
- data collected and used in the city development processes/project.

The interviews were conducted face-to-face, recorded, transcribed and the data received were analyzed using manual text-mining.

The second source of primary data was a series of workshops with various stakeholders – city developers, citizens, local business owners held in 2016 in three different cities – Brussels (Belgium), Pendik (Turkey) and Kouvola (Finland). In total, 50 people participated in the workshops. During these workshops, city co-design challenges were discussed and various solutions, which were developed by the C³PO consortium, were presented in response to the stated challenges. The workshop participants shared feedback on solutions, discussed additional challenges and requirements they have for city co-design platform and proposed ways to improve the currently developed tools. Notes were taken during all the workshops, which were analysed and compared.

The third source of primary data was notes and results of the C³PO consortium technical meetings, undertaken for actual C³PO platform development. Here, the contributors are the C³PO consortium members representing 21 organizations from Belgium, Finland and Turkey who have expertise in semantics, visualization, modelling & simulation, game development, software and services development, collaborative tools, data analysis, city development, professional design and architecture.

Results

Stakeholders and challenges faced in city co-design

Based on the literature and primary data analysis we identified seven key stakeholder groups in the city co-design process:

- Citizens (residents, users of local services);
- Planners & experts (urban area planners including civil engineering, green spaces and traffic);
- Communities, organizations and associations;
- State and regional authorities;
- City councillors;
- Organizations within municipality (healthcare, schools, sports and leisure time, electricity, construction, tourism, etc.);
- Businesses (small business and sector associations).

The participants of some of the workshops specifically mentioned the asylum challenge in Europe and refugees as a group with special needs to be integrated into cities infrastructure.

Based on the analysis of the literature and further validation during the interviews with city developers, we have identified seven key challenges common for city co-design across Europe

Table 1. Seven key challenges in urban co-design

#	Challenge Name	Description
1	Stakeholder involvement	Difficult to involve stakeholders in the participatory process
2	Explaining the problem	Explaining the technical challenges of a project to citizens is a challenge
3	Egocentric vision	Participants complain about issues that affect themselves, they do not think about consequences for other citizens
4	Dynamization of groups	How do we get constructive dynamic?
5	Dominating opinion leaders	Small groups to avoid leaders
6	Transparent participation process	Challenge: convey the participants how is their information going to be used, tell them until what extent their opinion is going to used
7	Transparency between stakeholders	Lack of transparency and information at the beginning of the projects

Figure 1 presents opinions of the city planners from Belgium, Finland and Turkey related to these challenges. The scores provided by our interviewees illustrate how difficult is to overcome the challenges. The most difficult ones in Belgium on average are (1) Transparent participation process (allowing clear understanding of participation process), (2) Explain the problem (making ordinary citizens understanding the technical difficulties of the city planning process), (3) Group dynamics (continuously increasing groups' involvement). City planners in Finland generally are more positive about possibilities to overcome the challenges they face. However, assuring group dynamics, getting stakeholders involved and allowing transparency between stakeholders are the most difficult challenges they face with. In Turkey, in addition to group dynamics and lack of transparency, the city planners often face with an egocentric vision among citizens (lack of understanding of the broader picture and others' needs).

The following subsection describes the state-of-the-art tools and technologies to address the identified challenges. Moreover, it gives the requirements of the solutions, which still need to be developed in order to better fulfil the current demands in city co-design.

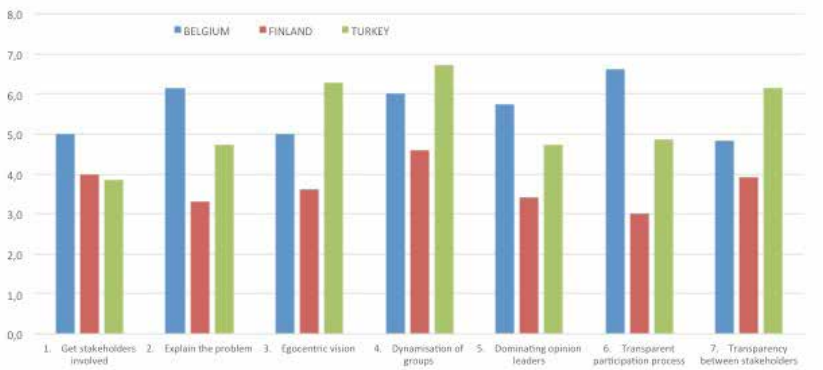


Figure 1. Challenges faced by city planners in Belgium, Finland and Turkey (based on interviews, the respondents were asked to evaluate how difficult is to overcome the challenge using a 1 (low) to 7 (high) scale).

Tools, technologies and platform characteristics to address challenges in city co-design

Analysis of our primary and secondary data allowed us to develop a set of requirements for city co-design platform. We determined 76 requirements, which are classified into 3 categories:

- Stakeholders (or end-user) requirements – defining the platform scope, performance requirements;
- Non-functional requirements – "attributes of/constraints on a system" (Glinz, 2007, 25). (system qualities as accessibility, security and privacy, maintainability, scalability, testability);
- Functional requirements – the functions the system should perform (Glinz, 2007, 21) (system requirements, software requirements, hardware requirements).

According to stakeholders' feedback to fulfil the requirements of all the three levels, a co-design platform should address user involvement in city development by including the following tools (with examples in brackets):

- Data gathering platforms – tools for data collection, aggregation and analysis (e.g. Liveminds, dscout, Revelation, Typeform, Polar),
- Collaborative platforms - enable exchange of information between large groups of people (e.g. Yammer, Appgree, co.createlli, Ushahidi),
- Crowdsourcing and idea management platforms – idea collection selection and classification (e.g. Chaordics, Topcoder, 99designs for crowdsourcing and e.g. Cognistreamer, Crowdicity, Citizenlab for idea management),
- Co-creation platforms - improving an idea/existing product or a first design (e.g. Cage, OpenIdeo),
- Groups support systems – software and processes supporting group decision-making (e.g. GroupSystems, Facilitate.com, Spilter, etc.),
- Participation tools and stakeholder management software – software assisting in identifying the stakeholders, mapping the actors and analysing the relationships between them, managing complaints (like Darzin, Staketracker, Stakeholder Circle and others),
- Visualisation and interaction tools – software for data visualization and communication between all the stakeholders (platform users) (e.g. GIS (geographic information system)-based tools, 3D visualization, AR tools).

The future platform for city co-design needs to combine a number of processes including data gathering (and conversion between various data standards), data storage and processing (the amount of required data could be huge), data analysis and transformation. Ideally, the platform should be cloud-based, since it allows keeping the data available and accessible, and the physical environment protected and running. Moreover, the platform needs to ensure exploitation of the advanced visualization tools and technologies such as GIS-based schemes for mapping, 3D visualization, AR, VR or Mixed Reality. According to our results, among other initiatives, using advanced visualization technologies influence stakeholders' awareness and participation in city co-design process positively. Among existing visualization tools there are ARKINECT and ERARGLASS™ (by ERARGE), Planet 3D (by Netcad), ALVAR SDK, DigiSpaces and AROnSite (by VTT) and others.

Finally, in order to ensure real-time and accurate data processing, the platform for city co-design also needs to include features of the urban planning software (as Planet 3D by Netcad, Esri's Urban and Regional Planning Tools (Esri.com, 2016, 1) or Autodesk's Land Development tools (Autodesk.com, 2016, 1)) and traffic modelling tools (such as Chaos™ (by ERARGE), Motion and Crowd Analysis Software, Bootstrapping Tools, Yandex Maps, Bing Maps and Google Maps). The existing APIs benefit from the cooperative communication between vehicles, which is well known as Vehicular Ad hoc Network (VANET). Majority of the traffic monitoring applications utilize OpenStreetMap (www.openstreetmap.org/), which is a collaborative project to create a free editable world map. Many traffic simulation systems (as MATSIM, VISSIM, SUMO, MAINSIM) also exist and their features needs to be taken in the account while developing a new city co-design platform.

Such tools have the potential to analyse and model city dynamics, not only vehicle-pedestrian traffic but also energy usage, population, municipality services, CO2 emissions, social media inputs, etc. A semantic background enabling interpreting such dynamic data and then combining inferences by considering static (geography, laws, etc.) or mostly static (city plan, historical places, green areas, etc.) city data is hardly desired.

Competition and business model for city co-design platform

In terms of value proposition, C³PO combines in one three different value streams: (1) data analysis and processing, (2) applications development and (3) user (city stakeholder) involvement in city design. Thus, the platform competitors could be classified accordingly.

The first group of value propositions includes city data access, acquisition, transformation, analysis, management and integration. This function is fulfilled by data integrators of different levels, but is also often managed by cities themselves like the "Helsinki Regio Infoshare" in Finland and Digipolis in Flanders. The second function the C³PO platform has is applications development support and dissemination - software development platforms as Mapgets, which is developed in the scope of the C3PO project. The third function of C³PO platform is enabling user (stakeholder) involvement, participation and city co-design, which is fulfilled partly by collaborative platforms, crowdsourcing instruments and tools for co-design. Citizen (city.createlli.com) is a participation toolset developed as part of the C3PO project, designed to both provide strong participation functionality and data-integration.

Four alternatives of the C³PO platform business model were defined on one of the project brainstorming sessions. The first alternative is the Industry standard. The second alternative considered relevant is an Open Source Technology. The third alternative is a big data integrator as a platform owner. Ownership by one of the consortium partners could be a fourth scenario for future C³PO platform development. Further detailed analysis of each of the options is one of the directions for future research.

Discussion, recommendations and conclusions

Our research proves that city co-design is a very complex process because of high level of interdependences between various actors. The analysis presented in this paper highlights an urgent need in developing a single cloud-based platform to support stakeholders' interaction on a common base. We have identified seven key groups of stakeholders involved in city co-design process and found that they face seven key challenges. We have defined three general levels of requirements for the city co-design platforms and generally

described the tools and technologies required for all the process the platform should possess – data acquisition, analysis, integration and transformation, visualization and stakeholders' participation. Moreover, we picture the current state of the competition as well as alternatives for business development in the field.

This study only pictures the scope of city co-design and future research along each of the platform functions as well as further actual platform development are needed. It is noteworthy that this study has the potential to be extended to other related challenges in urban co-design. For instance, urban transformation processes directly influences life style, public health, tourism and investment. Recent challenges, like issues related to Syrian refugees or terrorist attacks threatening Europe can be discussed in further studies all of which can be accepted as new factors in urban co-design.

References

Autodesk.com, 2016. Autodesk's Land Development tools. Available online: http://www.autodesk.com/solutions/bim/civil-infrastructure/land Accessed: June 2016

Botero, A., & Saad-Sulonen, J. (2008). Co-designing for new city-citizen interaction possibilities: weaving prototypes and interventions in the design and development of Urban Mediator. In Proceedings of the Tenth Anniversary Conference on Participatory Design 2008 (pp. 266-269). Indiana University.

Bäcklund, P. (2007). Tietämisen politiikka. Kokemuksellinen tieto kunnan hallinnassa (Politics of knowing. Experiental knowledge in municipal governance). Doctoral dissertation. City of Helsinki Urban Facts, Helsinki. (In Finnish)

Castelnovo, W., Misuraca, G., & Savoldelli, A. (2015). Citizen's engagement and value co-production in smart and sustainable cities. In International Conference on Public Policy (pp. 1-16).

CreativeCities, 2015. Urban Co-Design Tools.

De Roeck & D., De Kezel, J., "All aboard! A starting point towards broad-spectrum citizen involvement", in proceedings of workshop "Making Places", NordiCHI 2014.

Esri.com, 2016. Esri's Urban and Regional Planning Tools. Available online: http://www.esri.com/industries/urban-planning Accessed: June 2016

Frost & Sullivan (2014). Frost & Sullivan: Global Smart Cities market to reach US$1.56 trillion by 2020. Connectivity and the Emergence of Smart Cities at GIL 2014 Australia. [accessed 2 August 2016]. Available at: http://ww2.frost.com/news/press-releases/frost-sullivan-global-smart-cities-market-reach-us156-trillion-2020

Fu, Z., & Lin, X. (2014, June). Building the co-design and making platform to support participatory research and development for smart city. In International Conference on Cross-Cultural Design (pp. 609-620). Springer International Publishing.

Glinz, M. (2007, October). On non-functional requirements. In 15th IEEE International Requirements Engineering Conference (RE 2007) (pp. 21-26). IEEE.

Häikiö, L. (2005). Osallistumisen rajat. Valta-analyysi kestävän kehityksen suunnittelusta Tampereella. Tampere University Press.

King, S., Conley, M., Latimer, B. & Ferrari, D., (1989). Co-Design: A Process of Design Participation. Van Nostrand Reinhold Company, New York, NY.

Laine, M., & Peltonen, L. (2005). Regime stability and restructuration: from industrial to informational city. e-City, 345.

Leino, H. (2006). Kansalaisosallistuminen ja kaupunkisuunnittelun dynamiikka: Tutkimus Tampereen Vuoreksesta. Tampere University Press.

Li, Y., Zhang, T., & Tretter, D. (2001). An overview of video abstraction techniques. Technical Report HPL-2001-191, HP Laboratory.

Nevens, F., Frantzeskaki, N., Gorissen, L., & Loorbach, D. (2013). Urban Transition Labs: co-creating transformative action for sustainable cities. Journal of Cleaner Production, 50, 111-122.

Smart Cities (2010). Co-design in Smart Cities. A guide for municipalities from Smart Cities. Available online: http://www.smartcities.info/files/Co-Design%20in%20Smart%20Cities.pdf Accessed: Jan 2016

United Nations (2014). World Urbanization Prospects: The 2014 Revision, Highlights. Available online: http://esa.un.org/unpd/wup/Highlights/WUP2014-Highlights.pdf Accessed Jan 2016

Walravens N. & Ballon P. (2013) "Platform business models for smart cities: from control and value to governance and public value." Communications Magazine, IEEE 51.6 (2013): 72-79.

Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014). Internet of things for smart cities. Internet of Things Journal, IEEE, 1(1), 22-32.

Harmaala, M-M.

Title: Can Sharing Cities Promote Sustainability
Review Article

Abstract
Consumer behavior has changed dramatically. Engagement, meaning, nostalgia and the longing for belonging to a wider community, conscious consumerism and sustainability concerns have paved the way to a consumer readily accepting and taking part in the sharing economy. From niche to a significant trend, collaborative consumption and related businesses represent a market opportunity worth 335 billion USD within a few years to a decade. Currently the landscape is dominated often disrupting existing industries and businesses with their new business models.

The collaborative economy represents a new way of thinking about business, exchange, value and community. While its definitions are varied and parameters continue to evolve, activities and models within the collaborative economy enable access instead of ownership, encourage decentralized networks over centralized institutions, and unlock wealth. They make use of idle assets and create new marketplaces. In doing so, many also challenge traditional ways of doing business, rules, and regulation.

It seems there are numerous environmental savings and resource utilization benefits that follow from wide-spread adoption of collaborative models. Moreover, there may be a flow of social benefits that come from engagement and the enhancement of community spirit and belongingness. However, the actual positive and negative impacts of the sharing economy are still partly debated and unproven.

Sharing cities have recently sprung up and self-declared. Sharing cities in most cases actively promote sharing activities and lifestyles as a result of concerns related to environmental impacts or the economic situation. Some promote sharing as part of the natural and organic growth of the city and its economic structure. There are cities with a vibrant sharing economy scene, some of which have grown organically such as San Francisco, some that are a result of deliberate city actions such as Seoul and others which thrive despite the authorities, such as Berlin. This paper will explore questions related to how a city can start promoting collaborative lifestyles and how cities can best be used as platforms for sharing. We draw on different examples and provide a review based on the witnessed approaches. Clearly cities have vast potential to boost wellbeing and resilience through collaborative initiatives but how can it be achieved in practice?

Key words: collaborative economy, sharing economy, resource efficiency, engagement, sharing cities, sustainability

Introduction
The collaborative economy represents a new way of thinking about business, exchange, value and community. While its definitions are varied and parameters continue to evolve, activities and models within the collaborative economy enable access instead of ownership, encourage decentralized networks over

centralized institutions, provide new models to unlock wealth and often do so to a wider group of stakeholders. They make use of idle assets and create new marketplaces. Van den Hoff (2013, 22-28) amongst others, sees that this will lead to a situation and society where the traditional ways of doing business, existing rules and the current regulatory framework are challenged and questioned and to a vision of the society of the future dominated by new economic and social models, that embraces new models of consumerism, sharing, participation and democratic decision-making.

The peer-to-peer market is surpassing any other markets in outlook and market growth. PwC estimated in 2014 the five key sectors of the sharing economy globally to be around USD 15 billion and expected to grow to USD 335 billion by 2025 (PwC 2014). AirBnb, perhaps one of the most raved examples of the collaborative economy, sees over 12 million annual guests staying in 34,000 cities globally (Riley 2014). Airbnb raised capital in 2014 with a $10 billion valuation (Wall Street Journal 2014, Weber 2014), meaning it was valued at more than some of the hotel chains it is increasingly competing against. Not only are sharing economy business models posing a threat and opportunity for traditional businesses, they are also posing an interesting new challenge and opportunity for cities to rethink their organization, governance, decision-making and services.

What is the collaborative economy?
The collaborative economy builds on distributed networks of connected individuals and communities. The rise of new forms of consumption is not constrained to individual actions of buying goods to satisfy needs, but includes collaborative consumption, focusing on: products as services; redistribution markets; and collaborative life-styles (Botsman & Rogers, 2010, xvi). The current growth of the collaborative economy is due to the emergence of new urban lifestyles, and more importantly, the development of digital platforms that enable new forms of collaboration, as well as the development of professional skills and services that allow the replication of individual collaborative solutions.

Currently a vast mix of terms is used in connection with the collaborative economy. Often synonymously used are collaborative consumption, the sharing economy and the peer-to-peer economy. Botsman (2013) emphasizes the need to distinguish between these and provides distinctions for the terms. The collaborative economy is built on networks of connected individuals and communities instead of centralized organizations and transforms how we produce, consume, finance and learn. Collaborative consumption is an economic model based on sharing, swapping, trading or renting providing access over ownership. The sharing economy is an economic model based on sharing underutilized assets whereas the peer economy includes marketplaces that facilitate the sharing and trade of products and services built on peer trust.

There are only few studies of how much people are using the collaborative economy. In Germany research reveals that more than 50 percent of consumers have experience with some form of sharing economy, and that approximately 25 percent can be described as “socio-innovative co-consumers” (Heinrichs and Grunenberg 2013). Another study by VisionCritical demonstrates that 40% of the adult population in the US and 52% in the UK have used sharing economy enabled platforms to access goods, services, transportation, money or space from other consumers instead of going through traditional means (Owyang et. al. 2014).

How sharing promotes sustainability

There is a strong trend demonstrating that access is being more valued than ownership, especially when it comes to commodities such as cars for example (Birdsall 2014, 39; van den Hoff 2013, 89; Kelly 2009). The sharing economy has the potential to provide a new pathway towards sustainability as a long-term goal (Heinrichs 2013). The sharing economy and collaborative consumption can neither bring about sustainability by themselves. However, they may be significant elements in facilitating a new pathway towards sustainability. Collaborative systems can be more environmentally friendly by increasing usage efficiency, reducing waste, incentivizing better products, and by absorbing the excess of production and consumption. These lead to declines in CO2 levels, noise and traffic congestion and natural resource savings through product life-cycle extensions and decreases in food wastage for example (Dlugosz 2014, 14-15).

The sharing economy has also been demonstrated to bring about social benefits through engagement, building trust and enhancing community values and cohesion for example. For a great number of people, the sharing economy provides an additional source of income, sometimes even substantial. The sharing economy brings people and their work back together through sharing, gifting, bartering, and peer-to-peer buying and selling. It thus has deep implications for how cities design urban spaces, create jobs, reduce crime, manage transportation, and provide for citizens.

However, as Demailly and Novel (2014, 5-7), Agyeman et al (2013, 10) and others point out, the research on the actual, and not just the expected environmental impacts of the sharing economy have been very few and sporadic. There is no evidence demonstrating conclusively that the sharing economy is either good or bad as a rule in terms of environmental impacts. Rather, the impact is situational and can vary from very positive to very negative. Collaborative models can for example increase the use frequency and thus shorten the lifespan of products radically, it can shift demand from rail traffic to road traffic while on the one hand it can decrease the need for ownership of products and the need for new products thus enhancing resource efficiency.

Recent studies tend to show that humans feel and react to social pain, such as loneliness and exclusion in very much the same way we react to physical pain (for example Hsu et al. 2013, 1211; MacDonald & Leary 2005, 202). Currently in many aging European nations loneliness is reaching epidemic proportions. It may well be that an economy built around collaboration, sharing and interaction will help to alleviate this trend and slow down the epidemic. This would have significant benefits also in terms of public costs related to health care.

There are also strong viewpoints, such as those of Share The World's Resources (2014), which believe that sharing indeed will universally result in positive outcomes and provides a solution not only to the environmental challenges we are facing but will also facilitate social justice, participatory democracy and the global peace movement for example.

Sharing city examples

Cities have always been, by definition, about shared space, interaction and the exchange of goods and services. A successful city needs good governance and collective civic structures to facilitate and regulate the interface between the shared public realm and private interests, and enable effective and fair sharing of resources and opportunities (Agyeman et al 2013, 10-12 & 22-25, McLaren and Agyeman 2015, 1). Cities are natural hubs for innovation and

creativity, while on the flipside they are for the most part unsustainable through issues related to pollution, waste management, social challenges and voracious consumption. Cities are a powerful platform to promote collaborative lifestyles and the sharing economy (McLaren and Agyeman 2015, 8). A sharing city actively promotes initiatives based on the notion of sharing and includes a fundamental notion of the right to "remake" the city itself (Harvey 2012, 111; McLaren and Agyeman 2015, 5-9). In the best case scenario cities provide a platform for democratic decision making, genuine participation and creation of crowds and critical mass. Cities when truly being and working as communities might well form the very fundamentals of all future innovation systems as Kakko (2014, 23) argues. Cities have also time and time again been criticized for their stiff, rigid and bureaucratic decision making structures and their resistance to change, innovation and new ways of organizing economic activity and civic engagement and activism. In our extensive benchmarking research into sharing cities we have identified three distinct approaches to the collaborative economy that cities are embracing.

Table 1: Three identified types of sharing cities and their differences (Harmaala 2016).

	The city as the primus motor	The city as the facilitator or active reacting party	The city as the break pedal
One sentence	The collaborative economy thrives BECAUSE of the city	The collaborative economy thrives WITH the city	The collaborative economy thrives DESPITE the city
The city relative to the collaborative economy	The city is the prime driver behind the proliferation of the collaborative economy; it is the main engine driving the success of the collaborative model	The city is reacting positively to collaborative initiatives that have started at the grassroots and citizens level; the city turns itself into an active facilitator removing potential barriers and enabling growth.	The city is not embracing the collaborative models but they thrive despite the city's actions; in some senses the city acts as a brake pedal
Key background elements	Sustainability concerns, especially environmental and social challenges	Dire housing market, thriving start-up and innovation scene, rapidly growing city	Practical orientation, wariness towards public authorities and anything authoritarian
Key characteristics	Enthusiastic mayor/ other city officials, city ordinances changed to accommodate collaborative models; city initiates and organizes information sharing	Plenty of start-ups operating in the collaborative space; thriving economic force.	Collaborative models are in a sense part of the alternative or underground movement; plenty of start-ups or small co-ops operating in the space
Key collaborative actions	Usage of public space, mobility, housing	Mobility, housing	Food, work, services

In the first category are cities that act as the prime driver of collaborative lifestyles. In these cities, such as the successful sharing city of Seoul, the city has taken an extremely visible and strong role in driving the collaborative economy. This has often started with a very deliberate and conscious development effort with a few prominent and powerful governance officials. Characteristically the adoption of the collaborative economy is motivated by large-scale social and environmental challenges that relate to resource efficiency and social inclusivity (CC-KOREA and Bo-Ra Jung 2015). Collaborative solutions are seen as creating solutions to city pollution, congestion, as well as challenges related to social development, such as social exclusion of youth and old generations as well as the fragmentation of social relationships and networks. In these examples, the cities draw up new ordinances promoting sharing behavior, they actively disseminate information and attempt to get citizens involved.

In the second category are cities that positively react to the organic growth of the collaborative economy. In these cities, such as many cities in the US like San Francisco, there is a thriving start-up scene that has grown organically from the needs and demands presented in the communities and that have been solved by the participants in those communities. The cities have then actively deregulated and disassembled unnecessary structures that prohibited the growth of the collaborative economy. Characteristically the cities view the collaborative economy positively and are ready to embrace the benefits that it is assumed to bring about.

The third category includes cities where the collaborative economy thrives despite city actions that often work against its success. In these cities, the collaborative scene is very active, but seems to be more part of the alternative or underground movement. One example is Berlin, where in the near-history collaborative lifestyles partly meant a disruption of social structures. In these cities, governance is wary of the collaborative economy perhaps for a fear of those lifestyles and models disrupting social equality and coherence. In these cities, the collaborative economy thrives despite of the city's more reluctant attitude towards active advancement of the phenomena.

The approaches presented above are all different and suit different cities, different cultural backdrops and differing stages in the adoption of the collaborative economy. One approach is not better than another and any city can essentially become a sharing city by moving along any of these approaches, depending on the inherent characteristic of the city and its citizens.

How can sharing cities promote sustainability

A reinvention and revival of sharing in cities could enhance equity, rebuild community and significantly cut resource use. The most live and pressing sharing economy issue for many cities is the approach it takes to regulation (Goulden 2015, Wosskow 2014). Since there is no definitive answer on the sustainability impacts of the sharing or the collaborative economy the role of policy makers becomes that of an enabler and advocate. It is in fact up to the cities now to promote smarter regulation that ensures that the ways in which the collaborative models are deployed are such that promote positive environmental impacts (Demailly & Novel 2014, 8; Frenken et al 2015, Wosskow 2014).

One of the key roles for the city officials is to enable collaborative lifestyles and make their inclusion or a transition towards them easier. The most pressing concerns relate to making taxation easier, encouraging collaborative models through government/ city procurement, helping to find solutions for insurance questions related to shared use of assets and opening up public spaces and potentially other assets more generously for public use. Taxation rules and platforms for registering sporadic taxable income need to be digital and easy-to-use for everyone involved. Preferably they could be combined with the collaborative platforms themselves automatically. This would also decrease resistance from legacy operators, especially those in the transport and hospitality sectors, towards the collaborative economy.

Government and city procurement represents a substantial economic force. Cities need to ensure that collaborative models are as preferable as any other and that they can easily be chosen as an option for example when traveling or organizing events. City assets such as buildings, parks and other assets like car fleets also need to listed and an exploration made into whether they could be opened further for public use.

On a practical level, cities can start a sector-based review of the alternatives for promoting sharing. For example in terms of accommodation, cities need to review the existing regulation and the potential hindrances it sets on shared space. Regulations need to be crafted in proportion to the scale of space sharing and the logic behind potentially stringent regulations on sub-letting need to be revisited. Surplus food and edibles are a major concern in an economic, environmental and a social sustainability perspective. Cities can play a major part in redistributing surplus food from stores, schools and other public places.

Cities also need to review existing parking regulations, as city master and building plans often unnecessarily restrict parking. On an easier level to start, cities should look into the potential and availability of preferential parking spaces offered for shared transport operators as well as the usage of bus lanes in highly congested areas. Special care needs to be paid especially to the design of new mass transport hubs to ensure that shared transportation and bikes for example are an easy option; i.e. they have enough designated space in the vicinity of such hubs. Public authorities also need to be taking a systems view on the development of mobility and where possible and sensible encouraging and incentivizing the shift from a car-based mobility system towards a public transport based mobility system.

The benefits and challenges related to the sharing city are different on a public or societal and on a private or individual level. On the public or societal level the sought benefits often relate to making resource use more efficient, moving towards a circular economy through eliminating waste, increasing communality, creating jobs, employment and subsequently tax revenue, fostering innovations and improving the reputation and attractiveness of the city.

Conclusion and outlook

The sharing economy seems to bring about substantial benefits socially, environmentally and also economically. Undoubtedly it also raises many questions, which relate to public policy, urban planning, fairness and safety for example. Currently the information on whether collaborative models can bring about sustainability is inconclusive. However, it would seem that the Sharing City concept offers both a sustainable foundation for participatory urban democracy and a transformative approach to city futures.

There are different ways in which cities can approach the sharing economy and we have explored some in this paper. All cities thus far that have adopted the sharing city model have seen positive effects, although all being in the early stages of concept adoption and development. We believe that fostering the growth of the sharing economy is worthwhile and something that merits further studies to see whether it can be used to boost prosperity and resilience in times of economic crisis and climate change. Cities could act as a platform for sharing and provide breeding ground for reaping the benefits of the collaborative economy. It needs to be further studied how cities could contribute to more resilient ways of providing housing, transportation, goods, food and jobs through promoting collaborative business models.

While it may not be clear whether the adoption of collaborative business models and the sharing economy in city planning will result in sustainability, it is clear that sustainability can't be achieved without the involvement of cities and their residents. If, and as evidence points, the collaborative economy can enhance participation, involvement and engagements, it just might be what is urgently needed.

References

Agyeman, J., McLaren D., Schaefer-Borrego A. 2013. Sharing Cities. Briefing for Friends of the Earth.

Birdsall, M. 2014. Carsharing in a Sharing Economy. Institute of Transportation Engineers. ITE Journal. Apr 2014;84, 4. pg. 37-40.

Botsman, R. & Rogers, R. 2010. What's mine is yours: the rise of collaborative consumption. New York, USA. HarperCollins.

Botsman, R. 2013. The Sharing Economy Lacks A Shared Definition. FastCo Exist Blog. http://www.fastcoexist.com/3022028/the-sharing-economy-lacks-a-shared-definition

CC-KOREA, Bo-Ra Jung. 2015. Seoul draws a city through sharing. ShareHub Korea. [accessed 29 August 2016] https://www.scribd.com/doc/304751600/Seoul-Draws-a-City-Through-Sharing-English#fullscreen

Demailly, D., Novel, A.-S. 2014. The sharing economy: make it sustainable, Studies N°03/14, IDDRI, Paris, France, 30 p.

Dlugosz, P. M. 2014. The Rise of the Sharing City. Examining origins and futures of urban sharing. IIIEE Publications. Lund. Sweden.

Frenken, K., Meelen, T., Arets, M. and van de Glind P. 2015. Smarter regulation for the sharing economy. The Guardian. 20th May 2015. [accessed 29 August 2016] http://www.theguardian.com/science/political-science/2015/may/20/smarter-regulation-for-the-sharing-economy

Goulden, H. 2015. 8 Steps towards a sharing city... Nesta. [accessed 29 August 2016] http://www.nesta.org.uk/blog/8-steps-toward-sharing-city

Harmaala, M.-M. 2016. The sharing city as a platform for a more sustainable city environment. International Journal of Environment and Health. In press.

Harvey, D. 2012. Rebel Cities: From the Right to the City to the Urban Revolution. Verso. London.

Heinrichs, H. , & Grunenberg, H. 2013. Sharing Economy: Towards a New Culture of Consumption?. 21 S. Lüneburg: Centre for Sustainability Management.

Heinrichs, H. 2013. Sharing Economy: A Potential New Pathway to Sustainability. GAIA 22/4 (2013): 228– 231.

Hsu D T, Sanford, B J, Meyers K K, Love T M, Hazlett K E, Wang H, Ni L, Walker S J, Mickey B J, Korycinski S T, Koeppe R A, Crocker J K, Langenecker S A and Zubieta J-K. 2013. Response of the μ-opioid system to social rejection and acceptance. Molecular Psychiatry 18, 1211-1217 (November 2013).

Kakko, I. 2014. Oasis Way and the Post-Normal Era – How Understanding Serendipity Will Lead You to Success. St. Petersburg. 96p. [accessed 29 August 2016] Available at http://www.slideshare.net/ilkkakakko/new-book-ilkka-kakko-oasis-way-and-the-postnormal-era-how-understanding-serendipity-will-lead-you-to-success

Kelly, K. 2009. Better than Owning. January 2009. The Technium. [accessed 29 August 2016] http://kk.org/thetechnium/2009/01/better-than-own/

MacDonald G. & Leary, M. R. 2005. Why Does Social Exclusion Hurt? The Relationship Between Social and Physical Pain. Psychological Bulletin. 2005. Vol. 131. No. 2. pp. 202-223

McLaren, D., Agyeman, J. 2015. Sharing Cities. A case for truly smart and sustainable cities. Massachusetts Institute of Technology.

Owyang, J., Samuel, A. & Grenville, A. 2014. Sharing is the New Buying. [accessed 29 August 2016] http://www.web-strategist.com/blog/2014/03/03/report-sharing-is-the-new-buying-winning-in-the-collaborative-economy/

PWC. 2014. Five key sharing economy sectors could generate £9 billion of UK revenues by 2025. [accessed 29 August 2016] http://pwc.blogs.com/press_room/2014/08/five-key-sharing-economy-sectors-could-generate-9-billion-of-uk-revenues-by-2025.html

Riley, T. 2014. Sharing economies are here to stay. The Guardian. [accessed 29 August 2016]http://www.theguardian.com/sustainable-business/behavioural-insights/sharing-economy-sustainable-alternative-economics

Share The World's Resources. 2014. Sharing as our common cause. [accessed 29 August 2016]www.sharing.org/common-cause

Wall Street Journal. 21.3.2014. Airbnb Is in Advanced Talks to Raise Funds at a $10 Billion Valuation. [accessed 29 August 2016] http://online.wsj.com/news/articles/SB10001424052702303802104579451022670668410

Van den Hoff, R. 2013. Mastering the Global Transition on Our Way to Society 3.0. Society 3.0 Foundation.

Weber, H. 2014. Airbnb rumored to raise $500M in new round led by TPG Capital. [accessed 29 August 2016] http://venturebeat.com/2014/03/20/airbnb-rumored-to-raise-500m-in-new-round-led-by-tgp-capital/

Wosskow, D. 2014. Unlocking the sharing economy. An independent review. [accessed 29 August 2016] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/378291/bis-14-1227-unlocking-the-sharing-economy-an-independent-review.pdf

Kapahi, M., Sachdeva, S.

Title: Oyster Mushrooms: Waste to Taste

Review Article

Abstract

The oyster mushroom (Pleurotus species) is one of the most popular and widely cultivated varieties throughout the world owing to its simple, low cost and eco-friendly production technology. Oyster mushrooms are rich in nutrients and have often been used for medicinal and health benefits. Health benefits offered by oyster mushroom include anti-inflammatory, immunostimulatory, anti-tumour and anti-bacterial properties. Including oyster mushrooms into a regular diet ensures a constant supply of nutrients to the body.

More than a hundred types of organic waste are considered useful as substrates for oyster mushroom cultivation, which otherwise cause environmental problems. The waste sources may include agricultural (wheat/rice/maize/cotton straw, etc.), or urban (for example, waste cardboard, paper, tea or coffee). Mushrooms grown on these locally available wastes serve the dual purpose of providing a complete waste management solution and the production of a nutrient-rich (particularly protein based) food product. The cultivation of oyster mushrooms offers economic avenues improving the sustainability of small-scale farming for rural communities. At the domestic level in urban settings, cultivation can be carried out in small mushroom growing boxes/easy grow kits/containers/bags/baskets available at home, and in a very small space utilizing coffee/tea/paper waste as a substrate. Cultivation consists of the following steps: spawn procurement and substrate preparation; spawning of substrate; spawn running; and harvesting.

The spent mushroom substrate (SMS) contains essential nutrients and can be used as animal feed, fertilizer and for bioremediation of contaminated sites. Utilization of SMS as a soil fertilizer improves its texture, water holding capacity and nutrient status.

This study focuses on the basic biology and the cultivation method of oyster mushrooms applicable to small-scale production in urban or rural settings. The method was successfully employed under domestic conditions by the author. A case study in the form of a survey conducted through a well-designed questionnaire is being presented here. The case study was done to assess the level of awareness among consumers regarding mushroom consumption. Preliminary results reveal a lack of knowledge among the respondents regarding the varieties of mushrooms available. A large proportion of the sampled people was not aware of the oyster mushroom and its cultivation technology. Hence, the public at large needs education about this vegan diet in terms of its health and well-being benefits.

Keywords: Oyster mushroom, Pleurotus species, bioremediation, spent mushroom substrate, spawn

Introduction

The ecology

The oyster mushroom (Pleurotus spp.) is commonly called 'dhingri' in India and has a distinguishable oyster like shape (Syed Abrar, Kadam, Mane, Patil & Baig 2009, 1545-1740). Oyster mushrooms comprise some of the most popular edible mushrooms owing to its high nutritional and medicinal properties, simple cultivation technique and vigorous growth.

The body of oyster mushrooms has three parts - a fleshy shell or spatula shaped cap (pileus); a short or long stalk called the stipe; and gills or lamellae under the pileus that bear spores. The gills stretch from the periphery of the cap to the stalk bottom. The species has a number of varieties differing in shape, colour (white, cream, grey, yellow, pink or light brown) and texture and can be cultivated under diverse agro-climatic conditions. It is a lignin degrading mushroom (Abrar et al. 2009, 1545-1740); and therefore, can grow on a variety of lignocellulosic agricultural waste materials. Under natural conditions, it grows in forests on decaying organic matter, wooden logs, etc.

Nutritional and medicinal properties

The intake of oyster mushrooms in a regular diet can be beneficial in a number of ways. Besides its various culinary preparations, the species is rich in nutritional and medicinal properties like anti-inflammatory, immunostimulatory, anti-tumour and anti-bacterial. It contains a high content of dietary fiber, most of the essential amino acids, minerals, vitamins B complex and C, and folic acid (Randive 2012, 19381949). Protein content varies from 1.6 to 2.5% (Mostak et al. 2013). The statins present in oyster mushrooms can lower cholesterol levels. The oyster mushroom is an excellent source of riboflavin, which helps protect the cells from oxygen damage (Mostak Noorlidah, Kamal Uddin & Borhannuddin Bhuyan 2013, 197-202). The statins present in the oyster mushrooms can lower cholesterol level. The oyster mushroom is an excellent source of riboflavin, which helps protect the cells from oxygen damage (Mowsumi & Choudhury 2010, 23-28). mushrooms contain ergosterol, a substance that turns into vitamin D (which helps in strengthening bones) when exposed to sunlight; making it a vegetarian source of vitamin D. Considering its nutritional value, oyster mushrooms can be considered a high grade vegetable and a low grade meat (Kurtzman 1976, 268-295).

A considerable amount of research has been done on the medicinal properties of oyster mushroom (see Table 1).

Table 1: Medicinal properties of the oyster mushroom (Gregori, Švagelj & Pohleven 2007, 236-247).

Property	Oyster species extracts/isolated compounds	Species	Reference
Anti-tumour properties			
Inhibition of solid tumour proliferation in mice	Methanol extracts from mycelia and fruits	*P. florida* and *P. pulmonarius*	Jose & Janardhanan 2000, 941-943; Jose, Ajith & Jananrdhanan 2002, 59-66.
Induction of apoptosis of human carcinoma cells	Water soluble proteins or polypeptides	*P. ostreatus*	Gu & Sivam 2006, 196-204.
Anti-tumour activities through cytotoxicity and anti-proliferative activity against human leukaemia cells in vitro	Polysaccharides extracted from mycelia and fruiting bodies	*P. tuber regium*	Zhang, Cheung & Zhang 2001, 5059-5062; Zhang, Zhang, Cheung & Ooi 2004, 123-128.
Higher anti-tumour activity as compared to native polysaccharides	Carboxymethylated or sulphated derivatives of polysaccharides	*P. tuber regium*	Zhang, Zhang & Cheung 2003, 150-159; Zhang, Cheung, Zhang, Chiu & Ooi 2004, 319-325; Tao, Zhang & Cheung 2006, 2261-2269; Zhang, Cheung, Chiu, Wong & Ooi 2006, 455-462.
Apoptosis of colon cancer cells in vitro	α-glucan from mycelia	*P. ostreatus*	Lavi, Friesem, Geresh, Hadar & Schwartz 2006, 61-70.
Reduce tumour nodules in mice	Water soluble polysaccharides from fermentation broth	*P. citrinopileatus*	Wang, Hu, Liang & Yeh 2005, 759-766.
Inhibited sarcoma and hepatoma in mice	Lectin isolate	*P. ostreatus*	Wang, Gao & Ng 2000, 810-816.
Anti-proliferative effect on human cells	Lectin isolate	*P. oeus*	Mahajan, Patil, Mohan & Shastry 2002, 341-345.
Anti-oxidant properties			
Anti-oxidant activities in vitro and in hyperlipidaemic	Fruiting body extracts	*P. citrinopileatus*	Hu, Liang, Chia, Lien, Chen, Lee & Wang 2006, 2103-
hamster rats			2110; Sano, Yoshino, Matsuzawa & Ikekawa 2002, 37-41.
Increased anti-oxidant properties in rats	β-glucan isolate had a positive effect	*P. ostreatus*	Bobek & Galbavy 2001, 164-168.
Increases life span of senescence-accelerated mice due to increased gene expression of anti-oxidant enzymes	Polysaccharide-peptide complex	*P. abalones*	Li, Ng, Song, Yuan, Liu, Wang, Jiang, Fu & Liu 2007, 863-869.
Anti-inflammatory properties			
Decrease of oedema in mice and acute and chronic inflammation	Methanol extracts of fruiting bodies	*P. pulmonarius and P. florida*	Jose *et al.* 2002, 59-66; Jose, Ajith & Janardhanan 2004, 43-46.
Anti allergic activity after oral or percutaneous administration	Ethanol extracts	*P. eryngii*	Sano, Yoshino, Matsuzawa & Ikekawa 2002, 37-41.
Anti-viral properties			
Inhibitory of HIV-1 reverse transcriptase	Hot water extracts	*P. sajor caju and P. pulmonarius*	Wang, Wang & Ng 2007, 560-565.
Anti-HIV activity	Protein extract	*P. ostreatus*	Wang & Ng 2000, 587-593.
Anti-Herpes simplex virus type 1 and type 2	Water soluble sulphonated derivatives	*P. tuber regium*	Zhang, Zhang, Wang & Cheung 2003, 2863-2870; Zhang, Cheung, Ooi & Zhang 2004, 2297-2301.
Anti-microbial properties			
Effective against *Aspergillus niger*	Crude extracts from fermentation broth	*P. ostreatus*	Gerasimenya, Efremenkova, Kamzolkina, Bogush, Tolstych, & Zenkova 2002, 48-54.
Effective against *Fusarium oxysporum*	Eryngin extract of the species	*P. eryngii*	Wang & Ng 2004, 1-5.

Oyster mushroom - cultivation from waste

The oyster mushroom cultivation is an efficient means for converting lignocellulosic wastes into a nutrient-rich diet. It offers a substantial avenue for generating income and employment, alleviating the problems of malnutrition and unemployment. In India, mushroom cultivation has focused mainly on button mushrooms. The oyster mushroom is not popular and farmers lack awareness and training in its cultivation practices. The present study deals with the cultivation of P. florida on wheat straw, which is abundantly available in the states of Haryana and Punjab in India, and is otherwise used as cattle feed or burned. The burning of wheat straw leads to increases levels of regional air pollution.

The oyster mushroom cultivation is a simple procedure and does not involve expensive equipment. The standard process of oyster mushroom cultivation consists of the following steps (Kapoor 2010, 70-74):

- Spawn procurement and substrate preparation
- Spawning of substrate
- Spawn running
- Harvesting

If a person is allergic to mushrooms (or fungi), mushrooms may be grown outside as they produce spores. However, insects and other pests may be difficult to control in an outdoor setting. The process is easy and can be well performed under domestic environment.

Spawn procurement and substrate preparation
The mushroom spawn or seed can be procured from designated. Spawn can also be produced from culture or mushroom spores. Since oyster mushrooms have lignin decomposing extracellular enzymes, the substrate for the cultivation can be wheat straw, sawdust, cardboard, paper, tea or coffee waste, etc. Straw-based substrates are often used for its cultivation. The substrate used must be pretreated; mainly for the removal of contaminants and for softening. The pretreatment can be in the form of steam pasteurization or a chemical treatment.

For domestic cultivation, wheat grain based healthy spawn or mushroom seed was procured from the National Horticultural Research & Development Foundation, New Delhi. Locally available wheat straw was purchased from a local vendor and was utilized for the cultivation of Pleurotus florida in a domestic environment. For chemical treatment, the straw (4-6 cm) was soaked in water (100 L water + 7-10 g bevestine + 125-150 mL formaline) and kept for 6-8 hours/overnight. The wet straw was spread on the floor for 40-45 min to drain off excess water.

Spawning & bagging
Spawn was added to the pre-treated straw (3%, wet basis). Ten polythene bags (65 cm × 35 cm) were filled with a straw-spawn mixture (Picture. 1). The bags were tied at the top. Perforations were made throughout to provide ventilation. The bags were kept in a dark place (25°C, humidity 80%).

Picture 1: The mushroom spawn and wheat straw mixture in bags (bagging stage)

Spawn running
It took 16 days for the fungal mycelia to completely colonize the straw. Small fruits started appearing (pin heads or pinning stage) after this stage. Water was sprinkled twice per day to keep the straw moist. The pin heads turned into mushrooms with a lobed and folded appearance (fruits).

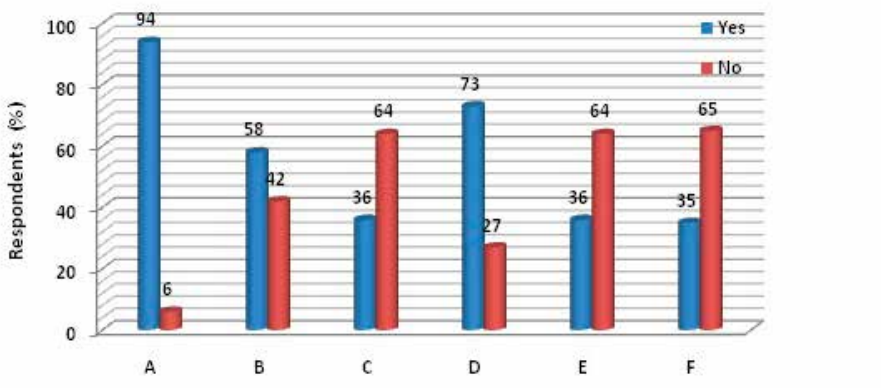
Harvesting
Fruits were harvested (size of caps; 8 - 10 cm) by twisting stalks between thumb and fingers. Mushrooms were harvested till three cycles/times.

Picture 2: Oyster mushrooms (Pleurotus florida) during the fruiting stage

Awareness survey

The aim of this survey was to assess the awareness levels of mushroom consumption in society at large. An attempt was made to review the perception of consumers on the basis of their eating habits, mushroom procurement patterns, their preferences towards different varieties and their awareness level regarding the therapeutic and nutritional properties of mushrooms. The study also explored the awareness levels of the respondents regarding oyster mushrooms and its cultivation technology.

The survey was based on a well-designed questionnaire using a sample size of 100 respondents. Consumers of various age groups were chosen as the target population. Data analysis was done in terms of frequency of responses per parameter.



Picture 3: Mushroom as a food & its availability

The respondents were evaluated on the basis of the following parameters with Yes/No responses.

A. Are you aware of mushrooms as a food?

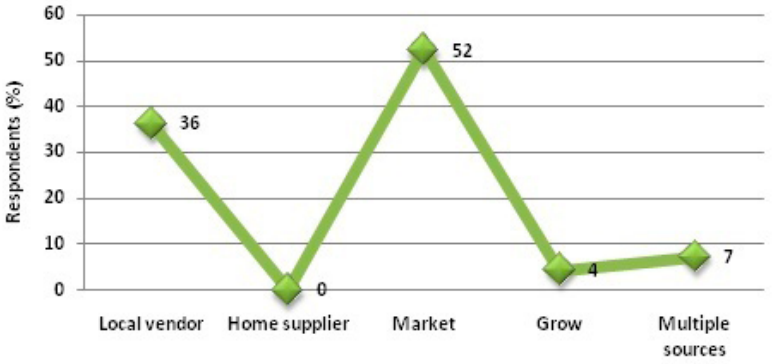
B. Do you include mushrooms in your diet?

C. Do you know that mushrooms can be a good substitute for vegetables?

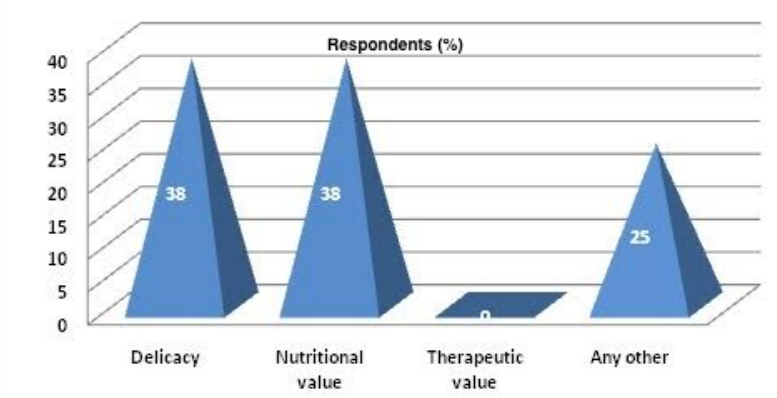
D. Are mushrooms easily available in the vicinity of your residence?

E. Would you like to grow mushrooms for your own consumption?

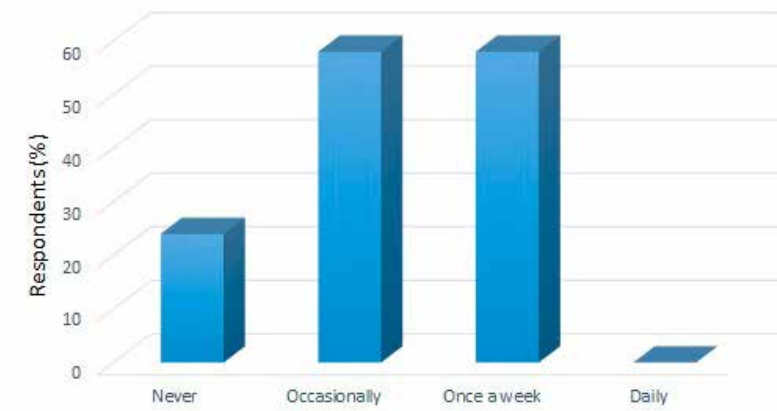
F. Would you be prepared to add mushrooms in your regular recipes?



Picture 4: Procurement patterns



Picture 5: Reason for mushroom consumption



Picture 6: Frequency of mushroom consumption

Results & Discussion

The mushrooms were successfully grown at home (Pictures. 1 & 2). Findings of the survey Picture 3) revealed that a large proportion of the sample (94%) was aware of mushrooms being used as a food item. Thirty six percent of respondents knew that mushrooms provided a good substitute for their vegetables. Surprisingly, almost the same percentage wanted to add mushrooms to their routine recipes (question F). More than half of the respondents preferred to buy mushrooms from a local market and around one-third from door-to-door (mobile) vegetable vendors (Picture 4). In spite of mushrooms being available in the vicinity of residences, people were not aware of mushroom varieties. A large fraction of the sample (85%) was not aware of oyster mushrooms and its cultivation technique. The evidence suggest that oyster mushroom is not popular in this part of the country. The major reason of consuming mushrooms (Picture 5) was because of their nutritional value and the respondents' inclination towards mushrooms as a delicacy; while none considered their medicinal values.

The study (Picture 6) showed that none of the respondents included mushrooms in their daily diets and the proportion of occasional eaters was high. This could be attributed to the fact that vegetarians in India abstain from eating mushrooms because of cultural beliefs. Mushrooms are placed in the category 'Tamasic or impure foods' along with meat and other non-vegetarian food because of their ability to grow on dead and decaying organic matter as reported by various researchers (Simoons 1998, 188).

Conclusion and recommendations

The oyster mushroom cultivation offers several benefits:

Cultivation: It involves a simple and a low cost technology that is suitable for both urban and rural environments with minimal essential requirements.

Food: According to the report by Unicef (2016), one-third of the global population of stunted children forms part of the Indian population. The mushroom plays a vital role in achieving self-sufficiency in terms of a high protein diet affordable for the poor segments of urban and rural populations. Oyster species offer a food resource of substantial nutritional and medicinal value. It grows quickly and can be harvested three times.

Space: Space is not a constraint; even in urban areas it can be grown in small boxes, containers, baskets or other clean and sterilized bags utilizing vertical/ horizontal space.

By-product/SMS: The spent mushroom substrate, which is left over after harvesting can be used as a soil conditioner/manure for plants and nutritious feed for cattle.

Entrepreneurial venture: On a small scale, oyster mushrooms can be integrated with other agricultural and domestic activities; hence, can be a sustainable income for sensitive sectors of society like the poor, disabled, and women.

Environmental: Waste wheat/rice straw can be recycled, which reduces air pollution since the straw is not burnt. The oyster mushroom cultivation can be considered a 'zero waste model' as SMS can also be utilized as cattle feed or compost for plants.

It is evident that there is a limited awareness among people regarding health benefits from mushroom consumption. Oyster mushrooms are not a preferred diet option. Despite recent growth, India is underperforming and is yet to achieve the status of a healthy society. There is an urgent need to educate people about highly nutritious yet cheap and easy to grow dietary alternatives. Looking at global and Indian nutritional status scenarios, active and timely interventions are required from government and non-government agencies. Awareness, using workshops, is needed to motivate and train people to cultivate oyster mushrooms. If required, technical and financial aid should be provided to the poor and other sensitive sectors of society. It can help them attain self-sufficiency in terms of nutrient-rich and therapeutic food and boost the local economy. However, before mushroom cultivation is considered a business option, a number of factors need to be considered, including the availability of mushroom spawn and a market for mushrooms. SMS generated at the end may be used as animal feed or soil conditioner for kitchen gardens or agricultural fields.

A step in this direction, a dedicated laboratory for spawn production (funded by the Department of Science and Technology, Haryana), has been set up to provide training to farmers, women, and/or the disabled to grow mushrooms and to provide start-up material to start a venture or to grow mushrooms for private consumption.

Acknowledgement
The authors would like to acknowledge the opportunity provided and the financial support extended by Manav Rachna University for attending the international conference Smart Cities in Smart Regions (10-12 May 2016) organized by Lahti University of Applied Sciences, Finland.

References

Bobek, P. & Galbavy, S. 2001. Effect of pleuran (beta-glucan from Pleurotus ostreatus) on the antioxidant status of the organism and on dimethylhydrazine-induced precancerous lesions in rat colon. British Journal of Biomedical Science 2001; 58. 164-168.

Gerasimenya, V.P., Efremenkova, O.V., Kamzolkina, O.V., Bogush, TA., Tolstych, I.V. & Zenkova, V.A. 2002. Antimicrobial and antitoxical action of edible and medicinal mushroom Pleurotus ostreatus (Jacq: Fr.) Kumm. Extracts. International Journal of Medicinal Mushrooms 2002; 4. 48-54.

Gregori, A., Švagelj, M. & Pohleven, J., 2007. Cultivation Techniques and Medicinal Properties of Pleurotus spp. Food Technology and Biotechnology 2007; 45. 236-247.

Gu, Y.H. & Sivam, G. 2006. Cytotoxic effect of oyster mushroom Pleurotus ostreatus on human androgen-independent prostate cancer PC-3 cells. Journal of Medicinal Food 2006; 9. 196-204.

Unicef. 2016. Global nutrition report. Ending Malnutrition by 2030 [accessed Aug 2016]. Available at: http://data.unicef.org/nutrition/malnutrition.html#sthash.bCffw2Gt.dpuf.

Hu, S.H., Liang, Z.C., Chia, Y.C., Lien, J.L., Chen, K.S., Lee, M.Y. & Wang, J.C. 2006. Antihyperlipidemic and antioxidant effects of extracts from Pleurotus citrinopileatus. Journal of Agricultural and Food Chemistry 2006; 54. 2103-2110.

Jose, N., Ajith, T.A. & Jananrdhanan, K.K. 2002. Antioxidant, anti-inflammatory, and antitumor activities of culinary-medicinal mushroom Pleurotus pulmonarius (Fr.) Quel. (Agaricomycetideae). International Journal of Medicinal Mushrooms 2002; 4. 59-66.

Jose, N., Ajith, T.A. & Janardhanan, K.K. 2004. Methanol extract of the oyster mushroom, Pleurotus florida, inhibits inflammation and platelet aggregation. Phytotherapy Research 2004; 18. 43-46.

Jose, N. & Janardhanan, K.K. 2000. Antioxidant and antitumour activity of Pleurotus florida. Current Science 2000; 79. 941-943.

Kurtzman, R.H. 1976. Nitration of Pleurotus sapidus effects of lipid. Mycologia 1976; 68. 268-295.

Lavi, I., Friesem, D., Geresh, S., Hadar, Y. & Schwartz, B. 2006. An aqueous polysaccharide extract from the edible mushroom Pleurotus ostreatus induces anti-proliferative and pro-apoptotic effects on HT-29 colon cancer cells. Cancer Letters 2006; 244. 61-70.

Li, L., Ng, T.B., Song, M., Yuan, F., Liu, Z.K., Wang, C.L., Jiang, Y., Fu, M. & Liu, F. 2007. A polysaccharide–peptide complex from abalone mushroom (Pleurotus abalonus) fruiting bodies increases activities and gene expression of antioxidant enzymes and reduces lipid peroxidation in senescence-accelerated mice. Applied Microbiology and Biotechnology 2007; 75. 863-869.

Mahajan, R.G., Patil, S.I., Mohan, D.R.K. & Shastry, P. 2002. Pleurotus eous mushroom lectin (PEL) with mixed carbohydrate inhibition and antiproliferative activity on tumor cell lines. Biochemistry, Molecular Biology and Biophysics 2002; 6. 341-345.

Mostak, A., Noorlidah, A., Kamal Uddin, A. & Borhannuddin Bhuyan, M.H.M. 2013. Yield and nutritional composition of oyster mushroom strains newly introduced in Bangladesh. Pesquisa Agropecuária Brasileira 2013; 48. 197-202.

Mowsumi, F.R. & Choudhury, M.B.K. 2010. Oyster Mushroom: Biochemical and Medicinal Prospects. Bangladesh Journal of Medical Biochemistry 2010; 3. 23-28

Randive, S.D. 2012. Cultivation and study of growth of oyster mushroom on different agricultural waste substrate and its nutrient analysis. Advances in Applied Science Research 2012; 3. 1938 1949.

Sano, M., Yoshino, K., Matsuzawa, T. & Ikekawa, T. 2002. Inhibitory effects of edible higher basidiomycetes mushroom extracts on mouse type IV allergy. International Journal of Medicinal Mushrooms 2002; 4. 37-41.

Syed Abrar, A., Kadam, J.A., Mane, V.P., Patil, S.S. & Baig, M.M.V. 2009. Biological efficiency and nutritional contents of Pleurotus florida (Mont.) singer cultivated on different agro-wastes. Nature and Science, 2009; 7. 1545-1740.

Tao, Y., Zhang, L. & Cheung, P.C. 2006. Physicochemical properties and antitumor activities of water-soluble native and sulfated hyperbranched mushroom polysaccharides. Carbohydrate Research 2006; 341. 2261-2269.

Wang, H., Gao, J. & Ng, T.B. 2000. A new lectin with highly potent antihepatoma and antisarcoma activities from the oyster mushroom Pleurotus ostreatus. Biochemical and Biophysical Research Communications 2000; 275. 810-816.

Wang, H. & Ng, T.B. 2004. Eryngin, a novel antifungal peptide from fruiting bodies of the edible mushroom Pleurotus eryngii. Peptides 2004; 25. 1-5.

Wang, H.X. & Ng, T.B. 2000. Isolation of a novel ubiquitin-like protein from Pleurotus ostreatus mushroom with anti-human immunodeficiency virus, translation-inhibitory, and ribonuclease activities. Biochemical and Biophysical Research Communications 2000; 276. 587-593.

Wang, J.C., Hu, S.H., Liang, Z.C. & Yeh, C.J. 2005. Optimization for the production of water-soluble polysaccharide from Pleurotus citrinopileatus in submerged culture and its antitumor effect. Applied Microbiology and Biotechnology 2005; 67. 759-766.

Wang, J., Wang, H.X. & Ng, T.B. 2007. A peptide with HIV-1 reverse transcriptase inhibitory activity from the medicinal mushroom Russula paludosa. Peptides 2007; 28. 560-565.

Zhang, M., Cheung, P.C. & Zhang, L. 2001. Evaluation of mushroom dietary fiber (nonstarch polysaccharides) from sclerotia of Pleurotus tuber-regium (Fries) singer as a potential antitumor agent. Journal of Agriculture & Food Chemistry 2001; 49. 5059-5062.

Zhang, M., Cheung, P.C., Ooi, V.E. & Zhang, L. 2004. Evaluation of sulfated fungal beta-glucans from the sclerotium of Pleurotus tuber-regium as a potential water-soluble anti-viral agent. Carbohydrate Research 2004; 339. 2297-2301.

Zhang, M.E.I., Cheung, P.C.K., Zhang, L., Chiu, C.M. & Ooi, V.E.C. 2004. Carboxymethylated b-glucans from mushroom sclerotium of Pleurotus tuber-regium as novel water-soluble anti-tumor agent, Carbohydrate Polymers 2004; 57. 319-325.

Zhang, M., Cheung, P.C.K., Chiu, L.C.M., Wong, E.Y.L. & Ooi, V.E.C. 2006. Cell-cycle arrest and apoptosis induction in human breast carcinoma MCF-7 cells by carboxymethylated [beta]-glucan from the mushroom sclerotia of Pleurotus tuber-regium. Carbohydrate Polymers 2006; 66. 455-462.

Zhang, M., Zhang, L. & Cheung, P.C. 2003. Molecular mass and chain conformation of carboxymethylated derivatives of beta-glucan from sclerotia of Pleurotus tuber-regium. Biopolymers 2003; 68. 150-159.

Zhang, M., Zhang, L., Wang, Y. & Cheung, P.C. 2003. Chain conformation of sulfated derivatives of beta-glucan from sclerotia of Pleurotus tuber-regium. Carbohydrate Research 2003; 338. 2863-2870.

Zhang, M., Zhang, L., Cheung, P.C.K. & Ooi, V.E.C. 2004. Molecular weight and anti-tumor activity of the water-soluble polysaccharides isolated by hot water and ultrasonic treatment from the sclerotia and mycelia of Pleurotus tuber-regium, Carbohydrates Polymers 2004; 56. 123-128.

Krarup, J.

Title: Becoming Regional – Climate Change Adaptation In A Regional Perspective

Research Article

Abstract

This paper examines the regional concept by analysing theoretical texts in architectural planning in order to discuss whether the regional scale holds a potential to support a substantial climate change adaptation planning.

Nordregion arranged in 2014 five meetings with the largest Nordic city regions, discussing challenges and opportunities in relation to the planning of Nordic city regions.

Three types of challenges were identified, the first relating to urban form, urban qualities, densification, population growth, localisation and mix of functions. The second concerned social inclusion and segregation, everyday life, lifestyles and mobility.

The third, addressed the need for new and innovative forms of planning and governance in order to meet the other challenges.

In relation to the third challenge, planning at the city-regional scale was pointed out as the most potential planning level and form.

Addressing the third challenge this paper takes its point of departure in an understanding of global warming as a hyperobject - a game changer, and a new condition for planning. Following this the thinking behind planning theories and methodologies and tools is to be critically examined and adapted to this understanding and new condition, and climate adaptation of cities is to be planned as part of a larger landscape context – a city-region. Secondly, self-organizing and dynamic eco-cultural processes embedded in the city-region are to be understood as active and co-constitutive spatial and design factors. This questions the role of the architect and planner as the designer.

As there is no universal definition of a city region, also the question on what to understand by the concept of city regions is to be addressed. In current conceptualization three elements seem to be common in various conceptualisations: the core(s), the hinterland(s) and the linkage(s). Also common, seems to be spatial demarcation in relation to functional urban areas, usually defined in terms of commuting patterns and density of economic activities and/or population.

But global warming and climate change doesn't respect such de-naturalized definitions and categorizations, and thus both questions the definitions and categorizations in planning systems and tools, and the thinking behind, and what to understand by the concept of the city-region and how to re-naturalize the regional concept.

In order to investigate these questions further a number of architectural planning theories relating to the region concept, and the regional scale, are examined and discussed. Examples that take their point of departure in the geomorphic features in landscape, such as watersheds, suggest a starting point for a possible re-naturalization of the regional concept, and how a city-region concept could be developed and qualified.

It is concluded the effects of global warming impacts not only the built environment but also planning thinking and methodologies. Planning thinking and planning tools have to be adjusted hereto in order to support the qualification and coordination of climate adaptation planning on a regional scale. The question on how to accommodate self-organizing eco-cultural processes in planning emphasise the importance of adjusting the planning thinking.

This paper is produced within the framework of my on-going research on climate change adaption on a planning level and aims to contribute to a current discourse on the Danish Planning System and climate change adaptation planning in Denmark.

Keywords: Regional climate landscape eco-cultural processes

Introduction

Nordregion arranged in 2014 five meetings with the largest Nordic city regions, discussing challenges and opportunities in relation to the planning and development of Nordic city regions. Three types of challenges were identified, the first relating to urban form, urban qualities, densification, population growth, localisation and mix of functions. The second concerned social inclusion and segregation, everyday life, lifestyles and mobility. The third, addressed the need for new and innovative forms of planning and governance in order to meet the other challenges, and pointed out the city-regional scale as the most potential planning level and form.

This paper discusses and examines the regional concept by analysing theoretical texts and positions in architectural planning in order to discuss whether the regional scale holds a potential to support a substantial and effective climate change adaptation planning.

It is my claim, that we have to understand,

1. Global warming as a hyperobject – an omnipresent en inescapable condition

2. Cities as part of a larger landscape context – as part of a region

3. Self-organizing eco-cultural processes embedded in the region as active and co-constitutive spatial and design factors in order to better develop and coordinate climate adaptation planning and initiatives.

4. Develop a planning thinking and methodologies able to accommodate self-organizing eco-cultural processes in climate adaptation planning and initiatives.

The discussion seeks to contribute to the discourse on and operationalization of climate adaptation planning in Denmark.

Effects of climate change in a danish context
In a Danish context, climate changes are primarily manifested in an interaction between modified wind and precipitation patterns, and increasing temperature and a rising sea level (IPPC 2013; DMI 2010).

Denmark is a low-lying country with over 7000 km of coastline; the terrain level ranges from minus 7 meters below normal sea level to 172,5 meters above. Most major cities are situated in the low-lying coastal landscapes, and susceptible to flooding from both surface water and from seawater.

In 2012 the Task Force for Climate adaptation (The Danish Government) published, 'How we handle torrential rain and storm water. Action Plan for Climate protection of Denmark.' The plan was initiated by severe damages in Copenhagen caused by torrential rain in July 2011. Apart from taking responsibility for the adaptation of the national road network, state-owned buildings and institutions and installations with national importance, the plan passed on the responsibility for developing plans and initiates to the municipalities and private landowners.

The plan has been criticized for trying to keep at arm's length its responsibilities for national action, and at the same time leave it open to the municipalities whether they would cooperate on strategies and specific initiatives or not, and that the municipalities were free to choose which climate scenario they would use in developing their individual action plans (Østergaard 2012, p.1).

Since 2012, some municipalities have developed plans and initiatives in cooperation and across administrative and municipal borders. But it is still free to the municipalities to initiate such voluntary cooperation projects or not, and no organizing principles or benchmarks on a national scale for such cooperation projects are given. The national plan thus consists of a series of more or less coordinated municipal adaptation plans and initiatives. Seen from a planning perspective, the regional level would be obvious for coordination and cooperation, but as a result of the re-organization of the Danish Planning System in 2007, the regional authorities are now primarily oriented towards and occupied with the public health care system. A result hereof is a missing permanent administrative and coordinating level and body between the individual municipalities in questions on landscape and urban planning in general, and especially on climate adaptation planning and initiatives. This means that adaptation initiatives along water systems crossing municipality boundaries not necessarily are coordinated, and that individual projects may create barriers and problems for others. Realizing this, a travelling Task Force was set up by the National Government in order to exercise damage control. But this is an emergency solution; the question on whether the planning system itself is adequate is not addressed by the Task Force, nor is the thinking behind.

Global warming – an inescapable condition
Timothy Morton has argued that global warming is to be considered as a hyperobject, an entity of such vast temporal and spatial dimensions that it defeats the traditional idea about what an object is (Morton 2013). In this understanding, global warming, and climate change, is an inescapable and omnipresent condition—a game changer.

In 2009 Cleo Pascal showed that climate changes leads to 'environmental changes.' She illustrated this by referring to damages on buildings, roads, and energy delivery systems in permafrost areas, which as an effect of global warming no longer are permanently deep-frozen, and thus no longer provide stable bases under infrastructural elements and buildings.

Pascal concluded that global warming not only impacts our understandings and notions of climate but of nature per se. Further, global warming also impacts our understanding of and thinking on planning and architecture. The effects of global warming cannot be isolated and treated individually; the individual effects often act together, and they interact with already known natural processes and with human practices and phenomena, 'the inextricable intermingling of human and natural systems almost everywhere on Earth's terrestrial surface, demonstrating that interaction between these systems can no longer be avoided in any substantial way', (Ellis and Ramankutty 2008, p. 445)

Smart thinking

Challenged by with the realities of the natural environment man has always turned to technology to exploit and control the desired natural resources and to control the undesired devastating natural forces. Man's emancipation from the constraints of the natural conditions was a prerequisite for the modern age, and technology proved a functional instrument in this process of emancipation. But we have also become depended on technology and one attribute of modern civilization is, that we find a technical solution which gives us a temporary resurgence, but in turn makes us extremely dependent and makes the subsequent downturn even more bleak. The Danish biologist Jesper Hoffmeyer has coined this as, 'The Technological Fix', (Birkholm 2008). The main purpose of this approach to nature is to control and pacify nature and natural forces,' nature considered and used (abused) as but a reservoir of resources meant only for exactly that, human exploitation, this culture increasingly renders nature abstract: out of sight, out of mind.' (Vetlesen 2015, p.3)

The effects of global warming are illuminating that nature is in no way passive, and man's detachment from nature is becoming a problem for us (Stefanovic 2012, p12; Mugerauer 2012, p. 258; Krarup 2016, p.5). We therefor have to reconsider how to plan and interact with active natural processes, and the relationship between the city and landscape,' need to be expanded beyond the human-centred and purely societal dimension, in order that the changes occurring within human-nature relationship come fully into view', (Vetlesen 2015, p. 11), in order to re-naturalize planning and architecture (Stefanovic 2012, p.13; Mugerauer 2012, p.273). And we have to question what re-naturalization is and can be, as cultural artifacts interacts with natural phenomena and creates another kind of nature than a pristine one (Lister Nina-Maria 2007,p.48; Mugerauer 2012; Vetlesen 2015) in order to develop a smarter thinking on climate changes adaptation on a city regional scale.

In search of the region and the regional scale

The notion of the region is in no way universal. Generally speaking, three elements seem to be common in various conceptualisations: the core(s), the hinterland(s) and the linkage(s). Also common, seems to be spatial demarcation in relation to functional urban areas, usually defined in terms of commuting patterns and density of economic activities and/or population.

Looking into architectural planning theory and writings on the region, reveals a concept hard to frame, and a concept, which is used in a variety of meanings and contexts, in different scales, and as justification of other agendas.

Critical regionalism
Kenneth Frampton, together with Alexander Tzonis and Liane Lefaivre, is one of the most outspoken proponents for regionalism in architecture. Frampton argues in several of his writings for an arriére-garde position in architecture, that through synthetic contradiction achieves a manifest critique of universal civilisation (Frampton 1983), this position is referred to as Critical Regionalism.

Frampton list up six aspects of Critical Regionalism,

- Culture and Civilization
- The Rise and Fall of the Avant-Garde
- Critical Regionalism and World Culture
- The Resistance of the Place-Form
- Culture Versus Nature: Topography, Context, Climate, Light and Tectonic Form
- The Visual Versus the Tactile

The six aspects suggest an architectural thinking sensitive to, and in a dialectical exchange with the specific landscape, and hence a thinking that might prove promising in climate changes adaptation on a regional scale. But as it turns out the regional level vanished (Paterson 1995, p.1) and the six points are used primarily to legitimize Frampton's ideas on building tectonics. The claimed direct dialectical relation with nature seems more to be a one-way extraction of inspiration derived from the context, and processed in an architectural interpretation hereof in the building design.

There are both strands and differences between Critical Regionalism and the vernacular discourses in the human sciences that thrived in the late 19th century. The vernacular was in general related closely to material and non-material 'folk' artefacts and culture, and used in arguing for specifying local, regional or even national, identity, value and properties. In architecture and planning, references to the vernacular, and regionalism, has been used as counter-arguments to modernistic planning and architecture, that en-bloc was (is) criticized for being un-sensitive to place, scale, people, cultural heritage, building traditions - which also Frampton argues. Critical Regionalism has been criticized for being too occupied with the aesthetics and design of buildings than with the region and the regional, but actually Tzonis himself emphasize the design approach, likewise Tzonis (Lefaivre and Tzonis 2003, p.10), has suggested to replace the concept of regionalism with the concept of realism to compensate for 'the vanishing of the region' (Paterson 1995).

Region = neighborhood
In their article, Designing the Region and Designing the Region is Designing the Neighborhood, (2001) Peter Calthorpe and Wiliam Fulton argue that the regional scale and the content of a region is similar to that of the neighbourhood. Like Kenneth Frampton, Calthorpe and Fulton sets up principles for their design methodology that are crystalized from a critique of modernistic planning. The design principles suggested by Calthorpe and Fulton are, Human scale, Diversity, and Conservation. By observing these principles - a new paradigm of community and growth, (Calthorpe and Fulton 2001, p.365) in planning and designing, they claim that architects will be able to overcome the failures of modernistic planning and move forward from the Edge City to the Regional City (2001). Calthorpe and Fulton further claim that the region and its elements - the city, suburbs and their natural elements – should be conceived as an entity, just as the city and the neighbourhood should. The approach is

straightforward – any problem is to be overcome by the architect's ability to handle any obstacle and any challenge at any scale by design. Like Frampton, Calthorpe and Fulton, do not define what a region is, nor do they reflect on what or how and with what their design principles might contribute with to the region and to the regional scale. Hence, the concept of the region is a kind of elasticated frame and scale that may be used indiscriminately. A similar ambiguity exists around the definition of the local, a term which, together with the region, often is used indiscriminately: 'it seems as if, as a legacy from the classical period (in Anthropology), it is assumed that everybody knows what local is and thus there is no need for further elaboration. This can be taken as one reason why the current literature dealing with 'local', is not at all explicit about what is meant by it (Korff, 2003, p. 2)

There is a line from Calthorpe and Fulton to Patrick Geddes' thinking on the region (1915). Geddes regarded the city as one component of a regional system, in which the historic development of the city and its inhabitants was inscribed. Geddes used the region, 'a representative section of the universe', as a basic geographical unit, claiming that it embraced all possible modes of human life and symbolizing comprehensiveness in the order of nature.' (Hysler-Rubin (2011, p. 44). This idea was epitomized and illustrated by the famous Valley Section, which according to Geddes was a universal applicable understanding, usable across time, and cultural and geographical settings. Geddes thus exemplified a rather generic and non-site specific understanding of the region.

Geomorphic urban planning and design approaches

Both Frits Palmboom (1987) and Marcel Smets (2002) suggest a geomorphic basis for analyzing and planning cities. Palmboom advocates for a return to landscape context and underlying site characteristics such as topography, geomorphology, drainage patterns, vegetation types, and historical settlements forms in the layout of new urban areas. Marcel Smets, on his side, suggests different urban design approaches as a kind of taxonomy, one of them the casco, or hull, reflects the constitutive form of the landscape and is based on local geological and hydrological conditions (Krarup 2016).

Palmboom and Smets thus not only refers to site-specific peculiarities and geomorphic conditions, they also try to activate them in developing design and planning methodologies.

A third example is urban planner Peter Bredsdorff's 'Dry Feet Theory' from 1973.

Bredsdorff was interested in the historical relationship between the landscape and infrastructure and urban formation. Through analyzing orohydrographic maps Bredsdorff realized that the natural watershed structure could be understood as nature's own infrastructural network and spatial organization principle. He further understood, that man in historic times had used his ability to read the embedded natural processes in the landscape, and to cultivate, and transport him self and to settle and develop city structures accordingly. Bredsdorff was inspired by Geddes' idea on the region as 'the naturally connected region or province', as the main planning level, but Bredsdorff actually suggested what to understand by, 'the naturally connected,' by describing the watersheds as a natural and spatial regional framework (Krarup 2016). Bredsdorff was also inspired by the idea behind Tony Garnier's, Cité Industrielle (Johansen and Juul Møller 2016, p.190), which Bredsdorff described as a city-region, comprised of agriculture, energy production, industry and infrastructure, and the city itself. Whereas Garnier's, Cité Industrielle, was envisaged in an imagined city-region, Bredsdorff was interested in the physical and actual interdependencies between urban

formation and the natural processes and features in the region. But Bredsdorff didn't take into account that cultural artifacts, such as cities and buildings themselves, interfere with natural systems creating new forms of eco-cultural systems.

More recent thinking on the relationship between landscape and city as formulated in Landscape Urbanism also hold a potential worth further examination. A question of particular interest here, is whether landscape is 'only' regarded a mediating tool for a (traditional?) urban thinking, 'landscape has become a lens through which the contemporary city is represented and a medium through which it is constructed.' (Waldheim 2006, p. 15), or a new/or different approach to landscape, or more precisely to eco-cultural site-specific processes, is emerging. In projects such as the Fresh Kill Lifescapes by James Corner (Corner 2006, p. 24), and Landschaftpark Duisburg Nord by Peter Latz, attention to the eco-cultural processes at the sites, is paid. But it is worth noticing that both projects are situated at contaminated sites, where the eco-cultural processes are to be controlled in order to avoid any further contamination of adjacent areas, and as such these sites can be, or is sought, treated as isolated objects, and as such they are based on a different thinking than that expressed by Morton (2013), Mugerauer (2012), Pascal (2009).

In conclusion

In light of an understanding of global warming as a hyperobject - an omnipresent and inescapable condition - that impacts the thinking behind planning and architectural theories by changing the conditions and framework for the thinking itself, the analyzed examples suggests that our thinking on the relationship between city and landscape first of all is to be critically examined. Secondly, that planning and architectural methodologies and practice have to follow and adapt to this adjusted thinking in order to develop a smarter thinking on climate changes adaptation at a city regional scale, and third, what a city region then can be.

The concept and the scale of the region is hard to frame in the analyzed theories. Also characteristic in these examples is, that the region and the regional scale often is used as a counter-argument and counter-scale in discourses on modernistic planning and architecture, and thus not discussed or investigated 'for it own sake.' The region and the regional tend to vanish to the benefit of other agendas.

In general the analyzed texts and theories on architectural planning illuminate an attitude towards landscape and natural processes as passive, and thus pre-suppose landscape and natural processes as 'others' and as resource for us. Acknowledging that we have moved from the Holocene era into the Anthropocene era, this kind of thinking seems out of sync.

Some of the discussed theories however do suggest to see geomorphic features in the landscape such as watersheds as an underlying framework for defining a regional scale, and they thus seems to hold a potential for further examination of how to set up a regional framework for coordinating climate changes adaptation planning and initiatives.

A special challenge, that arise in planning from re-naturalizing planning and architecture concerns the question on how to plan with self-organizing eco-natural phenomena and processes, which evade planning by nature?

It is therefor essential to develop a thinking on climate changes adaptation in architectural planning that acknowledge this, and is able to handle the effects of global warming processes as an active and spatial and functional co-constituent and self-organizing phenomenon, and thus dismiss architecture's self imposed prerogative as the designer.

References

BOOKS:

Birkholm, Klavs 2008, Det umådelige Fix. In, Kristeligt Dagblad 26 April 2008.

Bredsdorff, Peter. Kortlægning og historiske studier. Et værktøj? Udarb. for Kunstakademiets arkitektskoles Institut for By- og Landskabsplanlægning, Skrifter udgivet af Lokalhistorisk afdeling, Københavns Universitets Historiske Institut, København 1973.

Danmarks Meteorologiske Institut 2010. Klimaforandringer i Danmark. http://www.dmi.dk.

Hysler-Rubin, Noah 2011, Patrick Geddes and Town Planning. A critical view, Routhledge

IPCC 2013. Summary for Policymakers. In Stocker, T.F. et. al. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK; New York, USA, 2013.

Johansen, Jens and Juul Møller, Elith 2016, Peter. Arkitekten Peter Bredsdorff, Bogvaerket, Copenhagen, DK

Lara, Fernando L. 2000, Beyond Regionalism: Reflections on Lina Bo Bardi's Navigations, in, 88th ACSA Annual Meeting Proceedings, Heterotopolis, edited by, La Verne Wells-Bowie,

http://apps.acsa.arch.org/resources/proceedings/indexsearch.aspx?txtKeyword1=%22Lara%2C+Fernando+L.%22&ddField1=1&sort=1 (6.7.2016)

Lefaivre, Liane and Tzonis, Alexander 1981, The Grid and the Pathway. An Introduction to the Work of Dimitri and Susana Antonakakis, Architecture in Greece 15/1981, Athens.

Lefaivre, Liane and Tzonis, Alexander 2003, Critical Regionalism. Architecture and Identity in a Globalized World, Prestel, München

Morton, Timothy 2013. Hyperobjects. Philosophy and Ecology after the End of the World. Posthumanities 27, University of Minnesota Press.

Palmboom, Fritz 2013. DRAWING LINES, DETECTING TIME. Passions and skills of an urban designer. www.bk.tudelft.nl/.../Urbanism/.../Short_paper_Palm. (22.2.2016)

Paskal, Cleo, 2009, The Vulnerability of Energy Infrastructure to Environmental Change, Chathamhouse & Global EESE. London

Paterson, Scott 1995, Critical Analysis of "Towards a Critical Regionalism" by Kenneth Frampton, http://home.earthlink.net/~aisgp/texts/regionalism/regionalism.html (13.07.2016)

Smets, Marcel, 2008. Grid, Casco, Clearing and Montage. http://kullandscapeurbanism.blogspot.dk/2008/03/grid-casco-clearing-and-montage-marcel.html. (9.4.2015)

Task Force for Klimatilpasning, 2012, Sådan håndterer vi skybrud og regnvand. Handlingsplan for klimasikring af Danmark, Naturstyrelsen/Den Danske Regering, DK

Vetlesen, Arne Johan 2015, The Denial of Nature. Environmental philosophy in the era of global capitalism. Routledge.

ARTICLES IN BOOKS:

Calthorpe, Peter & Fulton, Wiliam 2001, Designing the Region and Designing the Region is Designing the Neighborhood, in, The City Reader. Fith Edition (2011), edited by Richard T LeGates and Frederic Stout, Routledge, p. 360-365

Corner, James 2006, Terra Fluxus. In, Charles Waldheim (editor), The Landscape Urbanism Reader, 2006 Princeton Architectural Press, p.21-34

Frampton, Kenneth 1983. Towards a Critical Regionalism: Six points for an Architecture of resistance. In, Anti-Aesthetic: Essays on Postmodern Culture, Seattle: Bay Press

Krarup, Jonna Majgaard 2016, Rural land(scapes) - Lessons to be learned(?) Technische Universität Braunschweig, Institute for Sustainable Urbanism, Germany. 13 pages. In press

Lister, Nina-Maria 2007, Sustainable Large Parks: Ecological Design or Designing Ecology? In, Julia Czerniak and George Hargreaves (editors) 2007, Large Parks, Princeton Architectural Press, p.35-58

Mugerauer, Robert 2012, The City: A Legacy of Organism-Environment Interaction at Every Scale. In, Ingrid Leman Stefanovic and Stephen Bede Scharper (editors) 2012, The Natural City. Re-envisioning the Built Environment, University of Toronto Press, p. 257-294

Smets, Marcel 2002. “Grid, Casco, Clearing and Montage” In, Robert Schafer and Claudia Moll, About Landscape, Essays on Design, Style, Time & Space. Callwey Birkhauser München, p. 132-133

Stefanovic, Ingrid Leman 2012, In Search of the Natural City. In, Ingrid Leman Stefanovic and Stephem Bede Scharper (editors) 2012, The Natural City. Re-envisioning the Built Environment, University of Toronto Press, p. 11-35

Waldheim, Charles 2006, Landscape as Urbanism. In, Charles Waldheim (editor), The Landscape Urbanism Reader, 2006 Princeton Architectural Press, p 35-54

ARTICLES IN JOURNALS:

Ellis, Erie C and Ramankutty, Navin 2008, Putting people in the map: anthropogenic biomes of the world. In, Ecotope.org, 2008, p. 439-447

Forster Ndubisi 2008, Sustainable Regionalism: Evolutionary Framework and Prospects for Managing Metropolitan Landscapes, Landscape Jrnl. 2008 27:p. 51-68

Korff, Ruediger 2003, Local Enclosures of Globalization. The Power of Locality, Dialectical Anthropology, Vol. 27, Issue 1, 2003, p.1-18

Palmboom, Fritz 1987, Rotterdam, verstedelijkt landschap. In, Oase #17/1987, p. 60–64.

Østergaard, Nicolai 2012, Eksperter dumper Danmarks strategi for klimatilpasning, Ingenøren.dk https://ing.dk/artikel/eksperter-dumper-danmarks-strategi-klimatilpasning-127739 p.2

Malhotra, S., Khurana MS.

Title: Addressing the Challenge of Sustainable Electronic Waste Management
Research Article

Abstract
The phenomenal growth of IT and electronics industry along with the enhanced affordability of electronic goods has resulted in substantial increase in e-waste generation. The matter of concern is the lack of awareness of the stakeholders regarding the hazards caused by e-waste. The current study is a survey based on a well-designed questionnaire, conducted at a technical university in the National Capital Region (NCR) of India. The paper attempts to assess the gap in the knowledge and awareness levels of young engineering students and faculty members as consumers of electronic products who eventually become the generators of e-waste. The survey has been undertaken to gauge three aspects of respondents: consumption and disposal habits of laptops and mobile phones; awareness of the presence of hazardous metals in Printed Circuit Boards (PCB) and Liquid Crystal Display (LCD) monitors; and understanding of e-waste legislation of India.

The results reveal that more than 50% of the respondents replaced their mobile phone within 1-3 years and laptop within 3-5 years; even when the product was in working condition. A significant fraction of the respondents had no idea of what should be done with their old mobile phones and laptops, hence left them unused at home. Another disturbing fact was that 80% of respondents were not even aware of any formal recycling facility existing in their neighbourhood. In spite of being future technology producers, majority of the respondents did not know of the hazards of e-waste. A meagre 23% of them were familiar with e-waste legislation. The study clearly emphasises the urgent need to design awareness programs related to handling and management of electronic waste, thereby adopting sustainability practices to tackle the growing menace of e-waste.

Keywords: Electronic waste, Hazardous substance, Computers, Mobile phones, Recycling.

Introduction
The fast pace of innovation and technological advancements has inevitably led to the exponential growth of the IT and Electronics industry globally. However, this technical competency accompanied by the enhanced affordability of electronic goods has resulted in the increased temptation of consumers to replace their electronic gadgets with newer models for various reasons (Bhutta 2011, 2). The rapid product obsolescence is now posing a new challenge in the management of the growing pile of electronic waste (Sinha 2008, 4-9).

E-waste or Electronic waste is broadly defined as ‘all types of electrical and electronic equipment (EEE) and its parts that have been discarded by the owner as waste without the intention of reuse (Step 2014, 4-5). It is one of the fastest increasing waste streams in the world. A recent UN study indicates that the global quantity of e-waste generation in 2014 was around 41.8 million tons with only 4 billion people covered by national e-waste legislation (Baldé,

Wang, Kuehr & Huisman 2015, 8). This amount is expected to grow to 49.8 million tons in 2018, with an annual growth rate of 4 to 5%. E-waste includes computer and its accessories, batteries, mobile phones and chargers, compact discs, headphones, LCD/Plasma TVs, air conditioners, refrigerators and other household appliances. It is in fact composed of over thousand of substances, some of which are very precious and valuable like platinum, gold, silver etc. that can be recovered if processed properly; thereby providing ample business opportunity (Zhang 2011, 73-74). In fact, according to the U.S. Environmental Protection Agency (EPA), 35 thousand pounds of copper, 772 pounds of silver and 75 pounds of gold can be recovered from every 1 million mobile phones recycled. But on the other hand, e-waste also consists of some hazardous and toxic ingredients such as lead, cadmium, beryllium, lithium, mercury and brominated flame retardants (BFRs) that do not biodegrade easily and pose a threat to environment as well as to human health (Pinto 2008, 67-68). Lead found in Cathode Ray Tube (CRT) screens, batteries and printed circuit boards causes damage to the nervous system, circulatory system, kidneys etc. Similarly, mercury which is an integral part of fluorescent lamps that are used to provide backlight in LCDs is highly poisonous and injurious to health on a long-term perspective (Elo 2014, 251-252).

The matter of concern is the ignorance and the dearth of awareness of stakeholders regarding the hazards caused by e-waste. Most of the people are unaware of the adverse effects of e-waste on environment and the resulting elevated risk of health problems including cancer, neurological, respiratory and reproductive disorders (Hester & Harrison 2009, 29-32). This paper attempts to assess the gap in the knowledge and awareness levels of students and faculty members of a technical university, who eventually as consumers of electronic products become the producers of e-waste. Being a part of a technical education system, the respondent group is expected to be more aware of e-waste and its management.

E-waste indian scenario

The issue of e-waste is more predominant in the developing countries. The present level of electronic waste in India is 18.5 lakh metric tons which is likely to reach 30 lakh metric tons by 2018 with Mumbai being the largest contributor to the problem, followed by Delhi (ASSOCHAM-Frost & Sullivan 2016). The major contributors to the existing domestic e-waste are the computer equipment and its parts that account for almost 70% of e-waste material followed by 12% of telecommunication equipment (Borthakur & Sinha 2013, 899-910). A report brought out by the Rajya Sabha Secretariat of this country highlights the United Nations prediction that by 2020, e-waste from old computers would jump by 500% on 2007 levels in India. Additionally, e-waste from discarded mobile phones would be about 18 times higher than 2007 levels by 2020 (LARRDIS 2011, 6-7).

India and other developing countries have become a popular global site for e-waste dumping. Industrialised nations are scrounging for space for landfills to dispose the huge amount of e-waste being generated by them (Widmer, Krapf, Khetriwal, Schnellmann & Bo¨ni 2005, 437-438). 99% of e-waste exports to the developing countries are designated as recyclable goods (Soopramanien & Usta 2015). Though trade in e-waste is controlled by the Basel Convention, a global environmental agreement on the trans-boundary movement of hazardous wastes (Basel Convention 1989); e-waste from developed countries is still being shipped to Asia or Africa, where it often ends up as a hazardous toxic waste problem (Perkins 2014, 287-288). In India, most of the e-waste lands up in the informal sector, where it is recycled without any consideration to the impact caused on health and environment. Open

burning, incineration, acid baths and crude handling of chemicals are some of the methods adopted by women and children employed in these operations (Toxics Link 2007). With no safety equipment at hand, the workers are exposed to the lethal cocktail of the toxic material daily. Further adding to the problem are the unregulated practices followed that release hazardous materials in air, water and soil; thereby threatening the environment (Sinha-Khetriwal, Kraeuchib & Schwaninger 2005, 498-500). Lack of stringent environmental regulations, weak enforcement mechanisms, cheap raw materials and labour, an ill-informed population and the unorganised nature of the sector contribute to the growing imports of e-waste in India.

Thus, India today is burdened with the colossal issue of e-waste which is either internally generated or illegally imported (Step 2013), causing serious problems to human health and environment. In view of the magnitude of the problem, there is an urgent need to find sustainable methods of managing the growing e-waste. The beginning should be made with educating and sensitising the stakeholders to take charge of their current and future electronic waste, hoping that it would bring change in their perception towards the environment (Okoye & Odoh 2014, 128). Young engineering students, guided by the faculty mentors, are the future drivers of technology and hence should be fully aware of the massive issue of the growing e-waste mountain. With this perception, the current study employs a survey-based methodology to discern the extent of understanding and awareness of these consumers of electronic products regarding the issue of sustainable e-waste management (Oomman 2014, 2-4).

Methodology

With the purpose of judging the cognisance of consumers as one of the most vital stakeholder, a survey was conducted among a group of higher technical education seekers and providers; who ultimately are the imminent developers of products, processes and systems as well as facilitators of knowledge. The target group selected comprised of young engineering students and faculty members of a technical university in the NCR region of Delhi. The reason for choosing Delhi and the NCR region as the study location for the current work is it being one of the top 10 e-waste generating cities of India as identified by the Indian Ministry of Environment & Forests (MoEF 2016).

The survey was conducted with a sample size of 275 engineering students and faculty members. The objective of the study was to determine the respondents consumption and disposal habit of personal computers and mobile phones; their awareness of the presence of hazardous metals in PCB and CRT/LCD that convert into dioxins and furans when burned at high temperatures. An attempt was made to assess the practices followed by the respondents regarding disposal of e-waste and their understanding of e-waste legislation of India.

Data was collected through the distribution of well-structured questionnaire. The questionnaire consisted of both open ended and close ended questions. The initial part of the questionnaire was related to the baseline information of respondents regarding their gender, age etc.; followed by questions on their consumption and disposal habits of mobile phones & laptop; and their awareness of e-waste hazards and legislative regulations. The questionnaire was distributed personally which created room for one to one interaction with the respondents.

Data analysis

Statistical approach was adopted for the analysis of the respondents' responses. Data was collected from the target group of 275 respondents, out of which 75% were males and 25% respondents were females; boys

outnumbering the girls in the chosen engineering university. The data thus obtained through the questionnaire was transferred on an excel worksheet with codes being assigned to the respective responses. The frequencies of the responses against their codes were tabulated and then their percentages were calculated for analysis.

Consumption Habits of Personal Computers and Mobile Phones

The study revealed that almost all the respondents used both mobile phone and laptop in their daily life. On inquiring when did the respondents last changed their mobile phone and laptop, it was found that more than 50% of them replaced their last mobile phone within 1-3 years (figure 1) and laptop within 3-5 years (figure 2). Moreover, more than 50% of the respondents had bought new gadgets even when the old product was in working condition. When asked about the reason for buying a new phone or laptop, desire for latest technology emerged as the main motive of the purchase as depicted by the pie diagram of figure 3. Findings of the survey showed that although being related to the field of technical education, the respondents were not even aware of the essentiality of e-waste management. It clearly reflects the ignorance of the respondents that frequent purchase of electronic gadgets leads to addition of existing e-waste. A recent consumer electronic product life cycle study (Ely 2014) states the life expectancy of laptops at 5.5 years and that of mobile phones at 4.7 years. Thus, the trend of extended usage of mobile phone and laptop till the actual end of life of the product needs to be emphasised.

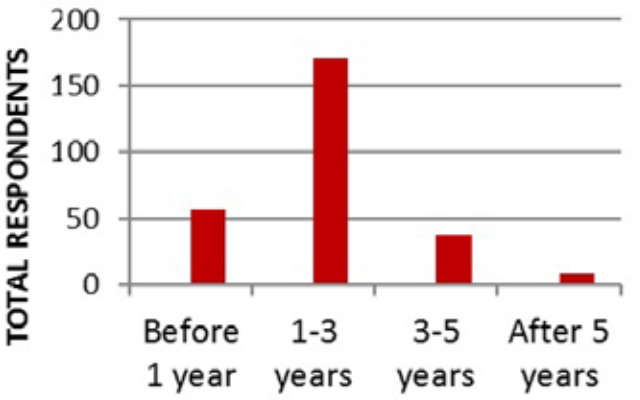


Figure 1: Replacement of recent mobile phone

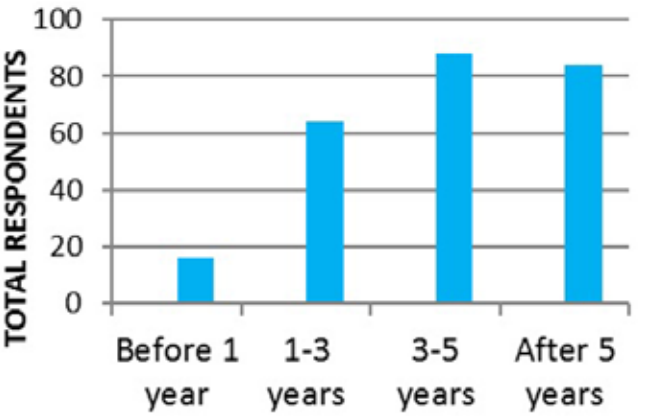


Figure 2: Replacement of recent laptop

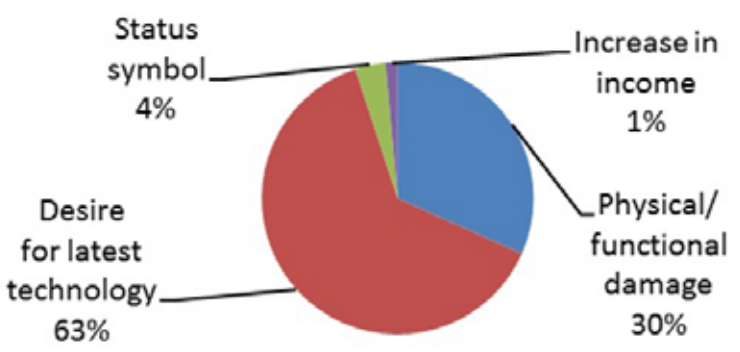


Figure 3: Reason for buying a new gadget

E-Waste Disposal Habits

The bar chart of figure 4 shows the e-waste disposal habits of the young engineering students and the faculty members of the target group. Half of the respondents had no idea of what should be done with their old mobile phones and laptops, and hence left them unused at home. 24% of them donated or sold the gadgets that were no longer in use to relatives or someone known. Another 22% returned to dealers in exchange offer. An alarming fact revealed by the survey was that a major 79% of respondents were not even aware of the availability of any formal recycling facility in their neighbourhood. As per the Government notified Management Handling Rules, 2011, there are around 29 e-waste collection, segregation and recycling centres in Delhi i.e. approximately one authorised centre for 3 million people (DEITY 2011). This important observation linked with the social awareness of e-waste of respondents is a cause of concern.

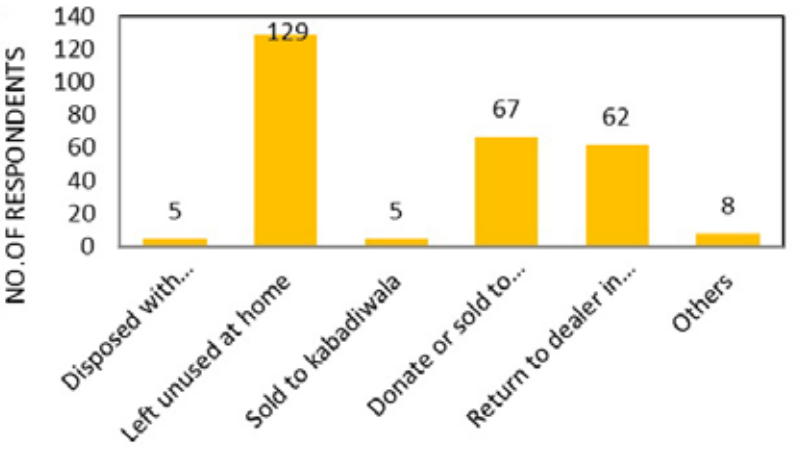


Figure 4: Bar Chart of disposal habit of gadgets not in use.

Awareness of E-Waste Hazards

Cathode ray tubes/Liquid crystal displays of computer monitors and PCBs of electronic gadgets contain heavy metals and toxic chemicals such as lead, mercury and cadmium, which can be very harmful to health if they enter the water system. Mercury for example is known to cause severe and permanent damage to the central nervous system, lungs and kidneys (Jaiswala, Samuela, Patela & Kumara 2015, 1320). The analysis of the survey data showed that

more than 81% of the respondents were not even aware of the e-waste hazards. When asked specifically regarding the most hazardous content of soldered printed circuit board (figure 5) and monitor of laptop (figure 6), many respondents were able to identify lead, mercury and cadmium as the harmful materials present, but they were ignorant of the negative impact of such substances on human health and environment.

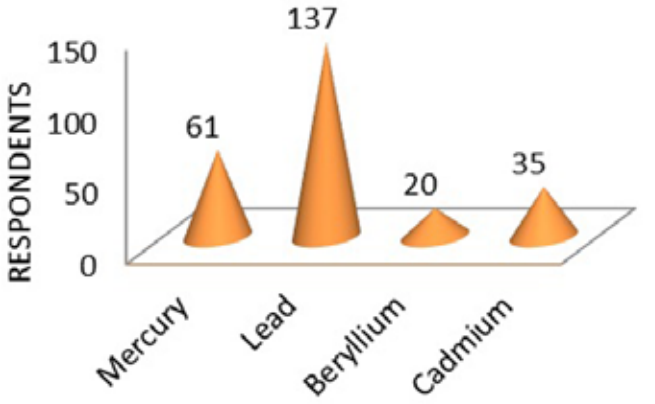


Figure 5: Hazardous element in soldered PCB

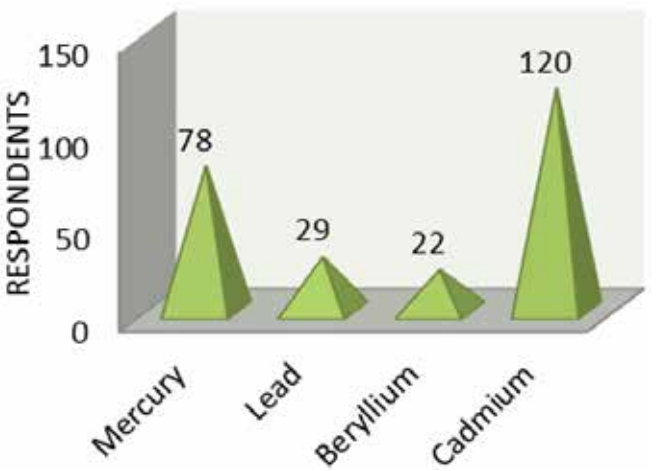


Figure 6: Hazardous element in LCD

Awareness of E-Waste Legislation

Government of India has taken initiative towards curbing the e-waste problem through the formulation and implementation of regulations and legal structure in the country (Singh 2013, 17-18). The Ministry of Environment, Forest and Climate Change has recently notified the E-Waste Management Rules, 2016 in suppression of the e-waste Management & Handling Rules, 2011 (MoEF 2016). The results of the survey showed that the awareness of government regulation of e-waste management is low. It is a matter of concern that only 23% of the consumers who are future technology producers are familiar with e-waste legislation, their source of information being electronic media. The survey data is suffice to conclude that there is an urgent need to educate the stakeholders on the National Environmental Regulations.

Summary of Results

The data analysis revealed that more than 50% of the respondents replaced their mobile phone within 1-3 years and laptop within 3-5 years. Moreover, more than 50% of the respondents had bought new gadgets even when the old product was in working condition; reason being the desire for latest technology. Half of the respondents had no idea of what should be done with their old mobile phones and laptops, hence left them unused at home; 24% of them donated or sold the gadgets to someone known; another 22% returned to dealers in exchange offer. An alarming fact revealed was that 79% of respondents were not even aware of any formal recycling facility existing in their neighbourhood. In spite of being future technology producers, 81% of the respondents did not know of the hazards of e-waste. Only 23% of the consumers were familiar with e-waste legislation. The survey conducted in the technical university clearly depicted the unawareness of the young engineering students and faculty members of the grave situation being faced by the country regarding the sustainable management of electronic waste.

The above results were further strengthened by the cross analysis done between the number of respondents, average tenure of the electronic gadget before replacement and the condition of the product when replaced, as shown in figure 7 for mobile phone. The results showed that maximum respondents, irrespective of the tenure of replacement of the gadget, did so while it was in working condition. Comparable results were obtained for laptop also.

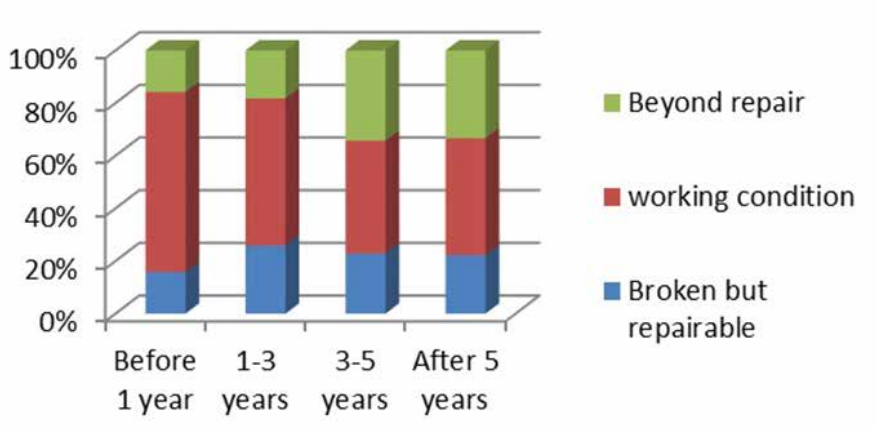


Figure 7: Number of respondent v/s replacement time of mobile phone v/s product condition

A similar cross analysis was done for the respondents against their disposal habit of unused gadget and their awareness of e-waste hazards. The results showed a very grim picture; respondents who left their old gadgets unused at home or sold/donated it to friends/relatives/dealers/scavengers were ignorant of the hazards caused by the toxic material present in these products. This is depicted in figure 8. When further analysed, it was found that the respondents had no familiarity with their duties and responsibilities as consumers, as laid down in the legislation.

Figure 8: Number of respondent v/s disposal habit of old gadget v/s awareness of hazards

Conclusion

The growing dependence on electronics spurred by increasing consumer demand for the new technologies and the shortening life spans of the products has resulted in piling up of the electronic waste at an alarming rate. In view of the magnitude of the problem, there is an urgent need to find sustainable way of managing the growing e-waste. The present survey conducted to gauge the knowledge and awareness level of young engineering students and faculty members of a university as consumers of electronic gadgets reveals the fact that majority of the respondents are totally unaware of the issue of sustainable e-waste management.

Awareness is the greatest agent for change. The first step towards this is education. It begins with empowering consumers to take charge of their current and future electronic waste. The challenge faced today as a society is how to reach consumers to remedy this lack of awareness and engage every organisation, individual and business in the circular economy. A serious environmental sensitisation campaign is the need of the hour, educating all stakeholders on the importance of electronic waste management and its three golden rules-reduce, reuse and recycle. The study presented in this paper can be replicated in other technical universities for re-authentication of the facts. The authors envisage that the study findings could benefit the policy makers in designing awareness programme related to the issue.

Acknowledgement

The authors would like to acknowledge the opportunity provided and financial support extended by Manav Rachna University for attending the conference 'Smart Cities in Smart Regions 2016" at Lahti University of Applied Sciences, Finland.

References

ASSOCHAM India 2016. India to sit on e-waste pile of 30 lakhs MT with Mumbai on top of heap, ASSOCHAM-Frost & Sullivan study [accessed 21 April 2016]. Available at: http://www.assocham.org/newsdetail.php?id=5642

Baldé, C.P., Wang, F., Kuehr, R. & Huisman, J. 2015. The global e-waste monitor – 2014. United Nations University, IAS–SCYCLE, Bonn, Germany.

Basel Convention. 1989. Controlling transboundary movements of hazardous wastes and their disposal [accessed 10 August 2016]. Available at: http://www.basel.int/TheConvention/Overview/tabid/1271/Default.aspx

Bhutta, M.K.S., Omar, A. & Yang, X. 2011. ElectronicWaste: A Growing Concern in Today's Environment. Hindawi Publishing Corporation, Economics Research International; Volume 2011. 1-8

Borthakur, A. & Sinha, K. 2013. Generation of electronic waste in India: Current scenario, dilemmas and stakeholders. African Journal of Environmental Science and Technology, September 2013; Vol. 7(9). 899-910

DEITY. 2011. E-waste management and handling rules, 2011. Department of Electronics and Information Technology. Available at: http://deity.gov.in/sites/upload_files/dit/files/e-Waste.

Elo, K. & Sundin, E. 2014. Automatic Dismantling Challenges in the Structural Design of LCD TVs. Elsevier, Procedia CIRP 2014; 15. 251 – 256.

Ely, C. 2014. The Life Expectancy of Electronics, Consumer Technology Association [accessed 10 January 2016]. Available at: https://www.cta.tech/News/Blog/Articles/2014/September/The-Life-Expectancy-of-Electronics.aspx

EPA, U.S. Environmental Protection Agency [accessed 15 July 2016]. Available at: https://www3.epa.gov/

Hester, R.E. & Harrison, R.M. 2009. Electronic Waste Management. Royal Society of Chemistry.

Jaiswala, A., Samuela, C., Patela, B.S. & Kumara, M. 2015. Go green with WEEE: Eco-friendly approach for handling e- waste. Elsevier, Procedia Computer Science 2015; 46. 1317–1324.

LARRDIS. 2011. E-Waste in India [accessed 3 February 2016]. Available at: http://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf

MoEF, 2016. E-Waste Management Rules, 2016. Press Information Bureau [accessed 18 March 2016]. Available at: http://pib.nic.in/newsite/PrintRelease.aspx?relid=138319

Okoye, A. & Odoh, C. 2014. Assessment of the level of awareness of e-waste management and concern for the environment amongst the populace in Onitsha, Southeastern Nigeria. Journal of Environmental Protection 2014; 5. 120-134.

Oomman, U.P. 2014. A survey of consumer behaviour towards e-waste management in the city of Mumbai. International Journal of Research in Applied, Natural and Social Sciences, August 2014; Vol. 2, Issue 8. 1-10.

Perkins, D.N., Drisse, M.B., Nxele, T. & Sly, P.D. 2014. E-waste: A global hazard. Annals of Global Health, 2014; 80. 286-295.

Pinto, V.N. 2008. E-waste hazard: The impending challenge. Indian Journal of Occupational & Environmental Medicine, August 2008; 12(2). 65-70.

Singh, R.P. 2013. India: A matter of electronic waste; the government initiatives. Journal of Business Management & Social Sciences Research, April 2013; Volume 2, No.4. 15-20.

Sinha-Khetriwal, D., Kraeuchib, P. & Schwaninger, M. 2005. A comparison of electronic waste recycling in Switzerland and in India. Elsevier Environmental Impact Assessment Review, 2005; 25. 492– 504.

Sinha, S. 2008. E-waste: Implications, regulations and management in India and current global best practices. TERI Press, New Delhi.

Soopramanien, R. & Usta, P. 2015. E-WASTE: a bigger problem than you think. Stanford Law School [accessed 5 December 2015]. Available at: https://law.stanford.edu/2015/10/21/e-waste-bigger-problem-think/

Step. 2014. Solving the E-Waste Problem (Step) White Paper: One Global Definition of E-waste [accessed 23 December 2015]. Available at: http://www.step-initiative.org/files/step/_documents/StEP_WP_One%20Global%20Definition%20of%20E-waste_20140603_amended.pdf

Step. 2013. MIT/NCER Study Analyses US E-Waste Generation and Flows. United Nations University/Step Initiative [accessed 5 February 2016]. Available at: http://www.step-initiative.org/news/mitncer-study.html

Toxics Link, 2007. Factsheet Number 31/November2007. Available at: http://toxicslink.org/docs/06184_ewaste.pdf

Widmer, R., Krapf, H.O., Khetriwal, D.S., Schnellmann, M. & Bo¨ni, H. 2005. Global perspectives on e-waste. Elsevier Environmental Impact Assessment Review, 2005; 25. 436– 458.

Zhang, K. 2011. Recycling of Electronic Waste II. Proceedings of the Second Symposium. February 2011. Available at: http://onlinelibrary.wiley.com/

Parjanen, S., Laakso, H., Rantala, T.

Title: Open Innovation Platforms Supporting City Renewal
Research Article

Abstract
This study examines the possibilities to build an open innovation platform in the context of city renewal. The city renewal has moved towards more interactive and complex processes involving a multitude of different stakeholders. The concept of open innovation provides an important contribution to the understanding of complex development processes of contemporary city renewal. The open innovation highlights the role of networks in innovation processes, suggesting that organisations rely heavily on their interaction with users, suppliers, and a range of other organisations inside the innovation system.

The study concentrates on one possible stakeholder group of city renewal: the holders of real estate. The research question is what elements the holders of real estate consider essential in building a common innovation platform. The data was collected by use of semi-structured interviews. The themes of the interviews were the business possibilities in the city centre, prospects for city development and co-operation as well as knowledge sharing with the municipality and other holders of real estate. Altogether eight interviews were made. The interviews were taped and analysed according to the principals of content analysis.

An innovation platform is a forum comprising of stakeholders bound together by their individual interests in a shared issue. Each stakeholder makes a contribution and also draws benefits in a win-win situation. It is essential to understand that the benefits do not necessarily materialize instantly but in the future. It is also crucial to establish a trustworthy development atmosphere, which helps different actors overcome their reluctance to take part in an innovation process. Joint development should highlight a multi-voiced dialogue emphasising interaction and communication. From the perspective of the holders of real estate there to be several issues that could benefit from co-operation in the city renewal context but the capacity to coordinate the exchange of complementary pieces of knowledge between different stakeholders is low. The innovation platform would also benefit from brokerage functions. Whilst spontaneous cooperation between organisations can occur, it appears that a brokerage intervention can help cooperation, for example, by advising on the advantages of cooperation, giving information, identifying opportunities, catalysing discussions between different actors or bringing organisations together.

Keywords: open innovation, innovation platform, city renewal, stakeholders

Introduction
Diverse political, economic and spatial progressions together with fast-changing ways of housing, consumption and work influence the urban space in many ways. The cities have a central role in economic prosperity and social well-being. Thus, increasing the attractiveness of city centres as well as improving their spatial and functional quality are essential goals. For example,

many Finnish cities are losing market shares to external shopping areas and online shops and are looking for methods on how city centres can win back retail and service that makes the city centre a high quality shopping area attractive to people.

The concept of open innovation provides an important contribution to the understanding of complex development processes in society such as those of contemporary city renewal (Mattsson & Sørensen 2015). According to them open innovation in city renewal puts emphasis on the process of innovating rather than on the specific set-up or organisation of planning. Open innovation processes are interactive, iterative and reflexive.

The open innovation highlights the role of networks in innovation processes, suggesting that organisations rely heavily on their interaction with users, suppliers as well as a range of other organisations inside the innovation system. (Chesbrough 2003; von Hippel 2005; Laursen & Salter 2006; West & Bogers 2011). This implies that cities should establish active dialogue with their citizens, companies and public organisations (Tukiainen, Leminen & Westerlund 2015). By integrating diverse actors into the innovation process, creativity and know-how are brought into the development. Open innovation processes are complex and often require a large number of different participants, where human engagement is essential. Innovation platforms are one way to bring together participants with diverse backgrounds to recognize solutions to common problems or to achieve common goals. This study is interested in the possibilities to develop an innovation platform in the context of city renewal. The research question is what elements the holders of real estate consider essential in building a common innovation platform.

Innovation platforms

There are several definitions of development or innovation platforms. For example, Harmaakorpi (2004, 28; 2006, 1089) defines regional innovation/development platforms “as regional resource configurations based on the past development trajectories, but presenting the future potential to produce competitive advantage existing in the defined resource configurations”. Ojasalo (2015, 195) defines innovation platform as "an approach that systematically facilitates external actors’ innovation with a purpose to develop solutions to the platform owner’s problems and needs – it is an approach for attracting, facilitating, and orchestrating other organisations’ innovation to solve platform owners’ problems." He sees the innovation platforms similar to innovation intermediaries. Consoli and Patrucco (2008) see innovation platforms as directed networks that do not emerge and evolve spontaneously, but where key nodes have a driving effect on the behaviours of the other actors and shape the evolution of the system and its aggregate performance. Common to these definitions is that they highlight the diversity of the actors involved in an innovation platform. The actors of a regional innovation platform may be the firms, technology centres, expertise centres, research centres, educational organisations and alike contributing to the defined platform (Harmaakorpi 2006, 1089).

The concept of an innovation platform is close to the concept of cluster. A cluster is defined as a specialized concentration of business and innovation expertise and support in a localized setting. A platform is more complex combination of clusters and non-cluster industry organisations highlighting related variety. (Cooke 2012, 1419; Uotila, Harmaakorpi & Hermans 2012, 1588-1590.) Because of related variety the platform offers greater potential for innovation than the cluster. The platform model celebrates the difference and cross-fertilization of ideas and practices among organisations in the same or different industries.

The data

The data was collected as part of a project 'Sustainable entrepreneurship innovations' that concentrates on, for example, how novel innovation platforms can be created, the existing ones accelerated and improved, and how organisations operating on these platforms can together create value-adding innovations and novel models of action, thus adding to and increasing regional resilience.

The data was collected by way of semi-structured interviews. The semi-structured interviews were selected because they allow interviewees to explain their own perceptions and matters concerning themselves more freely. The themes of the interviews were the business possibilities in the city centre, prospects for city development and co-operation as well as knowledge sharing with the municipality and other holders of real estate. Altogether eight interviews were made. The interviews, conducted by two researchers, were taped and analysed according to the principals of content analysis.

The results

Research indicates an innovation platform to be a forum comprising of stakeholders bound together by their individual interests in a shared issue. An innovation platform needs a common and concrete objective in order to function effectively. In this study one interviewee explained that "as far as plans and dreams resonate with neighbouring real estates and there is a good synergy and a path to results, we do discuss" about common development possibilities. Each stakeholder makes a contribution for the common goal and also draws benefits in a win-win situation. It is essential to understand that the benefits do not necessarily materialize instantly but later in the future. The development should be "forward-looking" with a common vision. Also, it is essential to have clear and long-term political commitment to the vision of how to develop the city centre. Several interviewees mentioned the decisions having been changed after a local election, thus making it difficult to plan one's own activities as it could not be trusted what will happen in the future.

Innovation literature builds on the idea that innovations do not originate from science alone, but are based on knowledge from multiple sources. There is a strong need to combine knowledge from theory and practice, as well as knowledge from different disciplines (Melkas and Harmaakorpi 2012, 2). Thus, diversity of stakeholders in the innovation platform offers great opportunities for knowledge co-creation. In the interviews the role of local knowledge as an important contributor to development was acknowledged. Local people have best insight of the urban surroundings and their special characteristics. The interviewees also mentioned the need for scientific knowledge, for instance, "why people come to city centre, how they move in the centre or what are the reasons they travel to the metropolitan area" instead the local city centre. In addition, there is a need for future-oriented knowledge to avoid path-dependence, visions and value networks that may reduce innovation capabilities in the long term. Because the surrounding environment is changing all the time giving weak signals of future trajectories, "it is not wise to lock in only one possibility".

It is also crucial to establish a trustworthy development atmosphere, which helps stakeholders overcome their unwillingness to take part in an innovation process. In the interviews "a need for open mind" was stressed. Collaboration can only happen when trust is established. For development to succeed, trust is required both at the levels of institutions and interpersonal relations (Ellonen, Blomqvist & Puumalainen 2008). The study shows social distance between different stakeholders to hinder collaboration. The interviewees, for

example, explained that “there are social tensions between people” or “the meetings have been turned into a shouting match”. The importance of social relations is that they not only co-ordinate transactions but are also vehicles that enable the exchange of knowledge because of mutual trust, kinship and experience as well as external resources to be mobilized (Boschma 2005, 66-67; Oerlemans & Meeus 2005, 78). At the institutional level the lack of trust was manifested, for example, in the disappointment the interviewees felt: “We do discuss with the municipality, but in the decision making our views and ideas are not taken into account”.

Cooperation between real estate holders as well as cooperation between real estate holders and municipality are in need of development efforts. For example, the holders of real estate do not necessarily have information on the kind of development plans the others have or on potential joint projects. One reason might be that the fragmented structure of property ownership makes discussion difficult. In the interviews, it was appreciated that the municipal authorities have changed their ways to a more open and dialogic direction. They have organized sessions and workshops and maintain discussion about the plans in public space. However, there is still need for more detailed discussion. The interviewees felt that discussion happens at a general level. Thus, common arenas that facilitate collective learning were required. Collective learning is an important aspect of knowledge co-creation. Possibilities for collective learning help stakeholders understand each others’ perspectives, and further common development. For example, interviewees made references to processes that did not succeed, and it turned out that none of these processes were not discussed together afterwards. In order to learn from failures, possibilities to reflect is required (Pässilä 2012; Pässilä, Oikarinen & Kallio 2013).

The innovation platform would benefit from brokerage functions. According to one interviewee “there is a need for an organiser, who does not have a hidden agenda”. Whilst spontaneous cooperation between different stakeholders might occur, it appears that a broker is able to facilitate cooperation, for example, by providing the links, knowledge sources, arenas and methods so that the stakeholders are able to concentrate on the effectiveness of innovation processes.

Conclusion

Based on the findings of this study there are critical elements that assist the forming of an innovation platform in the context of city renewal. Innovation platform is a forum comprising of stakeholders bound together by their individual interests in a shared issue. Each stakeholder makes a contribution and also draws benefits in a win-win situation.

It is also crucial to establish a trustworthy development atmosphere to ease different actors overcome their reluctance to take part in an innovation process. Common development should highlight a multi-voiced dialogue emphasising interaction and communication. The holders of real estate mentioned there to be several issues that might profit from co-operation but the capacity to coordinate the exchange of complementary pieces of knowledge between different stakeholders is low. The innovation platform would also benefit from brokerage functions. The brokerage intervention can enhance cooperation, for example, by advising on the advantages of cooperation, giving information, identifying opportunities, catalysing discussions between different actors or bringing organisations together.

Innovation platforms are an important mechanism for stimulating and coordinating innovation processes, but the platform is dependent on the engagement of the stakeholders (cf. Yström et al. 2015). By facilitating changes and supporting innovation processes innovation platforms are able to increase interaction, negotiation and learning between stakeholders. It would be interesting for future research to look upon how creative and innovative these platforms are in terms of creating new knowledge and what kind of innovations are stemming from them. It would be also essential what kind of brokerage functions are needed in different phases of open innovation platform processes.

Acknowledgements: The authors wish to thank the European Regional Development Fund and the Regional Council of Päijät-Häme for the opportunity of presenting their research in the Conference Proceedings of Smart Cities in Smart Regions.

References

Bogers, M. & West, J. 2010. Contrasting innovation creation and commercialization within open, user and cumulative innovation. Working paper. San José, CA: San José State University [accessed 5 September 2016]. Available at: http://www.joelwest.org/Papers/WestBogers2010.pdf

Boschma, R. 2005. Proximity and innovation: A critical assessment. Regional Studies 2005; 39. 61-74 [accessed 5 September 2016]. Available at: http://www.tandfonline.com/doi/pdf/10.1080/0034340052000320887?needAccess=true

Chesbrough, H. 2003. Open Innovation. The New Imperative for Creating and Profiting from Technology. Boston: Harvard Business School Press.

Consoli, D. & Patrucco, P 2008. Innovation platforms and the governance of knowledge: Evidence from Italy and the UK. Economics of Innovation and New Technology 2008; 17. 699-716 [accessed 5 September 2016]. Available at: http://www.tandfonline.com/doi/pdf/10.1080/10438590701785694?needAccess=true

Cooke, P. 2012. From Clusters to Platform Policies in Regional Development. European Planning Studies 2012; 20. 1415-1424 [accessed 5 September 2016]. Available at: http://www.tandfonline.com/doi/pdf/10.1080/09654313.2012.680741?needAccess=true

Ellonen, R. Blomqvist, K. & Puumalainen, K. 2008.The role of trust in organizational innovativeness. European Journal of Innovation Management 2008; 11. 160-181 [accessed 5 September 2016]. Available at: http://www.emeraldinsight.com/doi/pdfplus/10.1108/14601060810869848

Harmaakorpi, V. 2004. Building a Competitive Regional Innovation Environment—The Regional Development Platform Method as a Tool for Regional Innovation Policy. Doctoral dissertation series 2004/1, Espoo. [accessed 5 September 2016]. Available at: http://lib.tkk.fi/Diss/2004/isbn9512270110/isbn9512270110.pdf

Harmaakorpi, V. 2006. The regional development method as a tool for regional innovation policy. European Planning Studies 2006; 14. 1085–1104 [accessed 5 September 2016]. Available at: http://www.tandfonline.com/doi/pdf/10.1080/09654310600852399

Laursen, K. & Salter, A. 2006. Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. Strategic Management Journal 2006; 27. 131-150 [accessed 5 September 2016]. Available at: http://onlinelibrary.wiley.com/doi/10.1002/smj.507/epdf

Mattsson, J. & Sørensen, F. 2015. City renewal as open innovation, Journal of Innovation Economics & Management 1: 195-215 [accessed 5 September 2016]. Available at: https://www.cairn.info/revue-journal-of-innovation-economics-2015-1-page-195.htm

Melkas, H. & Harmaakorpi, V. 2012. Introduction. In: Melkas, H & Harmaakorpi, V. (eds.) Practice-based innovation: Insights, applications and policy implications. Springer. 1-13.

Oerlemans, L.A.G. & Meeus, M.T.H. 2005. Do organisational and spatial proximity impact on firm performance? Regional Studies 2005; 39, 89-104 [accessed 5 September 2016]. Available at: http://www.tandfonline.com/doi/pdf/10.1080/0034340052000320896?needAccess=true

Ojasalo, J. 2015. Open Innovation Platform in a Smart City: Empirical Results. The Journal of American Business Review Cambridge 2012; 4. 195-202.

Pässilä, A. 2012. A reflexive model of research-based theatre. Processing innovation at the crossroads of the theatre, reflection and practice-based innovation. Acta Universitatis Lappeenrantaensis 492. Lappeenranta University of Technology [accessed 5 September 2016]. Available at: http://www.doria.fi/bitstream/handle/10024/86216/isbn%209789522653222.pdf

Pässilä, A., Oikarinen, T. & Kallio, A. 2013. Creating dialogue by storytelling. Journal of Workplace Learning 2013; 25. 159-177 [accessed 5 September 2016]. Available at: http://www.emeraldinsight.com/doi/full/10.1108/13665621311306547

Tukiainen, T., Leminen, S. & Westerlund, M. 2015. Cities as Collaborative Innovation Platforms. Technology Innovation Management Review 2015; 5. 16-23 [accessed 5 September 2016]. Available at: http://timreview.ca/article/933

Uotila, T., Harmaakorpi, V. & Hermans, R. 2012. Finnish Mosaic of Regional Innovation System—Assessment of Thematic Regional Innovation Platforms Based on Related Variety. European Planning Studies 2012; 20. 1583-1602 [accessed 5 September 2015]. Available at: http://www.tandfonline.com/doi/full/10.1080/09654313.2012.713331

Von Hippel, E. 2005. Democratizing innovation. Cambridge, Mass: MIT Press [accessed 5 September 2016]. Available at: http://web.mit.edu/evhippel/www/books/DI/DemocInn.pdf

Yström, A., Aspenberg, H. & Kumlin, A. 2015. Exploring the creative climate in an open innovation arena. Identifying challenges and possibilities. European Journal of Innovation Management 2015; 18. 70-85 [accessed 5 September 2016]. Available at: http://www.emeraldinsight.com/doi/full/10.1108/EJIM-08-2013-0085

Rautiainen, T., Turkki, P.

Title: Smart food services support the wellbeing of smart citizens –technological meal service for senior CITIZENs evokes questions of social responsibility

Pilots, Demos and Experiment Case

Abstract

The new technology enables food service solutions for those citizens, who live in their own homes and are unable to get their food from outside their homes and prepare nutritionally well-balanced meals by themselves. In Finland the municipalities are under an obligation to provide the home care, including the food service, for the elderly or disabled people. The social responsibility of the municipalities as a service provider is to respect the independence of the customer to choose as to the quality of food and the variety of the meals and the food items.

The purpose of the case study described in this paper was to test the suitability of the Menumat service concept for the home meal service of the elderly home care customers. There were interviewed 23 Menumat users and eleven nurses from home care after a six month trial period on the quality of the service

The respondents felt that they learned how to use the Menumat device easily. Most of them stated that they can use it easily without help from outside. They also felt that Menumat has increased, at least slightly, their possibilities when deciding when to eat or what to eat. There was strong agreement, that they had a large variety of meals to choose from and the appearance, the taste and the healthiness of the meals was good. Considering the social life of the Menumat users it was found, that using Menumat did not seem to increase the feeling of loneliness of the users. The elderly people, who took part in the study gave a grade 8.6 on average for the service, when “the school grade scale” from 4 to 10 was used. Everybody was willing to continue using Menumat after the test period and everybody was willing to recommend the service for the elderly living at home, if the price for the service is kept as reasonable as in this case. The attitudes of the home care personnel were also quite positive towards this service and most of the nurses were willing to recommend the Menumat concept for the home meal service of the elderly.

In this study it was found that the Menumat meal service is one choice for the municipal home care to show social responsibility by ensuring a sufficient nutritional status for the elderly living at home, regardless of the location of their residences. Putting the Menumat meal service successfully into home care service operations requires preparations: guidance and advice for senior citizens, their next of kin and home care nurses. It also has to take into consideration that the senior citizens’ ability to function is in line with the functions this service provides.

Introduction

Food services play an important role in our everyday life. Over 860 million consumed meals in Finland (year 2015) are served in food service establishments, like restaurants, canteens and schools. Food service providers are not a homogenous group, for example, sizes, volumes, business ideas and concepts, food production and serving methods vary greatly. (Taloustutkimus 2016.) Like other areas of businesses the food service business can gain a significant benefit from technology and digital tools. Food services can, for example, offer their customers an access to detailed information of their services and meals.

Many food service customers can decide by themselves where, what and when they eat. In addition to that, there are customer groups who have limited abilities or/and possibilities to make these kinds of decisions. One remarkable customer group is the senior citizens who need assistance with grocery shopping, cooking and consumption of meals. It is a well-known fact that the number of senior citizens is increasing. The ability to function and the possibility to stay at home instead of in a nursing home or a hospital is of economic and a social interest to the municipalities. Healthy food and a good nutritional status supports health, hastens recovery from diseases and primarily keeps up the ability to manage one's daily life (Alden-Nieminen et al. 2009; Puranen & Jyväkorpi 2015, 7-13; Valtion ravitsemusneuvottelukunta 2010).

Municipalities are obligated to support senior citizens' wellbeing, health, functional capacity and independent living and to improve their access to social and health care services. Senior citizens' opportunities to participate and influence care services provided for them should also be strengthened. (Act on Supporting the Functional Capacity... 980/2012.) Senior citizens' services, for example, health, housing and home services or home nursing care, are granted based on a service needs assessment. Municipalities are responsible for arranging the required social and health services. They can be produced by municipalities themselves or bought from other municipalities or/and private service providers. The amount and type of services needed are reliant on the stage of ageing and ability to function. (Ministry of Social Affairs and Health 2016.) A senior citizen staying at home, having illnesses and having been granted home services often also needs dietary assistance. This can mean, for example, help with grocery shopping, vouchers to purchase meals, possibilities to have meals at a day-care centre or meals on wheels produced by communal or private food service provider. The meals on wheels service usually means that the senior citizens meal is packed in a meal-box and delivered at the appointed time and day frame to the senior citizens home. There are also alternative solutions to meals on wheels as described above. In this article the usability and the acceptance of an alternative solution, based on technology, is discussed.

The Menumat case

Menumat is a service concept to produce home meals for the elderly. The concept including the technology is quite unique Finnish invention and comparative analysis of the same kind of services cannot be found in the literature published internationally. In Finland single reports have been published on suitability of this technology on the food service for the elderly in some municipalities (Lehtosaari-Drushin 2012, Rantanen 2013, Lunti 2014). In these cases, the results have been encouraging.

At the heart of the Menumat service is a device comprised of a freezer, a convection oven and a computing unit. The customer uses the device at home with the help of voice guidance. When the user takes a meal from the

freezer, the system recognises it and transfers the values of the specific heating parameters to the oven. The user needs to push one button to start the heating, and when ready, the system tells user to take the meal out of the oven. Timing the heating is also possible. The freezer unit has a capacity of 18 main meals and desserts. The customer has 45 different main meal choices and 20 for desserts. The menu also encompasses the most common special diets, enriched diets and seasonal meals. Menumat personnel take care of the installation and the maintenance of the device, the introduction of its use and the delivery of the meals to the customers and the collection of the packaging material for recycling.

To fulfil the duty of social responsibility the municipalities and their subcontractors are recommended to allow older people to take part in their own services, to handle their own affairs as a client and to assess the quality of the services, even when they have lost some of their functional capacity (Ministry of Social Affairs and Health 2013). Based on this the Menumat service process need to be analysed from the perspective of an older person.

In the Menumat case, the customer is an elderly person (or a couple) living at home and the service provider is from the customer's point of view the Menumat personnel together with the home care personnel. The Menumat service concept consists of all three separate processes (according to the model of Grönroos and Ojasalo 2004):

1. The customer produces the service in isolation from the service provider when she/he uses the Menumat device to prepare meals at home. Depending on their situation the customers may need help from home care (see point 3).

2. The meals are produced for Menumat by a subcontractor in isolation from the end customer.

3. The service encounter exists between the customer and the Menumat service provider when they meet each other during installation, overhaul, meal order and meal delivery events. Some customers may need help from home care to use the device and/or for having their meals. In this case it was important to take into account not only the service encounter, but the entire social relations and the possible changes caused by the new service.

The aim of this study was, considering the processes above, to find out how the elderly home care customers experience the new home meal service and the technology it brings along and to give recommendations for its further use.

Methods

A customer study was carried out in the Mikkeli downtown area in eastern Finland, where 27 municipal home care customer households decided voluntarily to take part in the Menumat meal service trial for six months (May – October 2015). Four of them either ceased the trial or were not willing to give an evaluation of their experiences. The interviews were conducted by an experienced person in the respondents' homes at the end of the trial period. The interview was a structured interview with some open questions. The structuring of the interview was planned according to the service processes discussed above to get the overall picture of the customers' experiences. The subject area was divided into questions about the operation of the device, the timing and the quality of the meals, the social relations and the overall satisfaction for the service.

From 23 respondents 14 were men and 9 women. Their age was 72.3 years on average (range 47-92 years, four people under 65 years). Most of the respondents (16) lived in one-person households and the rest as couples in two-person households. Before the test period nine households received their meals from home care (meals on wheels), the others prepared their meals at home by themselves or with the help of home care personnel.

Eleven nurses from home care, who were involved with the Menumat users were also interviewed.

Findings

Operation of the device

The respondents felt they learned to use Menumat easily (n=22) after a short initiation to the operation and most of them stated that they can use it easily. Four people needed help from somebody else outside their own household. They considered the device was working reliably and it was safe to use (n=21). The voice guidance was felt at least somewhat helpful (n=16).

Meals

Most of the respondents (n=18) had their meals every day from Menumat. The majority felt, that Menumat has increased, at least slightly, their possibilities in deciding when to eat or what to eat, but seven persons considered no effect on that. The respondents were quite unanimous in agreeing, however, that they had a large variety of meals to choose from and the appearance, the taste and the healthiness of the meals was good. The fact that the meals contained only cooked vegetables and the lack of bread and beverages along with the Menumat meal was not considered to be a problem, because the respondents needed, in any case, somebody to help them get these among other items from the supermarket.

Social relations

Many participants of the study had a relatively active social life. Most of them (n=16) settle their affairs or meet their friends outside their homes several times a week or daily. 13 answered, that they never feel lonely, 8 said they feel lonely sometimes and 2 felt loneliness continuously. It is noteworthy that using Menumat did not seem to increase the users' feelings of loneliness. They said there was no difference in that compared to the time before Menumat. Three interviewees commented that the voice guidance of the device somehow even decreased their feelings of loneliness.

Overall satisfaction

The elderly people, who took part in the study were quite satisfied with the Menumat service concept in general. They gave a grade of 8.6 on average for the service (variation 7 – 10), when "the school grade scale" from 4 to 10 was used. Everybody was willing to continue using Menumat after the test period and everybody was willing to recommend the service for the elderly living at home. Three respondents gave their recommendation with a grain of salt concerning the price of the service. The price of the service should be competitive with the price of a possible alternative meal service, as in this case the situation was.

The overall satisfaction regarding Menumat reflects the fulfilment of the expectations. The expectations of the customers depend highly on the image of the service. In this case, the service concept was quite new to most customers and they probably had no prejudices about it, but on the other hand the idea of getting meals from the automate may have been strange to them. Thus giving proper information and demonstrations beforehand to the

potential users, their next of kin and the nursing staff is the most important factor. In this case this kind of briefing was arranged and, moreover, hands-on guidance for the nurses was included. Those customers, who were willing to start the trial, got the full introduction on the Menumat device by Menumat and the home care personnel.

The attitudes of the home care nurses are of crucial importance for the elderly to adopt the new meal concept and to continue its use. Their attitudes were found to be quite positive and most of them (n=8) were willing, unconditionally, to recommend the Menumat concept for the home meal service of the elderly. They felt that those elderly customers, who could use the Menumat device independently adopted the use of the device easily and were happy to use it. They considered that the activity of those customers was increased. They also indicated, that the timer on the Menumat device helps nurses to allocate their work in relation to those customers, who are not able to use Menumat independently.

Conclusions and recommendations

The Menumat meal service system brought positive feedback from the test group of users. It seemed to be a suitable solution for elderly people living at home, who are able to manage independently or with a little help. In those cases, where the users need help, the system eases the work of home care nurses or the relatives by releasing them from the preparation of meals. The device was felt safe, reliable and easy to use for the test people. The users gave good scores for the menu, the sensory quality and the healthiness of the meals and the size of the portions were found to be optimal. Considering the social point of view Menumat had no effect on the feelings of loneliness compared with the test persons' experiences of their previous meal service. The topic, assuming that automation and technology at home would decrease contacts and increase loneliness did not come up in this group.

As a good nutritional status keeps up functional capacity, it is important to take care of the senior citizens' diets. The risk of malnutrition is a common problem in home care clients and nutritional assessment tools should be used. (Kaipainen et al. 2015; Soini et al. 2005.) Tailored nutritional interventions, like nutritional guidance and counselling can have a positive impact on diet quality (Jyväkorpi 2016). A known fact is that only eaten food nourishes (e.g. Kaipainen et al. 2015; Suominen 2014). Therefore, municipalities have a considerable responsibility when arranging senior citizens' dietary assistance and meals. The declining economy with the concurrent increase in senior citizens and the need for home care forces municipalities to seek out new ways to manage this situation. The Menumat meal service has run up against criticism. The lack of everyday human contact, when there is no need for a meal deliver person and the concern over fresh ingredients, like salads, missing from diets, are often expressed.

The study shows, that the Menumat meal service is one choice for the municipal home care to show social responsibility by ensuring a sufficient nutritional status for the elderly living at home regardless of the location of their residences. Putting the Menumat meal service successfully into home care service operations requires preparation: guidance and advice for senior citizens, their next of kin and home care nurses. It also has to take into consideration that the senior citizens' ability to function is in line with the required functions when using this kind of service.

References

Act on Supporting the Functional Capacity of the Older Population and on Social and Health Care Services for Older Persons 980/2012. Available at http://www.finlex.fi/fi/laki/ajantasa/2012/20120980

Alden-Nieminen, H., Raulio, S., Männistö, S., Laitalainen, E., Suominen, M. & Prättälä, R. 2009. Ikääntyneiden suomalaisten ateriointi: Ruokapalveluiden seurantaraportti 3. Helsinki:Terveyden ja hyvinvoinnin laitos (THL) 7/2009.

Grönroos, C. & Ojasalo, K. 2004. Service Productivity. Towards a Conceptualization of the Transformation of Inputs into Economic Results in Services. Journal of Business Research 57, 414-423. Available at: http://dx.doi.org/10.1016/S0148-2963(02)00275-8

Jyväkorpi, S. 2016. Nutrition of older people and the effect of nutritional interventions on nutrient intake, diet quality and quality of life. Doctoral thesis. Helsinki: University of Helsinki. Available at: http://urn.fi/URN:ISBN:978951-51-2019-9

Kaipainen, T., Tiihonen, M., Hartikainen, S. & Nykänen, I. 2015. Prevalence of risk of malnutrition and associated factors in home care clients. The Journals of Nursing Home Research Sciences. Volume 1, 47-51 [accessed 24 May 2016]. Available at: http://www.jnursinghomeresearch.com/468-prevalence-of-risk-of-malnutrition-and-associated-factors-in-home-care-clients.html

Lehtosaari-Drushin, P. 2012. Ikääntyneiden asiakkaiden mielipiteet vaihtoehtoisista kotiateriapalveluista Oulussa. [Opinions of the Elderly Customers about the Alternative Home Meal Services in Oulu]. Kajaani: Kajaanin ammattikorkeakoulu [accessed 2 December 2016]. Bachelor thesis. Available at: https://www.theseus.fi/bitstream/handle/10024/45101/Lehtosaari-Drushinin%20Paivi.pdf?sequence=1

Lunti, L. 2014. Ruoka osana ikääntyneen hyvää hoitoa. [Food as a part of good elderly care]. Seinäjoki: Seinäjoen ammattikorkeakoulu [accessed 2 December 2016]. Available at: https://www.theseus.fi/bitstream/handle/10024/70799/lunti_leena.pdf?sequence=1

Ministry of Social Affairs and Health 2016. Older people services [accessed 16 June 2016]. Available at: http://stm.fi/en/older-people-services/services-and-benefits.

Ministry of Social Affairs and Health 2013. Quality recommendation to guarantee a good quality of life and improved services for older persons. Helsinki: Publications of the Ministry of Social Affairs and Health 2013:19. Available at: http://urn.fi/URN:ISBN:978-952-00-3443-6

Puranen, T. & Jyväkorpi, S. 2015. Hyvä ravitsemus tukee toimintakykyä. In Laitinen, M., (2015). Asiakaslähtöiset kotiruokapalvelut. Mikkeli: Mikkelin ammattikorkeakoulu, Vapaamuotoisia julkaisuja – Free-form Publications 64. Available at: URN:ISBN:978-951-588-535-7

Rantanen, K. 2013. Menumat-ateriapalvelun pilotointi Salon kaupungin vanhuspalveluissa. TeknoPro-projekti [accessed 2 December 2016]. Available at: http://www.ikateknologia.fi/images/stories/Julkaisut/menumat_raportti_teknopro_salo.pdf

Soini, H., Routasalo, P. & Lagström, H. 2005. Nutritional status in cognitively intact older people receiving home care services – a pilot study. The Journal of Nutrition, Health & Aging 9 (4): 249-253. Available at: http://www.mna-elderly.com/publications/198.pdf

Suominen, M. 2014. Ikääntyneen ravitsemusopas. Helsinki: Suomen muistiasiantuntijat ry & Gerontologinen ravitsemus ry [accessed 26 May 2016]. Available at: http://www.gery.fi/julkaisuja/

Taloustutkimus. 2016. Kodin ulkopuolella valmistettiin 868 miljoonaa ateriaa v. 2015. Uutiskirje maaliskuu 2016 [accessed 18 May 2016]. Available at: http://www.taloustutkimus.fi/ajankohtaista/uutiskirje/uutiskirje-maaliskuu-2016/kodin-ulkopuolella-valmistettiin

Valtion ravitsemusneuvottelukunta. 2010. Ravitsemussuositukset ikääntyneille. Helsinki: Valtion ravitsemusneuvottelukunta. Available at: http://www.ravitsemusneuvottelukunta.fi/attachments/vrn/ikaantyneet.suositus.pdf

Ojasalo, J., Tähtinen, L.

Title: Open Innovation Platforms and Public Decision Making in a City: Empirical Findings From a Smart City Research

Abstract

The purpose of this article is to increase knowledge of how an open innovation platform addressing the city's needs can relate to the public decision making processes of the city and propose a model for that.

This study belongs to a larger 2-year research project on Open Innovation Platforms in Smart Cities, in the Urban Research and Metropolitan Policy Program (in Finnish: "Kaupunkitutkimus ja Metropolipolitiikka"). One of the issues addressed in the study concerns how an open innovation platform addressing the city's needs can relate to the public decision making processes of the city.

An innovation platform is defined as an approach that systematically facilitates external actors' innovation with purpose to develop solutions to the platform owner's problems and needs – it is an approach for attracting, facilitating, and orchestrating other organizations' innovation to solve the platform owner's problems (Ojasalo 2015a). The platform owner in the current study is a city. An innovation platform in this context functions an intermediary between a city and external actors. External actors include companies, 3rd sector organizations, research institutions, and citizens. The role of an innovation platform is to bridge the city and the external actors to collaborative innovation for the city's needs and problems. The challenge here is that the decision making in a city is different from decision making in other organizations.

Many of the distinctive characteristics of public decision making processes pose a challenge for innovation collaboration with external actors. Often, external actors are not aware of these distinctive characteristics, or they find it very difficult to adapt to them. Particularly SMEs and start-ups find it difficult to adjust their operation to the public decision making processes. The existing literature includes very little knowledge of how an innovation platform, which is an intermediary between a city and external actors, relates to the city's decision making processes. Still, this is an important issue considering the prerequisites of the success of an innovation platform. There is an evident need to increase the knowledge in this area, and the present study responds to the need.

This qualitative explorative study is based on data from in-depth interviews and co-creative multi-actor workshops with participants from city governments and other organizations.

This article identifies several factors affecting how an open innovation platform relates to the public decision making processes in a city. As a result, it proposes a model of open innovation platform and public decision making in a city.

This study has both scientific and practical value. It increases the knowledge of combining different decision making cultures with the help of an intermediary organization in the context of collaborative innovation. It also proposes a practical model for organizing governing, sparring, and collaborative innovation relationships of an innovation platform with the city's public decision making systems and external actors.

Keywords: Open innovation platform, Public decision making, Innovation collaboration, Innovation Intermediary, Smart City

Introduction

Innovation platforms and innovation intermediaries can be used to enhance open innovation and collaborative innovation in cities. An innovation platform functions between a city and external actors, and facilitates their collaborative innovation. However, the knowledge of how innovation platforms can relate to the public decision making in in a city is still scarce. The present study addresses this knowledge gap. It aims at increasing knowledge of how an open innovation platform addressing the city's needs can relate to the public decision making processes of the city and propose a model for that.

The rest of this article is organized as follows. First, based on the earlier literature, this article discusses innovation intermediaries and platforms, as well as the special characteristics of public decision making processes. Then, it explains the method of this research. Next, based on the current empirical study, it proposes a model of open innovation platform and public decision making in a city. After that, it draws the final conclusions.

Innovation intermediaries and platforms

The innovative ideas and solutions to the problems of government and city halls can be provided both internally and externally through collaboration with public and other organizations (Fung and Weil 2010). This external knowledge space can be supported by public open innovation intermediaries (Bakici, Almirall & Wareham, 2013). An intermediary is a third party, a firm or a person that acts as a mediator and offers intermediation services between two other parties (Watkins & Horley 1986, Seaton & Cordey-Hayes 1993, Braun 1993, Stankiewicz 1995, Stewart & Hyysalo 2008, Gassmann, Daiber & Enkel 2011). Intermediaries may be private organizations, individuals, experts or advisors in the form of retailers, distributors, wholesalers, platforms, media companies, agencies and financial institutions (Aoki 2001, Howells 2006). According to Bakici et al. (2013), intermediaries of innovation include (a) intermediaries, (b) knowledge brokers, and (c) innovation intermediaries, and they (ibid.) define them as follows. A knowledge broker is an organization that spans multiple markets and technology domains and innovates by brokering knowledge from where it is known to where it is not (Hargadon 1998, Hinloopen 2004, Verona, Prandelli & Sawhney 2006, Ramirez & Dickens 2010, Hussler, Muller& Rondé 2010). An innovation intermediary is an organization that acts as an agent or broker in any aspect of the innovation process between two or more parties (Howells 1999 and 2006, Lichtenthaler & Ernst 2008, Sieg, Wallin & von Krogh 2010, Tran, Hsuan & Mahnke 2011, Nambisan, Bacon & Throckmorton 2012, Klerkx & Leeuwis 2009).

The meanings of the concepts of "innovation intermediaries" and "innovation platforms" are very close to each other. The function of innovation platforms is based on the fact that networks are loci – platforms – of innovation since collaboration favors the access to a broad set of complementary technological competencies and becomes an opportunity to recombine existing resources held by individual firms into new knowledge (Patrucco 2011). Innovation

platforms utilize the basic advantage of networks. Through networks, an actor may have an access to resources which it does not possess internally (Ojasalo 2004). In the case of innovation, knowledge and capabilities are the most important resources. Indeed, innovation networks (Ojasalo 2008 and 2012) are all about knowledge creation and governance for economic value through interaction in networks.

Special characteristics of public decision making processes

The nature of decision making in a city and other organizations is notably different (Nutt, 2006). Private companies have smoother decision making processes while public organizations experience more turbulence, interruptions, recycles, and conflict (Perry & Rainey 1988; Rainey, Backoff & Levine 1976; Ring & Perry 1985).

Nutt and Backoff (1993; in Nutt, 2005, 291-294) brought forward the following characteristics of public decision making processes in comparison with the decision making in the private sector organizations.

- Decision makers are obliged to seek out the views of people in controlling bodies in public sector organizations. In other words, public sector decision makers must determine the expectations of people who serve in authority networks, as alternatives are being uncovered.
- Competition shifts to collaboration in a public organization, so key players must have a role in suggesting alternatives. Public sector organizations are expected to collaborate with other organizations that offer similar services and not compete with them for resources. As a result, public sector decision makers attempt to enhance cooperation and collaboration by giving many of the key players an opportunity to suggest alternatives.
- Limited availability of performance and intelligence data in public organizations. Public organizations are often prohibited from diverting funds from service delivery to collect data on emerging trends in that service delivery. Even when information collection is possible, professionals are reluctant to take resources from service provision to collect such data.
- The need for consensus increases in public organizations. The views of opinion leaders, outright manipulation by legislators and interest groups, and opposition to an agency's prerogatives are more important than economic issues, which are crucial for private organizations (Levine et al. 1975). Disagreements, reciprocity, and quid pro quos can occur at any time and, within limits, are permissible components in public decisions. Bargaining is needed to find the permissible arenas of action.
- More time is required to balance user needs with demands of the controlling bodies in a public organization. The views of opinion leaders, outright manipulation by legislators and interest groups, and opposition to an agency's prerogatives are more important than economic issues, which are crucial for private companies (Levine, Backoff, Cahoon & Siffin 1975). The prospect of influence encourages public organizations to build buffers in the form of coalitions, advisory groups, and interagency coordinating bodies to help with negotiations.
- Alternatives are more likely to be revealed as they are identified in a public organization. Mechanisms of accountability and control make all actions in public organizations, even contingency plans or hypothetical scenarios, subject to review and interpretation by outsiders. Most public organizations cannot isolate their decision making. Evaluating an alternative as soon as it is identified makes creativity difficult and limits the prospect of innovation (Nisbett & Ross 1989).

- More people are involved in decision making in a public organization. Everyone has an ownership stake in public organizations. Devices such as public meetings, task forces, and public announcements are used to determine expectations and refine understandings about what the public organization should do and how. As a result, strategic decisions in public organizations encourage a complex web of transactions.
- Clarity about the desirability of an alternative declines, increasing the time to make decisions in a public organization. Public organizations have multiple goals, which are often vague, controversial, or both (Baker 1969; Bozeman 1984). The demands made by interest groups, flux in missions, and manipulation by important stakeholders and third parties create a complex, confusing and often conflicting set of expectations.
- Search time and resources are more limited in a public organization. Public sector decision makers have weaker power and lack the funds to make investments that reshape systems they manage, compared with the private sector managers (Bozeman 1987). Autonomy and flexibility are usually lower in public organizations. Consequently, the investments made to uncover alternatives in public sector organizations are far lower than those found in private sector organizations (Nutt & Backoff 1993, in Nutt 2005 291-294).

Method

This article emerges from stems from a larger 2-year research project on open innovation platforms in Smart Cities. The project addresses several objectives. One of them concerns how an open Innovation platform can relate to the public decision making processes in a city. The results shown in this article relate to this research objective. The research method is qualitative based on data from in-depth interviews and co-creative workshops (Gummesson 2000). The data of this article include 65 in-depth interviews. The interviews were audio recorded and transcribed for later analysis. The interviewees also had a chance to make drawings during the interviews. The drawings were photographed, collected, and interpreted in the analysis.

The informants of the in-depth interview come from Finland (49), Spain (5), Netherlands (2), China (3), Italy (2), Denmark (1), USA (2) and Australia (1). The informants were selected based on their expertise or experience in innovation in the cities, public procurement, Living Labs, or other type of innovation intermediaries in the city context. The interviewees include persons from the city government, private companies, 3rd sector organizations, innovation intermediaries, as well as research institutions. Interviewees selected from the city government had experience or expertise in innovation, urban development, and collaboration with private/3rd sector organizations. Interviewees selected from the private sector had experience or expertise in collaboration with cities. Similarly, interviewees from 3rd sector had experience or expertise in collaboration with the cities. Interviewees from innovation intermediaries had experience or expertise in Living Labs or facilitation of collaborative innovation networks.

Researchers interviewed were academics who have examined innovation intermediaries or urban development. Interviews took around 1-3 hours. In addition to in-depth interviews, the data of this article include material from 4 co-creative workshop addressing innovation collaboration between cities and external actors. The data of the workshops include the transcriptions of selected parts of the workshops, notes, photos on written and drawn material during the workshops, as well as written summaries of the main conclusions of the workshops. The data were analyzed by open coding and selective coding, in terms of the grounded theory method (Glaser 1978).

Open Innovation Platform in Public Decision Making of a City: Empirical Results

Based on the current empirical study, we propose a model illustrating open innovation platform in public decision making of a city (Figure 1).

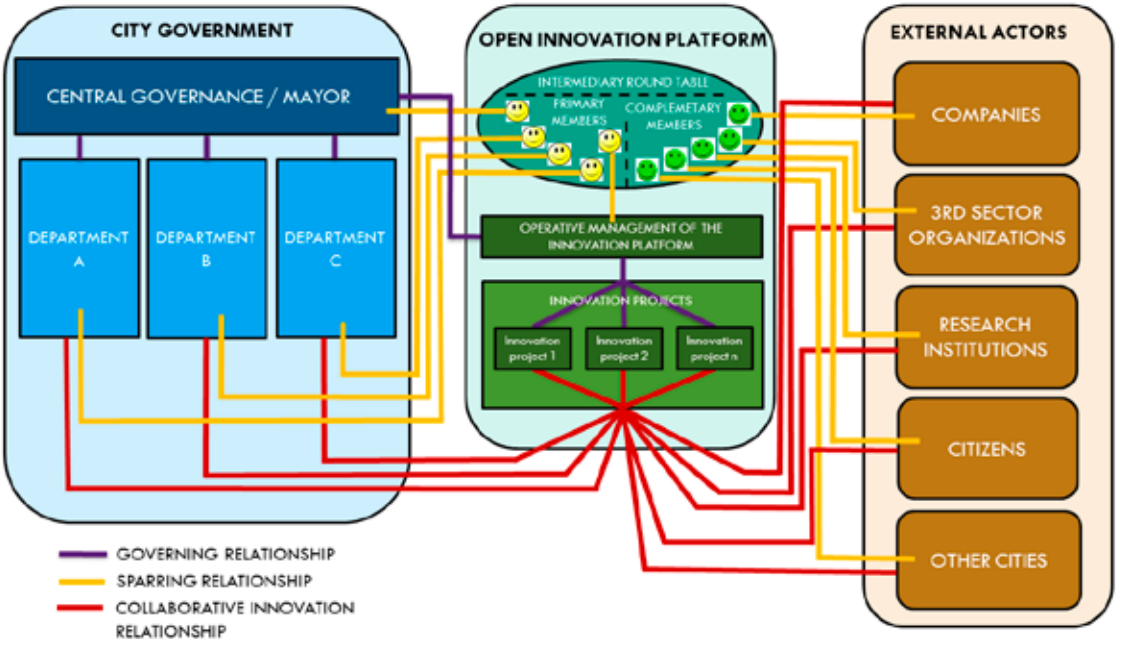


Figure 1. Model of Open Innovation Platform in Public Decision Making of a City

The model includes three main actor blocks and three types of relationships between them. The actor blocks are the city the government, external actors, and open innovation platform between them. The open innovation platform facilitates and enables collaborative innovation between the city and external actors. “Innovation platform” is an approach that systematically facilitates external actors’ innovation with purpose to develop solutions to the platform owners’ problems and needs (Ojasalo 2015a, 2015b).

In this research, the city is the sole platform owner or at least one of the main owners. It has the main power in the innovation platform’s decision making. An innovation platform may have a broad and general focus (Forum Virium Helsinki) or very specialized and narrow (DOLL Lightning Solutions Albertslund, Amsteram Rooftop Solutions). It may be a formal organization (Amsterdam Smart City) or less formal network or club (Kalasatama Developer’s Club Helsinki). It may be an association (Genova Smart City Association, Lahticity.fi Lahti), certain part of the city (Kalasatama Helsinki, Espoo Innovation Garden), a city organization or unit such as a municipal hospital (SLL Innovation Stockholm), citizen-interest driven foundation (Miami Foundation), or Living Lab or incubator or accelerator (Turbiini Vantaa, Ladec Lahti, iMinds Flanders, Vacouver City Studio). It may be an open innovation community or organization based on virtual platform and digital tools (Innokylä Finland, Sentilo Organization and Community Barcelona).

The most of the platform's budget comes from the city and other public sources (Ojasalo, 2016). Still the innovation platform acts as an independent, self-organizing mechanism. Its activities should be transparent. It needs an effective information transfer mechanism for sharing and gathering information from the city government's internal and external environment in order to facilitate and enhance collaborative innovation. This information transfer mechanism is here called as an intermediary round table. The city government in the model is simplified to consist of the central government, and the city departments. Examples of departments include health and well-being, education, real estate, culture, etc. External actors refer to private companies, 3rd sector organizations, research institutions, citizens, as well as other cities.

The open innovation platform includes an advisory and facilitation entity, which is called as an intermediary round table. The round table includes primary members and complementary members. The primary members are carefully selected city personnel. They come from the city departments and possibly the central government. They intermediate information between their own departments and the innovation platform. They also interpret the information and communicate it in the way that it is usable at the both arenas. Primary members have long-term involvement in the intermediary round table.

The intermediary round table has also complementary members. Their involvement is usually case or project specific, and they are invited by the primary members. For example, the innovation platform may be a city hospital which allows companies from the health and well-being industry to develop and test their products and services in an authentic real-life context in the hospital environment. The permanent members of the intermediary round table come from the city government, particularly from the health and well-being department. In addition, different complementary members are also invited, depending on the need, to participate in different meetings to bring case specific valuable insights.

The model includes three kinds of relationships between the actors. Governing relationships, sparring relationships, and collaborative innovation relationships. Governing relationships are based on formal coercive power. Its justification is grounded on democratic system, legislation, and rules of city government. A governing relationship exists between the mayor's office and the different city departments subordinated to it. A governing relationship also exists between the mayor's office and the innovation platform.

The earlier research has examined various options on how the innovation platform may relate to the decision making processes of the city government, and identified four options (Ojasalo, 2015b). Firstly, the innovation platform can be subordinated to the central government of the city. Secondly, one or several of the city departments may have their own innovation platform(s), which are subordinated to them. Thirdly, a connecting entity is added to the previous option within the city government. The purpose of this connecting entity is to share ideas, practices and visions of the service innovation of each department's innovation platform. Fourthly, the innovation platform is externalized, so that governing relationship does not exist with the city or it is weak. All these options are possible and they have their pros and contras.

On the whole, the empirical material of this study suggests that the first option is the most suitable, and the fourth one is the least preferred. Thus, our model is based on it. The main reason for why this option seems to be the best one, based on our empirical material, is that the open innovation platform requires

a mandate to efficiently affect the city government and practices. Therefore, it should be subordinated to central government and the mayor of the city. Even though the platform is subordinated to the mayor's office, the hierarchy should not interfere the innovation platform's activities by strong commanding policy. Our empirical material suggests that the mayor should act as a supervisor of the innovation platform and bear the overall responsibility. The intermediary round table should be responsibility for the platform's strategic management. The platform director or coordinator is responsibility for the operational management of the platform. According to Ojasalo (2015b), in this option, the innovation platform is likely to have more freedom and it can develop and experiment various visionary and future-oriented services. The success of this option depends highly on how supportive and visionary the top management of the city is. However, in this option, the city departments may perceive to be left outsiders.

Sparring relationships are based on sharing knowledge and networks. Those who spar share their knowledge, experience, and contacts of their networks to advance the purposes of the one being sparred. The purpose of sparring is to improve the professional performance and the effectiveness of the one being sparred. Sparrers are invited based on their professional expertise and knowledge or position in certain organization. They may have their own interest to gain something from the sparring relationship or they may function altruistically. In the present model, a sparring relationship exists between the open innovation platform and the central government of the city, city departments, companies, 3rd sector organizations, research institutions, citizens, and other cities.

An innovation collaboration relationship aims at new solutions, which are new services, tangible products, or processes. The activity of sparring relationships relationship is hands service or product development. The purpose of the innovation collaboration is to develop new solutions that solve the city's problems. Both the city government as well the external actors have their interests in the innovation collaboration. The city wants to get services and products which solve its problems effectively and efficiently. The private companies are interested in new business opportunities and sales to the cities. The 3rd sector organizations aim at promoting their own mission and research organizations are interested in creating new knowledge. Citizens are interested in improving the quality of the public services and infrastructure of their own city, and ultimately the quality of the life in the city. Other cities are interested in knowledge transfer and learning about the best practices.

Conclusions

The purpose of this article was to increase knowledge of how an open innovation platform addressing the city's needs can relate to the public decision making processes of the city and propose a model for that. It was based on qualitative explorative study and the data from in-depth interviews and co-creative multi-actor workshops with participants from city governments and other organizations. It increased the knowledge of combining different decision making cultures with help of an intermediary organization in the context of collaborative innovation. It also proposed a practical approach for organizing three types of relationships of an innovation platform with the city's public decision making and external actors. The relationships were governing, sparring, and collaborative innovation relationships.

Following opportunities for further research, experiments and pilots emerge from the current empirical study. Firstly, more knowledge is needed of public collaborative innovation in multicultural context. In metropolitan areas, the

collaborating actors often come from diverse cultural backgrounds. This calls for addressing multicultural aspects. Secondly, more research is needed on how different innovation platforms and intermediaries can collaborate more effectively with each other. Thirdly, more knowledge is needed to explore special means how to stimulate SMEs, start-ups and young entrepreneurs for innovation collaboration with cities.

References

Aoki, M. 2001. Types of relational financing and the value of tacit knowledge. In M. Aoki, A. Greif, & P. Milgrom, (ed.), Toward a comparative institutional analysis. Cambridge, MA: MIT Press, 2001; 307–309.

Baker, R. 1969. Organizational theory in the public sector. Journal of Management Studies 1969; 6. 15–32.

Bakici, T., Almirall, E. and Wareham, J. 2013. The role of public open innovation intermediaries in local government and the public sector. Technology Analysis & Strategic Management 2013; 25(3). 311-327.

Bozeman, B. 1984. Dimensions of publicness: An approach to public organization theory. In B. Bozeman & J Straussman (ed.), New directions in public administration. Belmont, CA: Brooks/Cole. 46–62.

Bozeman, B. 1987. All organizations are public. San Francisco: Jossey-Bass.

Braun, D. 1993. Who governs intermediary agencies? Principal-agent relations in research policy-making, J. of Public Policy 1993; 13. 135–62.

Fung, A., and Weil, D. 2010. Open government and open society, In D. Lathrop & L. Ruma (ed.), Open Government: Collaboration, Transparency, And Participation in Practice. Sebastopol. CA: O'Reilly Media. 105–112.

Gassmann, O., Daiber, M. & Enkel, E. 2011. The role of intermediaries in cross-industry innovation processes. R&D Management 2011; 41. 457–69.

Glaser, B.G. 1978, Theoretical Sensitivity. The Sociology Press, California.

Gummesson, E. 2000, Qualitative Methods in Management Research. 2nd ed., Sage Publications, California, 2000.

Hargadon, A.B. 1998. Knowledge brokers: A field study of organizational learning and innovation, Academy of Management Proceedings, San Diego, CA. 1998

Hinloopen, J. 2004. The market for knowledge brokers, Small Business Economics 2004; 22. 407–415.

Howells, J. 1999. Research and technology outsourcing and innovation systems: an Exploratory Analysis, Industry and Innovation 1999; 6. 111–129.

Howells, J. 2006. Intermediation and the role of intermediaries in innovation, Research Policy 2006; 35. 715–728.

Hussler, C., Muller, P. & Rondé, P. 2010. University knowledge networks in space: Are far-reaching scientists also international knowledge brokers? International Journal of Entrepreneurship & Innovation 2010; 11. 307–320.

Klerkx, L. & Leeuwis C. 2009. Establishment and embedding of innovation brokers at different innovation system levels: Insights from the Dutch agricultural sector. Technological Forecasting and Social Change 2009; 76. 849–60.

Levine, C. H., Backoff R. W., Cahoon A. R., & Siffin W. J. 1975. Organizational design: A post-Minnowbrook perspective for the ‘‘new’’ public administration. Public Administration Review 1975; 35. 425–35.

Lichtenthaler, U. & Ernst, H. 2008. Innovation intermediaries: Why internet marketplaces for technology have not yet met the expectations, Creativity and Innovation Management 2008; 17. 14–25.

Nambisan, S., Bacon J. & Throckmorton J. 2012. The role of the innovation capitalist in open innovation, Research Technology Management 2012; 55(3). 49–57.

Nisbett, R. & Ross L. 1989. Human inferences: Strategies and shortcomings of human judgments. (Rev. ed.) New York: Wiley.

Nutt, P.C. 2006, Comparing Public and Private Sector Decision-Making Practices. Journal of Public Administration Research and Theory 2006

Nutt, P. C. & Backoff R. W. 1993. Organizational publicness and its implications for strategic management. Journal of Public Administration Research and Theory 1993; 3(3). 209–31.

Ojasalo, J. 2012, Challenges of Innovation Networks: Empirical Findings. International Journal of Management Cases 2012; 14(4). 6-17.

Ojasalo, J. 2015a, Open Innovation Platform in a Smart City: Empirical Results. The Journal of American Business Review, Cambridge 2015; 4(1). 195-202.

Ojasalo, J. 2015b, Open Service Innovation Platform in a Smart City. In: P.D. Renata & L. Beltrametti (Ed.), Proceedings of the 10th ECIE European Conference on Innovation and Entrepreneurship. Genoa, Italy, 2015; 521-528.

Ojasalo, J. 2008, Management of Innovation Networks —A Case Study of Different Approaches. European Journal of Innovation Management 2008; 11(1). 51-86.

Ojasalo, J. 2016, Building An Open Service Innovation Platform For a City’s Needs: An Empirical Study On Smart Cities. In: L. Gómez Chova, A. López Martínez, I. Candel Torres (Ed.), INTED2016 Proceedings, 10th International Technology, Education and Development Conference. Valencia, Spain: IATED Academy, 2016; 6172-6181.

Patrucco, P.P. 2011 Changing network structure in the organization of knowledge: the innovation platform in the evidence of the automobile system. In Turin, Economics of Innovation and New Technology 2011; 20(5). 477-493.

Perry, J. L. & Rainey H. G. 1988. The public-private distinction in organization theory: Critique and research strategy. Academy of Management Review 1988; 13(2).182–201.

Rainey, H. G., Backoff, R. W. & Levine C. H. 1976. Comparing public and private organizations. Public Administration Review 1976; 36. 233–44.

Ramirez, M. & Dickens P. 2010. Gatekeepers, knowledge brokers and inter-firm knowledge transfer. In: Beijing's Zhongguancun Science Park. International Journal of Innovation Management 2010; 14(1). 93–122.

Ring, P. & Perry J. 1985. Strategic management in public and private contexts. Academy of Management Review 1985; 10(2). 276–86.

Seaton, R.A.F. & Cordey-Hayes M. 1993. The development and application of interactive models of industrial technology transfer, Technovation 1993; 13. 45–53.

Sieg, J.H., Wallin, M.W. & von Krogh, G. 2010. Managerial challenges in open innovation: a study of innovation intermediation in the chemical industry. R&D Management 2010; 40. 281–291.

Stankiewicz, R. 1995. The role of the science and technology infrastructure in the development and diffusion of industrial automation in Sweden. In B. Carlsson (ed.), Technological Systems and Economic Performance: The Case of Factory Automation, Dordrecht, Kluwer. 165–210.

Stewart, J. & Hyysalo, S. 2008. Intermediaries, users and social learning in technological innovation. International Journal of Innovation Management 2008; 12. 295–325.

Tran, Y., Hsuan, J. & Mahnke, V. 2011. How do innovation intermediaries add value? Insight from new product development in fashion markets. R&D Management 2011; 41. 80–91.

Verona, G., Prandelli, E. & Sawhney, M. 2006. Innovation and virtual environments: Towards virtual knowledge brokers. Organization Studies 2006; 27. 755–788.

Watkins, D. & Horley, G. 1986. Transferring technology from large to small firms: the role of intermediaries. In T. Webb, T. Quince, T. & D. Watkins. (ed), Small Business Research, Gower. Aldershot. 215–251.

Robinson, J. A., Kocman, D., Kontic

Title: Building a wireless sensor network to capture air pollution trends in Ljubljana – added value to the citizens

Pilots, Demos and Experiment Case

Abstract

Modern sensor technology can provide smart tools for citizens to familiarize with the air pollution levels they are exposed to in everyday life. Air pollution is a serious health risk to the city dwellers and affects millions of people worldwide. Air quality varies spatially even at micro scales in different parts of cities and is experienced in a variety of ways, with some people being more susceptible to health effects from lower levels of pollutants than others. However the air quality monitoring network operated by governmental and city authorities is sparsely scattered and does not provide a detailed air quality information, therefore the exposure of an individual can only be a rough estimate. Usually, the environmental monitors are large and expensive and give accurate but limited data coverage. The general public is not actively informed about the air quality unless there is an extreme pollution episode/ incident. Hence there is need for targeted air quality monitoring at individual level where also the data are easily accessible and displayed in a user friendly manner. This can be achieved by small, battery powered, fixed or portable sensor units evenly distributed (in a scattered manner) across cities. A Europe-wide, EC funded project CITI-SENSE - Development of Sensor-based Citizen's Observatory Community for improving quality of life in cities is currently providing a framework for testing and developing low-cost portable and fixed air quality sensor units, where citizens become both data collectors and consumers. Low-costs micro sensor packs coupled with smartphone-based applications can be leveraged to provide more detailed information on air pollution exposure at individual levels. In this paper, the CITI-SENSE case study in Ljubljana, the European green capital of 2016 is presented.

The citizens of Ljubljana are a part of the development of the project products. The network of air quality sensor units in Ljubljan¬a is partially hosted by individuals while collaboration with the local decision makers is also established. Twenty five static air quality units have been deployed in the city, while volunteers have been equipped to carry additional portable units for gathering data in real time. The limitations and capabilities of the prototypes was necessary to communicate from the earliest interactions with the stakeholders. Feedback of the usefulness of the devices and associated air quality information products e.g. data visualization web portal were collected. The volunteers who helped to test the infrastructure were excited about the new technology, yet, their feedback for improvements of the prototypes helps to make better products in the domain of air quality, and hence clarify the fit for purpose of these devices. The new technology can co-exists with the local monitoring stations, while providing valuable information to the citizens about their everyday life thus the data being more of indicative type.

Key Words: Wireless sensor network, Ljubljana, air quality, participatory evaluation

Introduction

Air quality information to the citizens is currently provided by public institutions. The data are usually based on few air quality monitoring stations in the cities representing high pollution, commonly near roads or residential areas, so called city background areas. However, air quality changes on a microscale and a few air quality monitoring stations in a city cannot give a complete picture of the air quality in every corner of the city. Often, modelling can provide additional overview of the city; however, this is not done in Ljubljana on a regular basis. Standardized air quality monitoring stations are accurate, yet expensive, and therefore cannot be deployed in high density. In order to cover a wider area of the city, a European project, CITI-SENSE develops and tests low-cost sensor technologies, with the aim to complement and bridge the data and information gap in the participating cities. However, this information coming from low-cost and less accurate devices needs to be presented to the public in a different way. Many of the challenges of deployment of such sensor were already addressed by Kumar et al. (2015). In addition, challenges arise from the field performance of the low-cost sensor devices (AQ-SPEC 2015) as well as the follow-up communication with the public regarding the data and the limitations of the devices. Known challenges regarding sensitivity, selectivity and stability of these devices were recently summarised by Lewis and Edwards (2016). This paper discusses the infrastructure deployed in Ljubljana as well as its added value to the potential end users such as citizens in the light of the above mentioned challenges.

Methodology

In order to establish a wireless sensor network in Ljubljana, Slovenia, variety of equipment were tested with the involvement of the local community. Preliminary small scale testing was conducted during a pilot study, later followed by a full implementation phase in 2016. User feedback was collected during and after the participation using participatory approach with the aim of the results of the evaluation being fed back to the developers of the products and hence, better future products in the domain of air quality.

During the full implementation, twenty five small air quality sensor units equipped with batteries and SIM cards were installed in various locations of the city generating stationary air quality data. The device, AQMesh (Environmental Instruments 2015), measures NO, NO2, O3, CO, PM, temperature, humidity, noise and pressure. The gaseous air quality parameters are based on electrochemical gas sensors, while the PM is an optical particle counter.

Prior to a city wide deployment of the sensor units, the sensor units were co-located together with an official air quality monitoring station in Ljubljana. This enabled us to determine the performance of the devices in local environment and adjust individual sensors where necessary. The locations of the low-cost air quality units were chosen according to the spatial distribution necessary for future modelling purposes applying Land Use Regression modelling (LUR) by Eeftens et al. (2012). LUR modelling takes into account land use, geographic and traffic characteristics (e.g., traffic intensity) to explain intra urban variation of air pollution (Wang et al. 2014). On the bases of LUR maps, a near real time air pollution maps were to be created by using data fusion methods. Data fusion combines LUR modelled maps and observations from high-density low-cost sensor networks by interpolating the observations in an objective way and therefore provides further information in areas where no data are available (Lahoz and Schneider 2014). In practice, the distance

from a heavy trafficked road for example led us to exclude locations too close to the motorway ring surrounding the city of Ljubljana. Further, as Paulos et al. (2009) recommends, we encouraged public participation in the process. The local community was involved in hosting the units at chosen locations. Many local schools and public institutions took part as hosts. In addition we also reached out to the general public who hosted the devices in their backyards.

Further, citizens were given an option to test a newly developed portable air quality sensor unit. The Little Environmental Observatory (LEO) (Ateknea Solutions 2015) was to give further more detailed information about the air quality in various areas of the city where people actually spend their days, the data being directly available to the citizens via smartphone and web based applications (Figure 1).

Figure 1. LEO hardware (left) and accompanying phone app, ExpoApp (right).

The LEO measures NO, NO2, O3 temperature and humidity with a ten second sampling frequency, while also collects accelerometer and GPS data through an android smartphone coupled with Bluetooth. The user carriers the device either attached to arm or a belt, depending on the model.

In addition to measured air quality, the citizens were introduced to a mobile application, CityAir (Castell et al. 2016), available both for Android and iOS, through which they could report their subjective air quality observations at their current location. The application was both publicly promoted for anyone to participate, as well as volunteers carrying the LEO were asked to use it multiple times a day during their one week measuring campaign.

The visualization of the established sensor network was collectively available on a public web portal (CITI-SENSE consortium 2016). The web portal (Figure 2) displays the location of the static units (coloured round dots) as well as enables individual users of LEOs to see their user tracks, if GPS was turned on while using the device. The various colours of man icons display the latest CityAir observations. The air quality is displayed as Air Pollution indication (APIN). The APIN is calculated from the concentrations of all the pollutants. APIN has five indicative values and goes from green (very low pollution) to red (high pollution). The APIN is based on the Common Air Quality Index (CAQI) as described by van den Elshout et al. (2008), but we use 1 minute average and measurements that are not equivalent to reference instrumentation, which uses 1 hour or even 24 hour resolution.

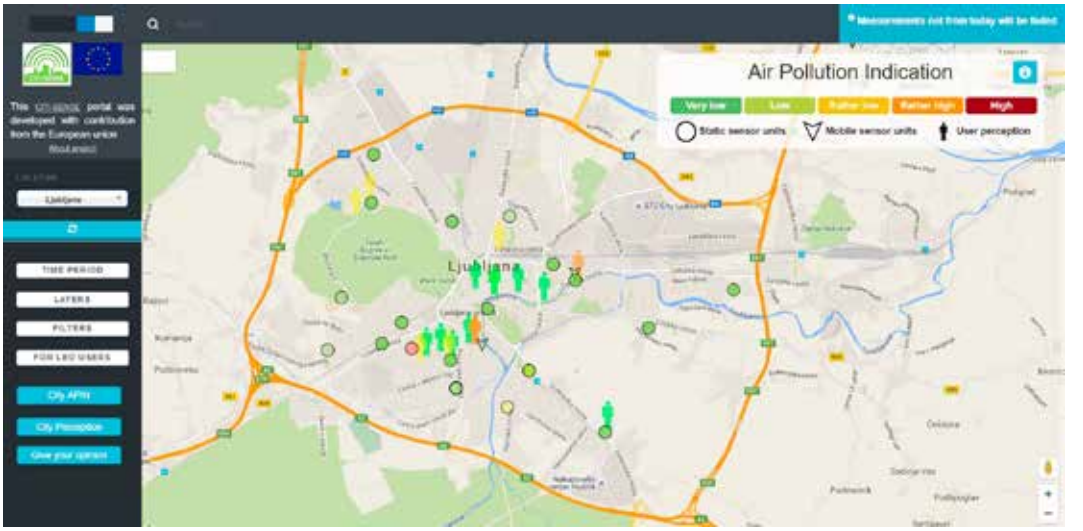


Figure 2. Visualization data portal.

Results

The established sensor network was up and running on full scale during the main study in 2016. The performance of the static air quality network was continuously supervised thru online proprietary and public web interfaces. The electrochemical gas sensors were often subject to failure which resulted in some data gaps or incorrect calculations of the APIN. This further sometimes led to communication issues with the public, especially in the occurrence of a red dot on the visualization map.

Regular citizens preferred the air quality being communicated using simple colour codes, as was provided through the APIN, whereas participants from various research institutions were after raw data i.e. pollution concentrations as they were mostly interested in the health aspect of air pollution.

Even though the LEOs did not contribute to the public sensor network due to privacy issues, the information chain “citizens - sensor units - data storage and data visualization” was tested. Volunteers recruited to test the LEOs found the personalization aspect of the product positive. They found it interesting to see the air quality situation along their daily routes, while being consciously more and more aware of the air quality in their everyday life. While most found it burdensome to use due to many technical issues with the phone app, they were interested in the technology and were happy to know that their suggestions for improvements were to be taken into account in the next version of the device. In addition to receiving near real time data on their smartphones, the LEO users could access the data retrospectively by entering individual username at the visualization portal. This feature was appreciated amongst the users, as it enabled further individual analysis of ones’ exposure estimates displaying the travelled route with APIN colours.

With the use of CityAir app humans became sensors and likewise to the portable air quality unit, they were reporting observations in various locations of the city. Figure 3 illustrates the CityAir observations in Ljubljana. This information was also available on the phone app itself displaying everyone else’s observations in addition to displaying the individual users’ contributions. Altogether over 50 people installed the CityAir app in Slovenia out of which 14 were active users in Ljubljana.

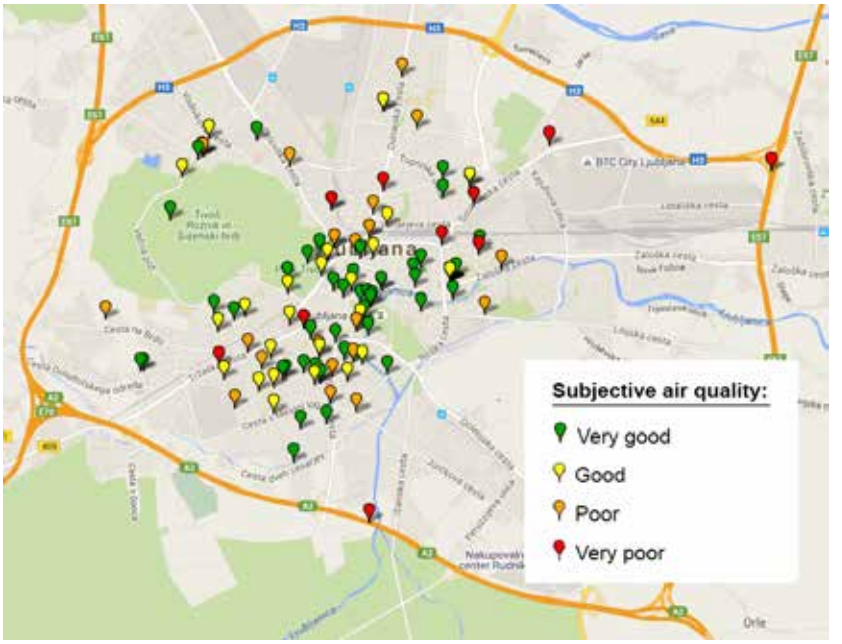


Figure 3. CityAir observations in Ljubljana

Due to the eventual low number of static sensor units available and deployment time not being sufficiently long enough to produce base maps, e.g. only two seasons were covered, the requirements to produce near real time air pollution maps using data fusion techniques were not met in Ljubljana. Such maps can provide various information for multiple purposes, which were also realized by many of our stakeholders who showed interest towards the data and its potential applications. The near real time pollution maps could for example further feed information into a phone app, which could suggest a less polluted commuting cycling route. Created base maps can be further used in collaboration with local stakeholders to various purposes once upgraded with relevant data such as meteorology and pollution sources from individual house heating.

Discussion and recommendations

Building a sensor network based on low-cost sensors is a challenging task. During interviews with local stakeholders and volunteers feedback was obtained about the user experience and usefulness of the wireless sensor network. In order to create better devices and services in the future, the feedback was fed back to the developers. The citizens welcomed the general idea, yet acknowledged that the technology used needs further improvements. In the current form of the technology, the raw data coming from low-cost sensors needs further data QC/QA procedures. There is need for development of automatic calibration and quality control for such wireless sensor networks. Also, attention needs to be paid to usability of user interfaces of the tools e.g. phone apps, which can be optimized by iterative feedback and re-design cycles between the potential end user and the developer.

The interest expressed by various local stakeholders towards the infrastructure as well as the various data speak for the public interest of such wireless sensor network. The project has built a good basis for further collaboration with local stakeholders who often lack the resources to establish something as large and near real time on their own. A network of low-cost sensors can provide various types of data to various types of stakeholders as also

described by Campbell et al. 2012, which is why we recommend that such networks would be established and maintained as continuous data collection networks by local authorities, who would have the data openly accessible by any interested body. However, depending on the type of sensors used, appropriate QC/QA procedures needs to be addressed prior to deployment as well as continuously when the data comes in.

Conclusions

Building a wireless sensor network in Ljubljana did not only demonstrate the feasibility of such network, but also collected feedback from the local community, who tested the new technology. This built trust to continue working with the local stakeholders in future similar projects as well as provided much needed feedback for the developers of the new technology and associated air quality information products for the benefit of next generation wireless air quality sensor network. Weaknesses of the approach were also clearly identified, as the current technology is not accurate enough to provide detailed information of concentration levels, yet, it provides indicative values of the pollution trends in a city and hence clarified the fit for purpose of the current technological level. Likewise, when enough citizens are participating in reporting their subjective air quality in the city, we similarly get air pollution trends over the city as with sensor technologies. However, this information coming from the human sensors can be as relevant if not even more relevant than the data collected with low-cost sensors, as the data generated by the contributing citizens is aimed for the citizens themselves.

Acknowledgements

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 308524. The platform AQMesh was provided for the project by Environmental Instruments. The Little Environmental Observatory (LEO) was provided for the project by Ateknea Solutions.

References

Ateknea Solutions. 2015. Technical specifications [accessed 13 June 2016]. Available at: http://citisense.ateknea.com/sensors/technicalspecifications

AQ-SPEC. 2015. AQMesh field evaluation report. South coast air quality sensor performance evaluation center [accessed 13 June 2016]. Available at: http://www.aqmd.gov/aq-spec/evaluations#&MainContent_C001_Col00=2

Campbell, A.T., Lane, N.D., Miluzzo, E., Peterson, R.A., Lu, H., Zheng, X., Musolesi, M., Fodor, K., Eisenman, S.B. & Ahn, G.S. 2008. The rise of people-centric sensing. IEEE Internet Computing 2008;12. 12–21.

Castell, N., Fredriksen, M., Cole-Hunter, T., Robinson, J., Keune, H., Nieuwenhuijsen, M. & Bartonova, A. 2016. CityAir app: Mapping air-quality perception using people as sensors. Geophysical Research Abstracts, Vol. 18, EGU General Assembly 2016.

CITI-SENSE consortium. 2016. Outdoor data portal [accessed 13 June 2016]. Available at: http://srv.dunavnet.eu/new/citisense/OutdoorDataPortal/

Eeftens, M., Beelen, R., de Hoogh, K., Bellander, T., Cesaroni, G. et al. 2012. Development of land use regression models for PM2.5, PM2.5 absorbance, PM10 and PMcoarse in 20 European study areas; results of the ESCAPE project. Environmental Science & Technology 2012; 46. 11195–11205.

Environmental Instruments. 2016. Technical specification [accessed 13 June 2016]. Available at: www.aqmesh.com

Kumar, P., Morawska, L., Martani, C., Biskos, G., Neophytou, M., Di Sabatino, S., Bell, M., Norford, L. & Britter, R. 2015. The rise of low-cost sensing for managing air pollution in cities. Environment International 2015; 75. 199–205.

Lahoz, W. A. & Schneider, P. 2014. Data assimilation: making sense of Earth Observation. Frontiers in Environmental Science 2016; 2. 1–28.

Lewis, A. & Edwards, P. 2016. Validate personal air-pollution sensors. Nature 2016; 535. 29–31. Available in: http://www.nature.com/news/validate-personal-air-pollution-sensors-1.20195.

Paulos, E., Honicky, R.J. & Hooker, B. 2009. Citizen science: enabling participatory urbanism. In Foth, M. (ed.), Urban Informatics: The Practice and Promise of the Real-time City. IGI Global, Hershey, PA. 414–436.

Van den Elshout, S., Léger, K. & Nussio, F. 2008. Comparing urban air quality in Europe in real time: A review of existing air quality indices and the proposal of a common alternative. Environment International 2008; 34. 720–726.

Wang M., Beelen, R., Bellander, T., Birk, M., Cesaroni, G. et al. 2014. Performance of Multi-City Land Use Regression Models for Nitrogen Dioxide and Fine Particles. Environmental Health Perspectives 2014; 122. 843-849.

Suomalainen, S., Pässilä, A., Owens, A., Worrall, M.

Title: Landscape Alive: Pilot Study Report Of An International Collaborative Smart Parks Project Utilizing Appropriate Digital Technology, Artful Inquiry And User Participation

Pilots, Demos and Experiment Case

Abstract

This paper reports on, a new international initiative called 'Landscape Alive'. This is based on a 'Smart Park' project, started in 2013 at Häme University of Applied Sciences in Finland that has now been extended to Birkenhead Park, through collaboration with Birkenhead Park, part of the Parks and Countryside Service, Wirral Metropolitan Council, UK. Although digitalization has previously been used to share information in parks and open spaces, we are generally lacking a mechanism to conceptualize guidance for experiencing parks and open spaces, particularly in sharing experiences interactively in ways that activate people to use the area. The project is concerned with aesthetic, sensual, experienced–based, sustainable approaches utilized through digital technology and informed by the concepts of artful inquiry and user participation.

At present a range of applications are used to share information, but user experience is not evaluated or assessed. Landscape Alive aims to produce stakeholder information for parks and to inform management plans prepared by public park administrations to evidence their value, show response to the desires and aspirations of users and provide feedback into the application for further interactive use. Park management always requires a strategic plan to combine aims from the operational, tactical and policy levels (Randrup & Persson 2009, 31-40), Landscape Alive with its radical approach to open space management has the potential to speak to all three levels.

This aim of this paper is to open up the theoretical framework and practice based research approach used in the initial stages of the pilot project and reflect on the implications of early results. The theoretical framework is based on the theory of Third Space (Soja 1996, 57) and practices of Learning Jam (Lehikoinen, Pässilä & Owens 2015) that aims to produce new knowledge through arts-based learning approaches to create dialogue through interaction (Pässilä, Owens & Pulkki 2016, 2; Pässilä, Oikarinen & Kallio 2013, 159-177).

The distinctive feature of this study is that it makes use of both artful inquiry and appropriate technology in the design and realization stages. Artful inquiry is a qualitative symbolic constructivist approach to social science research. In this qualitative form of research, art like, non-routine portrayals such as photographs, drawing, dramatization are used to elicit, challenge, and shift existing sense making frameworks (Barry 1996, 411-438). The development

of intersubjective understanding is central as respondent and researcher interpretations interact to create multiple forms of meaning. The methodology is used here to produce new innovative thinking for park and open space management. The larger research project will focus on how digitalization can promote experiences and activate people to use parks and open spaces.

The initial stage of the pilot took place at Häme University of Applied Sciences in Finland, drawing on participatory and democratic art-based learning techniques (Adams & Owens 2015), in particular the 'drifting' method (Owens & Holtham 2013). The results demonstrated that the environment can be experienced in new and different ways when all senses are used (Suomalainen, Pässilä, Owens & Muuronen 2015, 15-17). The outputs of this work were then used in the development of digital interpretation for Lepaa campus called 'Smart Park'. The carefully documented pilot process created a base for critical co-reflection through which key implications have been identified and an initial conceptualization of the technique has been constructed. It is anticipated that ways of learning new to this field will be introduced and created as a result of the border crossing between education and working life. In addition, it will develop the organizations involved in terms of stakeholder participation. The main limitation is that full conceptualisation will require further practice in a range of settings over time.

Keywords: Smart Park, mobile guiding, artful inquiry, user participation

Introduction

Digitalization has been determined as a megatrend by the EU and has lead to rapid linkages between the social sciences and technologies in a wave of innovation and growth. The Finnish Innovation Fund, Sitra (Särkkä, Konttinen & Sjösted 2013, 35) for example highlights digitalization in the form of Green Entertainment and media that can promote visits to parks and green spaces. Several systems and applications have been used in these public open spaces to deliver information about the area. To date these have tended to be framed as 'visitor experience evaluations' focusing on the quality of experience provided by open public space experts and inclining to factual verifiable data such as ease of access, cleanliness and range of activities available. Whilst this is useful, we are interested in moving beyond such factual tick-box data towards perceptions of human experience and the knowledge generated through exchanges of these experiences. This form of experimental interactive knowledge should not be confused with studies such as the Green Decision project in Finland 2006-2008 which focused on combining ecological and social information in urban planning studies, urban forest planning and decision making. Our target is to utilize perceived experiences, expressed through stories and other artful forms in smart parks and to disseminate them through dialogue and the use of the senses.

Parks and open spaces are sources of natural experiences, irrespective of their size or the situation. The Finnish Innovation Fund, Sitra describes nature values ranging from agrarian nature through to the experimental nature in a modern society. The connection and ethereal values of nature are changing over time. Nature in a modern society is connected to experiences, to self-fulfilment, to ubiquitousness and to the information society, it is a pillar for human well-being and it will be achieved by using the senses (Särkkä et al 2013, 15-31).

The involvement of users in park and open space management planning has often been undertaken at a cognitive rational level, with a lack of attention to visitors' experiences or the aesthetics of the space. This is often due to the

use of a formal, pre-determined participatory process. Other opportunities for participation are often available when new sites are planned, but not more constantly in terms of park and open space management. The key stakeholders are often both regular park users, but other tourists and short-term visitors should be involved. Furthermore, multicultural aspects and uses are not well known or considered. In this study, the involvement of all user groups is seen as critical in the move to inquire into perceived experiences, such as use and how users value the area.

Human experience has long been used in urban planning. For example, the method sosiotope mapping, developed in Sweden is used to produce map-based data of perceived direct open use values of the environment for landscape and urban planning processes, thereby enabling dwellers to be involved in planning and developing public green spaces (Ståhle 2004, 19). A digital technique used in sosiotope mapping is participatory GIS (participatory geographical information system). The Finnish innovation Soft Gis enables the study of people´s experiences by using soft experimental GIS data and hard register based GIS data (Kyttä & Kahila 2011, 2). Whilst these methods produce experimental information for urban planning processes, our target is to involve users and use their experiences as an integral component of park and open space management.

We have designed the 'Landscape Alive' project to conceptualize the use of individual and socioecological knowledge for Smart Parks. The project will utilize digital technology to share information and the human experiences of users. It will be built up to serve as an optional guide of the area's history, it´s development and it´s nature. Furthermore, the interactive dimension will enable sharing and enhance visitors´ experiences. Individual stories and informal stories will continuously generate information for park and open space management.

Content

Our practical case example is the ongoing learning and development project Landscape Alive which grew out of the initial pilot project at Lepaa Campus. The form of artful inquiry used was a basic situationist practices, the dérive [literally: "drifting"], a technique of passage through varied ambiances. Dérive (drifting) involves playful,constructive behaviour and awareness of psychogeographical effects, and is thus quite different from the classic notions of a journey or stroll. We have adapted this (Owens & Holtham 2013) for use in a range of professional contexts where the aim is to generate interactions and conversations, by rendering the familiar strange through a collective psycho-geographical drift through the landscape.

A group of 40 students studying Landscape Design drifted around their campus, a site they were very familiar with. The briefing for the drifting licensed forms of behaviour highlighted by Guy Debord (1931-1984) the originator of the concept of the Derive (1957), this included moving in groups of two or three. The approach involves: taking account of the weather to pause; noticing the shade; keeping warm in places that appeared to attract the sun; taking routes not based on a professional need to achieve goals; creating an awareness of metaphor in the landscape; encouraging the sharing of memories and dreams triggered and stories recalled or that seemed to connect. The students were also invited to photograph what they noticed and reflect on the reason why they had chosen a particular place, object or subject. The drifting, in other words, legitimised the noticing of that which, in the business of everyday life on campus, could be so easily passed by, through the sharing of what had been noticed.

When back in the class room, the small groups were invited to create group sculptures with their bodies that incorporated them holding and so displaying their chosen photograph. The rest of the group were then invited in turns to step out and move round the created sculpture park and interpret what they saw and articulate the thoughts this prompted and the feelings it gave rise to. Central to this was the valuing of the imagination and the unique individual human experience of each individual as they drifted and shared and exchanged their noticings, information and imaginings (Picture 1). This form of interaction can be characterised as social learning through the arts and there is a long history of this, whether it be performance or artistic activities in community settings, or creative practices with businesses: in each case it shares inter-subjective imaginings, the ways in which people might interact creatively, and in so doing construct ideas about others, culture, space and place that interests us (Adams & Owens 2015).

Picture 1. Drifting legitimized noticing something new on campus and sharing the human experience.

This basic activity of drifting is now being developed to allow for international information and knowledge exchange aimed at gathering stories and experiences that can be used both by visitors and park managers as an aid to deepening appreciation of the many facets of both Lepaa Campus in Häme University of Applied Sciences in Finland and Birkenhead Park in the UK.

To summarise development to date, the process started with the pilot project in 2013 as a research and development initiative at the Smart Park Lepaa Campus in Häme University of Applied Sciences in Finland. The next phase of project commenced in 2015 as an international development, working with Birkenhead Park, UK. This stage of the pilot involved the use of the digital technology to present users' stories and experiences of this internationally important public park. Furthermore, it utilized international knowledge and cultural diversity.

The Landscape Alive concept is based on the idea of Third space and it links co-creation, arts-based storytelling and lived experiences. Relevant elements of it are also learning and practice-based innovations. Practise-based (Harmaakorpi & Melkas 2012, 437-452) and arts-based (Pässilä 2014, 285-301) approaches to knowledge production in development will be utilized in the larger study of which this case is a part.

Through the initial pilot we have clarified the essential aim of the project which is to create a concept for sharing experiences and experiencing parks in a new way. We approach utilizing digital technology from a postmodern political geography position and through the idea of “third space" (Soja 1996, 57), namely that spaces that are both real and imagined (Lehikoinen, Pässilä & Owens 2015). According to Soja (1996, 57) in such spaces “...everything comes together... subjectivity and objectivity, the abstract and the concrete, the real and the imagined, the knowable and the unimaginable, the repetitive and the differential, structure and agency, mind and body, consciousness and the unconscious, the disciplined and the transdisciplinary, everyday life and unending history.”

The project’s long-term aim is to enhance park and open space landscape sustainability in urban areas using visitors´ and users’ knowledge and experiences of parks and open spaces. The approach has clear benefits in terms of the sociality field, but in addition, socioecological and economic benefits can be achieved. The project’s implementation makes use of appropriate technology and content provided by visitors and other parks and open space users.

Conclusions

The pilot aimed to gather stories and experiences that could be used both by visitors and park managers as an aid to deepening appreciation of the many facets of both Lepaa Campus and Birkenhead Park. It was instrumental in helping us to conceptualize an artful inquiry approach to the use of individual and socioecological knowledge for the interpretation, promotion and management of Smart Parks.

Ethnographic challenges presented themselves when the Smart Park on Lepaa was first developed. The aim of the Smart Park, following the initial experimental work with students, was to test mobile guiding applications in Lepaa campus park. The data collection during 2013-2015 showed that content can readily be generated through such forms of artful inquiry, in order for people to experience the area in interactive ways. It was also seen during the Smart Park development process that visitors who used the mobile guiding, listened to stories and also shared their experiences, hence producing richer information about the user experiences of that area.

Artful inquiry has created the base for critical co-reflection between international collaborators, committed to finding new ways of developing organizations entrusted with the management of open public spaces; this has been conceived in terms of participation involving stakeholders not only as visitors but as users. The challenge in the next stage centers around the engagement of people from different backgrounds to work with this development project. As such, it resonates with the challenges of those contemporary social innovators seeking to shift from a reliance on only scientific and technical innovation to a more balanced situation in which this is combined with innovation based on doing, using and understanding (Pässilä & Oikarinen 2014, 203-221), such as the techniques employed in Landscape Alive.

References

Adams, J. & Owens, A. 2015. Creativity, Education and Democracy: the practices and politics of learning through the arts, London: Routledge.

Barry, D. 1996. Artful inquiry: a symbolic constructivist approach to social science research, Qualitative Inquiry 1996; 4.411-438

Debord, G. 1957. Report on the Construction of Situations, Situationist International On-Line

Harmaakorpi, V. & Melkas, H. 2012. 'Epilogue: Two Modes of

Practice-Based Innovation', in H.Melkas and V. Harmaakorpi (eds.)

Practice-Based Innovation: Insights, Applications and Policy Implications:

Heidelberg: Springer. 437-452

Kyttä, M. & Kahila M. 2011. Soft Gis methodology. Building Bridges in Urban Planning in GIM International 2011: 2.

Lehikoinen, K., Pässilä, A. & Owens, A. 2015. Critical Reflection and the Arts as Third Spaces, Paper presented at OLKC, Milan, Italy, March 23.

Owens & Holtham 2011. Using the Urban to span Diverse Disciplines, PESTLE Glasgow:LSE

Owens, A. & Holtham, C. 2013. The derivé, Learning through walking about. PP-presentation, University of Chester and Cass Business School of City University. Non-Published References.

Pässilä, A., Oikarinen, T. & Kallio, A. 2013. Creating dialogue by storytelling. Journal of Workplace Learning. 25; 3: 159 – 177.

Pässilä, A. 2014 Tutkimusperustainen teatteri ja tiedon muotoutuminen organisaatiokontekstissa. P. Korhonen ja R. Airaksinen (ed.), Hyvä hankaus 2.0. Helsinki: Draamatyö. Taideyliopisto Kokos-julkaisusarja 1. 285-301.

Pässilä, A. & Oikarinen, T. 2014. Research-based theatre as a facilitator for organisational learning. P. Meusburger, A. Berthoin Antal, L. Suarsana (eds.), Learning Organizations: Extending the Field. Dordrecht; Springer Verlag 2014. 203-221

Pässilä , A., Owens, A. & Pulkki ,M. 2016 Learning Jam: an evaluation of the use of Arts Based Initiatives to generate polyphonic understanding. Journal of Higher Education, Skills and Work-Based Learning 2016; 6.2.

Randrup T. & Persson B. 2009. Public green spaces in the Nordic countries: Development of a new strategic management regime. Urban Forestry and Urban Greening 2009; 8.38. 31-40.

Soja, E. 1996. Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places. Oxford: Basil Blackwell. 57

Ståhle, A. 2004. Sosiotope mapping- exploring public open space and its multiple use values in urban and landscape planning practice Nordic Journal of Architectural Research 2004; 4.19.

Suomalainen, S., Pässilä, A., Owens, A. & Muuronen, V. 2015. Drifting - metodinen lähestyminen kaupunkitilaan in Mustonen (ed.) 2016 Kohti kokonaisvaltaisempaa opetusta- moduuliopetuksen ensitoteutukset Lepaalla. Tampere: Juvenesprint.15-17

Särkkä S., Konttinen L. & Sjöstedt T. (ed.) 2013. Luonnon lukutaito - Luo liiketoimintaa vihreästä hyvinvoinnista. Helsinki: Erweko 2013; 15-35

Virtanen, M.

Title: Smart Solutions at Sports Events: Case Lahti2017 Pilots, Demos and Experiment Case

Abstract

Each year, large-scale sporting events and activities convene hundreds of millions of people globally. Events play an important role in communities and in peoples' lives and also act as economic drivers. However, events also cause negative environmental impacts through, among other things, energy use, travel, consumption and temporary and permanent construction. The trend in sports has been to organize massive events to attract international crowds, publicity, sponsors and partners. As business entities, events seek to make profit, but are also increasingly recognising the need for corporate responsibility. The large scale of events and the number of people involved also provides still little-used opportunity to innovate, pilot and showcase smart technologies and solutions.

In Finland, an interesting example of cooperation to find new sustainable solutions is the work related to the FIS Nordic World Ski Championships 2017. The championships are held in Lahti as part of the Finnish centenary celebrations in February-March 2017. The aim of Lahti2017 is to leave a sustainable legacy also on the environment with the slogan "not for 10 days but for the next 100 years". To reach this goal, event organisers aim to innovate smart solutions together with partners and suppliers. This effort is supported by Sitra, the Finnish Innovation Fund, with a shared interest of promoting resource efficiency and circular economy.

The cooperation between Lahti2017, Sitra and partners provides an opportunity for participating companies to rethink their own activities from a circular economy point of view. Within the Lahti2017 organisation, cooperation has strengthened commitment to sustainability and raised the ambition level. The aim is not only to organise a sustainable event but to influence future actions.

This paper aims at analysing the main challenges and possibilities related to sustainability of sporting events, and describing the approach to sustainability at Lahti2017. The paper focuses mainly on the environmental aspects of sustainability. The author is the Environmental Manager for Lahti2017, and this paper is partly based on observations and data gathered from workshops and meetings, as well as personal communications within the event organisation team and with partners.

Keywords: events, sustainability, Lahti2017

Introduction

Sustainability in events can be approached from different viewpoints with Pernecky (2013, 22-23) presenting three different characteristics. Firstly, sustainability as continuance, referring to maintaining or continuing the existence of something, for example, an ecosystem. Secondly, sustainability as orientation, referring to a normative approach that encompasses, for instance, environmental management schemes. Thirdly, sustainability can be

seen as fundamental relationships between human beings as well as human beings and nature. Events are an important part of people's lives and in the functioning of societies, and must thus be significant players in the arena of sustainability.

Sustainability in events is a broad phenomenon, which should include social, cultural, economic and environmental concerns. The sustainability of large events has been criticised for a top-down approach focusing on best practices and technological solutions, instead of encouraging social and cultural transformation. In addition, there is a lack of efficient mechanisms for diffusion of processes or practices between event organisers (Hayes & Horne 2011, 759-761).

The environmental bottom line of events can be described under the acronym of four R's: recycle, reuse, reduce and rethink (Fenich & Strick 2013, 183-185). Most events nowadays recognise the importance of the three first R's, with many good examples of reuse and recycling. For example, Jukolan Viesti orienteering relay, which is organised annually at different locations in Finland with around 30 000 participants and spectators, reuses most of the equipment and materials. The organisers transfer, among other things, wooden fences and constructions, LED screens, signposts, scoreboards and sauna stoves to the following year's organiser. (Ojala 2016.) However, if events wish to act as examples of sustainability, rethinking and new innovation is also needed.

New innovations in events can be achieved through collaboration with different stakeholders. Earlier, sustainability impacts were mainly addressed to the event-goer, while now the scope has widened to include suppliers, partners, and at least to a certain extent the local community (Henderson 2011, 250). Industries support sports either as a supplier or a sponsor in one way or another, including the food, textile, plastics, chemical and energy industries. The involvement of industries brings both economic pressure that can override environmental concerns, but also possibilities for innovation and showcasing.

Lahti2017, the FIS Nordic World Ski Championships in 2017, a 12 day event of 21 disciplines, will bring together 700 athletes from 60 countries, 200 000 - 300 000 spectators, 2000 media representatives, 500 million TV-viewers and 2000 volunteers. Winter games have a long history in Lahti with the first Salpausselkä Ski Games organised in 1923. (Kiuru 2016.) The 2017 world championships are organised for the 7th time in the traditional Lahti Sports Centre, with the possibility of using mostly existing facilities in the Centre and surrounding area. Another positive aspect is the location of the venue, which is within walking distance from the city centre and railway station with good train connections to the capital Helsinki.

The long tradition of winter games in Lahti means that the attitudes towards Lahti2017 are positive and the local community is enthusiastic to participate through, for example, schools and volunteering. The City of Lahti forms part of the Lahti2017 organisation. The size of championships poses, however, new types of management challenges. For example, the number of spectators creates pressure for logistics, accommodation and telecommunication services. There are around 200 listed spaces used for championships, each of which needs services. Besides the actual sports activities, the championship festivities include a wide range of media activities, music and entertainment, catering, volunteer services, medal award ceremonies at the city centre, etc.

Environmental management is based on the EcoCompass Event management system, which is a system designed for events according to international standards. EcoCompass includes an environmental program for different sectors and an external auditing during the event. (Ekokompassi 2016.) The main environmental aspects, stakeholders and outputs of Lahti2017 are presented in Fig. 1.

Figure 1. The main environmental aspects at Lahti2017.

Smart Solutions at Lahti2017

Lahti2017 has contracts with over twenty international and national sponsors, official suppliers and institutional partners (Lahti2017a 2016). Most of the procurement is done via these contracts, which on one hand limits the choices but on the other hand provides cooperation opportunities to find new and smart products and services for the championships. All partners and main suppliers are asked to sign a Code of Conduct outlining joint principles on management, occupational health and safety, environmental impacts, responsible business, human rights, basic worker's rights, and wages and working hours.

The Lahti2017 environmental work is supported by Sitra, the Finnish Innovation Fund, which is also an institutional partner. Sitra has an ambitious vision on circular economy, which is seen as a 2.5 billion Euros opportunity for Finland. Sitra cooperates with businesses, municipalities and cities, households and public administration to enact an extensive systemic change. (Sitra 2016.) With Lahti2017, Sitra acts as a facilitator supporting the organisers and companies in finding sustainable solutions to the championships and also for the longer term.

The first workshop with Sitra was held in June 2016 with around thirty participants from partner companies, EcoCompass Event project, Gaia Consulting Group, Protect Our Winters (POW) and Lahti2017 (Fig. 2). The

workshop included short introductions to resource efficiency and circular economy, innovation of ideas for the championships, and drafting of pledges or action plans from each organisation. The participants responded positively to the possibility to find new solutions, although their starting points were quite different. For some of the companies involved, sustainability is a key issue, while for some the topics were quite new. The action plans done covered a broad range of issues like the use of materials, carbon neutral meals and the minimisation of food loss, joint rides, the use of eco energy and a communications campaign. One outcome of the workshop was also a symbol for work on sustainability; a green snowflake.

Figure 2. Sustainability Workshop (photo Ewa Wikman).

The workshop will be followed by discussions with partners to concretise the plans. Sitra and Gaia Consulting Group act as facilitators, as needed. Lahti University of Applied Sciences is also involved in the process and can assist with, for example, material flow analysis and other studies needed. The follow-up workshop is scheduled for September 2016, and the aim is to finalise the implementation plans to get things ready for the championships.

Communication is an essential part of cooperation and a means to engage main stakeholders: athletes, audience, media, volunteers, partners and special guests. The plan for the communication campaign includes joint efforts with Protect Our Winters (POW), Suomi100Forum seeking future solutions, and a sustainability event during the championships. POW is an organisation mobilising the snow sports community to act against climate change and to save winters. Finnish Ski Association is a main supporter of POW, which provides a direct link to Lahti2017 with plans for a visible snow campaign before and during the championships. (Finnish Ski Association 2016).

The aim of sustainability communication is to engage stakeholders and encourage rethinking of environmental issues during and after the games. Activities include, for example, encouragement of the audience to use public transportation or start using green energy, public comments by athletes and cooperation with schools. Local schools in Lahti are involved in Lahti2017 especially in cultural activities, and there is a schools Green Team coordinating environment-related activities. School children have participated in planting trees together with Stora Enso and POW (Lahti2017 2016b), setting up bird houses (Lahti2017 2016c), as well as environmental activities at the 2016 pre-games with positive feedback (Fig. 3). Many volunteers are students from the local Lahti University of Applied Sciences and Salpaus Further Education Consortium.

Figure 3. School children at the 2016 pre-games (photo Maarit Virtanen).

Lahti2017 and Sitra have been involved in Suomi100Forum that was organised during the pre-games in 2016 and will take place again in 2017. Suomi100Forum is a place to discuss future business, work and knowledge in Finland. The concept includes a future forum, challenges presented by partner organisations, a student forum and public discussions. In 2016, Sitra's challenge was called: "From sausages to insect burgers: What does circular economy mean in the event industry." (Suomi100Forum 2016). The circular economy theme will continue in 2017 and is linked to an international sustainability event organised during the championships by Lahti2017, Sitra, EcoCompass Event Project and Lahti University of Applied Sciences.

The cooperation between Lahti2017 and Sitra also aims at promoting sustainability in future events. It has been agreed to collect a lessons learned report after the championships for the use of future organisers. Another aim is to challenge FIS, the International Ski Federation, to address sustainability issues more concretely in all activities. FIS has environmental guidelines for world championships (FIS 2009), but these could be more ambitious with more communication about best practices and smart solutions.

Conclusions and recommendations

Events have an important role in communities and can also act as sustainability examples. The involvement of companies in events creates economic pressure that can override sustainability efforts, but also cooperation possibilities. The fact that most companies nowadays invest in corporate responsibility means that they expect the same from event organisers.

Especially large events are becoming environmentally aware with environmental management systems and efforts to recycle, reuse, organise sustainable transportation, etc. What makes Lahti2017 different from other events, is the extensive cooperation with Sitra and partner companies to find smart solutions. This supports the possibility to organise a sustainable event, and perhaps even more importantly to influence the audience, athletes, media and other partners. The cooperation with Sitra provides a good opportunity for companies involved to rethink their own activities. Within the Lahti2017 organisation, the involvement of Sitra and partners in environmental work emphasises the importance of these issues and strengthen the organisation' commitment to sustainability. Furthermore, cooperation has raised ambition and enabled a move towards circular economy thinking and finding smart solutions.

References

Ekokompassi. 2016. Ekokompassi tapahtumille [referenced 14 July 2016]. Available at: http://www.ekokompassi.fi/tapahtumat/

Fenich, G. G. and Strick, S. 2013. Conventions and Conferences: Trends and Challenges in Sustainability. In Pernecky, T. and Luck, M. (eds.). Events, Society and Sustainability: Critical and Contemporary Approaches. Routledge. 179 – 193.

Finnish Ski Association. 2016. Hiihtoliitosta yksi POW-ilmastoliikkeen päätukija [referenced 12 July 2016]. Available at: http://www.hiihtoliitto.fi/en/uutiset/hiihtoliitosta-yksi-pow-ilmastoliikkeen-paatukija/

FIS. 2009. Environmental Guidelines for Sustainable FIS World Championships [referenced 12 July 2016]. Available at: http://www.fis-ski.com/mm/Document/documentlibrary/MajorEvents/03/66/27/wsc-candidates-2019_environmental-guidelines_Neutral.pdf

Hayes, G. & Horne, J. 2011. Sustainable Development, Shock and Awe? London 2012 and Civil Society. Sociology 2011; 45(5). 749-764.

Henderson, S. 2011. The development of competitive advantage through sustainable event management. Worldwide Hospitality and Tourism Themes 2011; 3(3). 245-257.

Kiuru, J. 2016. Lahti2017. Presentation at Smart Cities in Smart Regions Conference site visit 12th May 2016. Unpublished.

Lahti2017a. 2016. Lahti2017 FIS Nordic World Ski Championships [referenced 12 July 2016]. Available at: http://www.lahti2017.fi/en/lahti2017-front-page.

Lahti2017b. 2016. Salpausselällä tempaistiin puita istuttamalla ilmastonmuutosta vastaan [referenced 26 September 2016]. Available at: http://www.lahti2017.fi/salpausselalla-tempaistiin

Lahti2017c. 2016. Salpausselän linnuille omat MM-pöntöt [referenced 26 September 2016]. Available at: http://www.lahti2017.fi/salpausselan-linnuille

Ojala, I. 2016. Field and Service Manager. Lahti-Hollola Jukola. Personal communication 15.6.2016.

Pernecky, T. 2013. Events, Society and Sustainability: Five Propositions. In Pernecky, T. and Luck, M. (eds.). Events, Society and Sustainability: Critical and Contemporary Approaches. Routledge. 15-29.

Sitra. 2016. A circular economy can be a 2.5 billion euro opportunity for Finland [referenced 12 July 2016]. Available at: http://www.sitra.fi/en/ecology/circular-economy.

Suomi100Forum. 2016. Keskusteluteemat [referenced 12 July 2016]. Available at: http://suomiforum.fi/keskusteluteemat/.

THEME C. Smart Industry and Innovation

The world is in anticipation of a fourth industrial revolution. This revolution is driven by giant leaps in digital technologies and promises to radically alter the face of industry in the coming decades. The uptake of industrial internet and internet of things in manufacturing create new value chains for the traditional industries. Innovations will underline the importance of digital and sustainable business solutions as key drivers for success. Can regional economies and innovation systems respond to this? If entire development and production processes become digital, will regions and cities remain the key spatial units, where knowledge is transferred, and competition to attract investments and talents takes place?

We are living in the world, where digital information and the digitalization is changing the word and our daily life rapidly. This trend seems to be speeding up all the time. Where ever we are or where ever we go, we find more and more possibilities to communicate, work and live our lives by using digital services.

The right skills, a sharp focus, and a passion for learning and adaptation are a must for enterprises to succeed in the digital universe of tomorrow. The digital revolution will continue to grow at a rapid pace and flood already saturated business infrastructures. Digitalization can offer a company a chance to rethink all operations and to improve responsiveness to customer needs and demands. This track invites research and case studies on the impact of digitalization to traditional industries as well as new market opportunities and jobs created by digitalization.

Gaddi, R.

Title: Creative Industries: Cultural and Territorial Development Model? Pilots, Demos and Experiment Case

Abstract
Design approach, creative catalyst for entrepreneurship, is a disciplinary territory that spans inspiration all along from the worlds of art and culture. In particular, within the design industry, there are many cases where we have the possibility to show convergences between culture and creativity and how the world of design is a founding element of contemporary culture, whose birth dates back to the scientific definition of Cultural Studies, social studies that was born in Britain in the Sixties as an extension of traditional culture towards mass culture, that revolutionized the way people think about the relationship between individual and messages.

In fact, culture usually springs out from conflict and overlapping groups, each of which is defined by his particular lifestyle, is included in its institutions and social relations, in its beliefs and customs and its use of objects in the material life (Fiorani, 2007).

Members of a subculture use to differentiate themselves from the rest of society with common objects, music, or a certain type of clothing or hairstyle. Therefore, objects produce style, consistent set of expressive elements.

An element of innovation that helps to promote the beneficial contribution of creativity for culture can come from design, where the theoretical and practical dialogue blends the ability to work closely with the major labels. The opportunity to act with such a broad phenomenon as design, from the perspective of both practical (design professionals) and theoretical (academic approach), social and stylistic, nudges the operational tools to amplify the potential of a designer, now known as an interpreter, and not anymore a proponent of contemporary culture.

Keywords: Creativity, Culture, Design, City

From creativity economy to creativity industry: an analysis framework
The debate triggered by Richard Florida about the rise of the Creative Class (Florida, 2003) involved a multiplicity of subjects who daily face the changes and challenges of the city: local governments, development agencies, universities, associations trade, just to name a few of them.

The question underlying the debate is about the processes that a city (and consequently its citizens) has to follow, and even before the potential that must have, to grab the opportunities of the knowledge economy, system of consumption based on the intellectual capital.

Our societies are permeated by the productive power of creativity. The professions where individuals can apply their creative abilities to identify and solve complex problems are increasing. The knowledge economy induces competition based on intangible bases, and so the research, the refinement

of creative talents, the individual talent as the ability to exploit it as a team, is rewarded. In this context, the city becomes a creative habitat.

In recent decades, the importance of cultural industries and the consequent production of culture has grown, related to the growth of demand for its goods and services. The development of the new economy, financial activities related to the application of the most advanced information technologies and telecommunications, has produced tools for the consumption of culture, available and affordable at relatively low cost in every part of the world, for billions of people.

Thus, the demand for culture has registered significant growth as a result of the development of education and the increase in income. This global trend has driven the demand for goods of the "content industry" (publishing, cinema, music, audio-visual, museums,...) and cultural and ancillary services to the markets of cultural and creative goods industries (advertising, legal systems, training). A new phase of economic development of material culture or economy of goods for the person and its habitat has changed and increased the international trade system.

This huge market consists of all goods and services produced for the survival, protection, comfort, entertainment, culture, and human well-being, not only has expanded and consolidated, but has become more open. In particular, the market for goods based on the material culture has radically changed, moving from competition based on low production costs to the competition based on the quality and content of products; consequently the immense productive sector of the material culture heritage (which in Italy largely corresponds to the Made in Italy) is pulled by an increasing demand for quality products and contents, which is expressed in the traditional (and so local) aesthetics, decoration, design, and knowledge.

At the base of the production of goods of cultural industries is fundamental the contribution of creativity, for several reasons:

- creativity is an input process both aesthetic and functional, and thus has an impact on the intangible component and intellectual property products;
- creativity catalyzes innovative technological processes, and thus has a dual impact on productivity and technical quality of the products;
- creativity adds to the products a symbolic component with an impact on their supply and competitiveness.

We find creativity in our culture, in our territory, in the quality of our daily lives and our products. In this sense, creativity and culture become pillars for social quality, just, economically developed, culturally alive, and with an high quality of life.

Creativity is a fundamental resource for the post-modern society, which needs increasing intellectual capital to face the challenge of the knowledge society. The nodal question around creativity and its beneficial effects on our societies is precisely decipher the operational mode to figure out how to produce creativity, and how to pass it on to future generations.

The creative process is influenced by the atmosphere in which culture develops. The more the cultural environment is free, interdisciplinary and challenging, the greater the production of creativity and talent. Here lies the importance of the creative human capital through the education system and the learning field.

The creative industry for cultural promotion processes: synergies and methodologies

Culture and creativity can be combined in different ways, depending on the historical conditions of countries. Some of them prevail in some technological aspects, in others economic aspects related to the development of markets and business; in others the legal aspects and the application and development of copyright, in others the cultural, appeals to tradition, to the territory and social quality.

In order to define a methodological framework about the use of creativity into cultural development processes, it is possible to define two distinct models:

- Creativity for innovation.

Creativity and cultural production are considered growth factors of the knowledge society, communications technology and content industries. Key points are scientific research, markets, business, product marketing and creative services. Cultural and creative industries are strongly linked of those based on the allocation of copyright: the audio-visual sector, cinema, music, software, live entertainment, publishing.

- Creativity for social quality.

The main reference is to the manifestations of culture and social life, and sectors which express them. Special consideration is devoted to the world of material culture that embraces the wide range of markets for the individual goods and services. Similarly are important factors for the progress of social quality development of content industries and enhancement of cultural heritage. While the model of creativity for innovation and its insistence on the technological aspects is typical of northern European countries and North America, the model of creativity for social quality and its reference to culture, territory, society, cultural districts and creative city looks better interpret the direction of the creative processes of the Mediterranean countries, African, Latin American and Asian.

In this division of the world according to creativity models, Italy has a position between those who aspire to move towards new successes the technological frontier of innovation and who wants the advancement of creativity is shaped by ethical reasons and the aesthetic quality and social of common life. For these reasons the Italian experience has a particular meaning in the international arena. Historically, Italian creativity manifests itself in a model that privileges the social quality and is based not only on technological innovation but also on the development of material culture, in all its branches, aesthetic, artistic, historical and design.

Social quality can be defined as the extent to which people are able to participate in social, economic and cultural development of their communities in conditions that improve the well-being and individual potential.

At the same time the social quality can be defined as that which allows individuals access to culture and cultural heritage, the fundamental values of citizenship, to enjoy good health, to participate in community life, increase its planning. Culture is an important component for the social quality. Primarily because its production and its daily consumption push the enhancement of the social fabric in terms of community cohesion, quality of human relations, feeling of confidence, willingness to cooperate, a sense of identity. All this changes the constraints and opportunities of everyday life by making the first and second best less stringent and more numerous.

The heart of the Italian model is the bond of creativity and production of culture with history and territory. The cultural and creative industries are strongly marked by the territory.

The historic cities, industrial districts, and technological innovations have a long history of accumulation of knowledge and experience. Technological innovations, information, content, communications and intellectual property that are the new strategic resources have a partial delay in the experience factor current Italian. Cinema, audio-visual industry, software, publishing, television and radio content that the Italian action can bring fatigue to success in international markets.

The work of design as a driver of change on an urban scale is shown when it investigates the generative roots and the processes and designs on the basis of the outcomes of research acting as a catalyst for change, an engine for development, participatory working to the change from the inside.

"A new interpretation of the industrial development process has moved forward in recent years, not restricting the development process to a unidirectional growth of the companies (small, medium or large) but voting for the creation of complex systems report from the conditions district, weak or diffuse but able to produce synergies and ductility compared to the new, and original energies of expansion in mature markets." (Andrea Branzi, 2002)

If it is true that, as says Maldonado, "Industrial design (...) emerges as a total social phenomenon. That is to say that it belongs to that category of phenomena that can not be examined in isolation, but always in relation to other phenomena with which they constitute a single connective tissue", the strategic ability of design has a feature that distinguishes it, to feel local needs and see the opportunities offered by a territory.

Strategic design is always located, recovers deep qualities, enhances knowledge, connecting networks with local contexts, local creativity and global knowledge resources.

It seems clear, in this analytical framework, such as the design education acquires a strategic importance for urban contexts, transferring methods and tools in the area, approaches to research and design that are never separated from where these are pursued and developed.

Italy, while providing a strong tradition in professional design practice, is a country where until a few years ago the industrial design was not structurally inserted in university courses. This delay has in turn delayed the development of targeted research activities but also represented a starting point for the search of the institutional set-up.

It is a singular condition that in Italy, more than in other countries, has been established a design culture completely free from the training activities or research and it is for this that the sphere of the design practice, as well as took form in Italy, is a disputed special observation and representative.

In the context of the international Changing the Change Cumulus conference, a mapping of the design research system in Italy has been published (DRM Design Research Maps), care of the agency National Research SDI (Italian Design System). From that research it has emerged clearly as the design education strictly follow the Italian industrial districts, receptacles of capabilities and tacit knowledge on design, but was clearly also the reverse:

where design is taught and where you search on design, then you have a key productivity gains and applied research financed by companies and public bodies.

Competitive tools for cultural development

Where design can be expressed in its possibilities and expansive research, then there is a sharp increase in production. The cities are the places where this evidence is more clearly. The development of a creative district depends on factors such as the resources available in the territory (tangibles and intangibles), the quality of urban life that attracts the creative class and proves the effectiveness of urban policy, the perceived image inside and outside the city, the so-called city brand, the perceived image of the vitality, quality and potential owned by the city. This process of analysis, if properly adapted to the objective national image, is a key component of competitive identity strategy.

The territorial marketing must be connected to the forms of governance aimed at promoting a territory in its tangible and intangible components and specifically consist of the activities (analysis, planning, implementation, monitoring) that work together to identify the needs of a territory and to define the most consistent actions to satisfy them. Goal of territorial marketing action is to trigger a virtuous cycle of territorial promotion which improves the condition of the place and attract investments through knowledge of the territory itself. The virtuous circle could be defined as satisfaction-attractiveness-value.

Territorial marketing is an activity that brings the concept of industrial production and into the territory, which becomes a real economic entity comparable to a companies with internal and external structures, which operates in a highly competitive environment in where the choice of geographical location becomes a discriminating vital in order to improve competitiveness. The communication therefore plays a key role in maximizing the potential of local development plan (as an industrial “business plan”), coherently and effectively to the peculiarities of geographical location, and to those of the target audience.

Main local marketing activities are:

- The design mix of goods and local services (could be like “the product”);
- Creating incentives for users (“pricing policies”);
- Improving access to products (“distribution policies”);
- Promoting the values and image of the territory (“communication strategies”).

The role of culture in promoting a city is strongly influenced by a critical issue that comes from the institutions concerned on the return on investment that is not regarded as foreign investment, exports, tourism.

Culture is often relegated to the status of non-profit activities, although its communicative potential is essential to bring out the true spirit identity of a city. The role it plays, although these obvious problematic, it is essential in a city (or territory) enrichment process because it guides the public towards a more full and lasting understanding of local values.

Explore the territory (in its morphological and geographical sense) are the only truly characteristic elements of a place, the representation of the culture of a city provides an image that functions as an essential complement to the image more related to traditional consumption. Culture can help reduce a potentially negative image, reassuring consumers.

The knowledge of a Western consumer of art, poetry, cuisine and Japanese philosophy, for example, serves as a counter to the image of Japan trade, made of miniaturization, productivity and advanced technology.

The challenge for all cities is to find ways to present and represent their cultural goals past alongside modern equivalents, difficult task due to the increased pluralism in contemporary society. Celebrate the past and its glories essentially mono cultural without marginalizing multiracial reality of the current population of a country, it reduces the temptation to stay stuck or live in the past.

The urban image and irreproducible cultural aspect is irreplaceable because it is uniquely linked to the city itself, much more eloquent of commercial brand-related sales strategies.

The communication of culture is indeed no goals, because it does not respond to the despotism of the return on investment, and its stakeholders usually do not ask more of a true representation

Conclusions
Creative cities for the development of communities and creative industries
The creative city is not only a powerful attractor of new economies, or just a place of settlement of the creative class.

In a report about the economy of culture presented by the European Commission in 2006, the industry is estimated at nearly 3% of European GDP, compared to 2% of the food, or 2.3% of the chemical industry sector.

If it is true that creativity is becoming a real development factor, it can be argued that the creativity of the city can become a great factor of production of new urban economies and thus the city that will be increasingly able to produce quality and innovation, but also new reputation based on the outcomes of processes induced by the creative class.

To the generation of new urban phenomenon, observable with extraordinary speed, one will have to respond quickly, generating planning tools and as new urban project. Sometimes modifying existing instruments sometimes spawn whole new, must remain the tension towards the interpretation of the processes to guide them towards the fulfilment of the quality and the guarantee of democratic freedoms, not to allow the market alone to guide and lead change.

The main components of an urbanism that can help the city to foster creativity have been identified in 2003 by Richard Florida, “3T” factors as technology, talent and tolerance that can feed economic development, favouring the settlement of the creative class.

Maurizio Carta (2008) identifies an additional component to the “3T”of Florida, the territory, “... as a source of excellence, as a power supply of the soft economy –the economy of excellence- and as producer of value in the capitalism of territory where the value (the capital) is essentially territorial capital, and relational identity”.

For Carta, the territory is the city, a place where we can find the grater the interaction between the components of the creative class, not least the local knowledge and capabilities that enriched so much the Made in Italy. The city for Carta not only produces energy, but activates the motor function of the evolution of a community.

Competitive factors for creative cities are for Carta summarized in three “C” and are culture, communication and cooperation, and spread out from the “3T” factors of Florida.

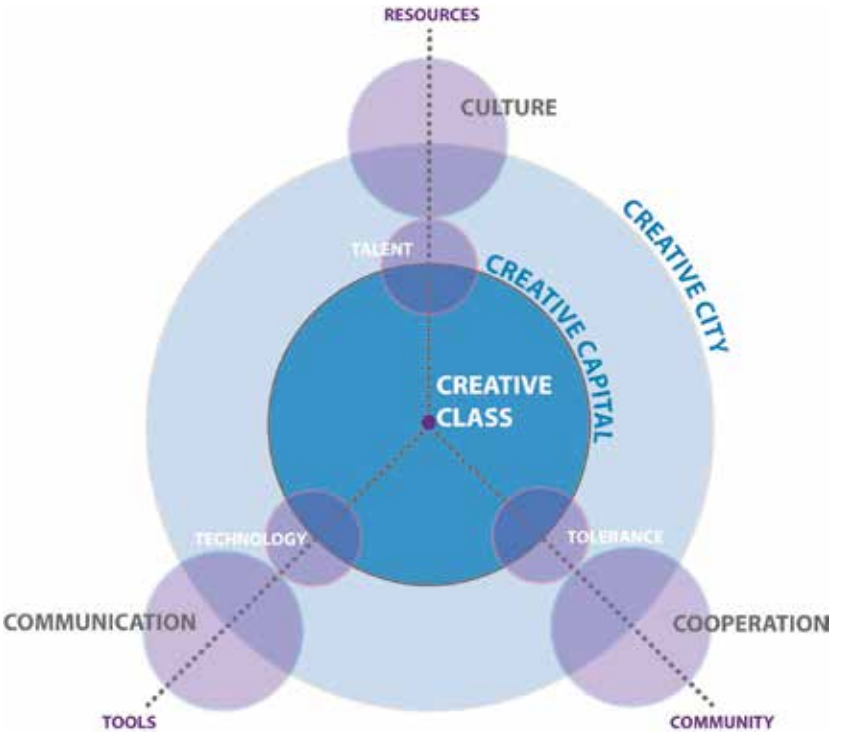


Figure 1 - Creative class / Creative Capital / Creative City, Maurizio Carta, Creative City, 2008; p. 13.

Culture is a major factor of urban creativity, because the talent of a city seen as distinctive and competitive asset is its cultural identity, diversity produced by the history that looks to the future.

The talent of a city must be put in a position to produce value, entered into the virtuous circle of the culture and the quality of the project.

Culture acts in the domain of resources to make the most creative city.

The communication, the ability of the city to inform, disseminate and engage its people, provides the means by which it is facilitated the process of innovation, and its spread.

The use of communications technology and information also allows intervention of the reduction in congestion and degradation factors: technological innovation allows the reduction of displacements, controlling pollution, improves the way people work, relocation services and repositions the central role.

Cooperation, the third factor for competitive development, redefines the urban community, assigning new clearer roles and objectives.
In global and multicultural cities tolerance does not mean tolerate the existence of other cultures but accept explicitly the differences.

Cooperation therefore means being able to put together components focusing their action towards common goals and results.

In conclusion, the creative city is not just a city open to difference, but able to mobilize its diversity to the project of the future, transforming the economy of creativity into the industry of creativity. The creative city, then, is nourished by the fruitful interaction of culture, communication and cooperation, resources for administrators, planners and designers of the city, constituting the indispensable guide to generate innovation and to increase the quality of life in urban communities.

References

Amari Monica, La progettazione culturale, Franco Angeli, Milano, 2006

Anholt Simon, L'identità competitiva: il branding di nazioni, città, regioni, EGEA, Milano, 2007

Bonomi Aldo, Abruzzese Alberto (a cura di), La città infinita, Mondadori, Milano, 2004

Bonomi Aldo, La comunità maledetta. Viaggio nella coscienza di luogo, Edizioni di Comunità, Torino, 2002

Burdett Richard e Kanai Miguel, La costruzione della città in un'era di trasformazione urbana globale, in Città Architettura e Società - La Biennale di Venezia, 10ma Mostra Internazionale di Architettura, Marsilio Editore, Venezia, 2006

Castells Manuel, Jordi Borja, La città globale Sviluppo e contraddizioni delle metropoli nel terzo millennio, De Agostini, Novara 2002

Castells Manuel, L'età dell'informazione: economia, società, cultura, EGEA, Milano, 2004

Carta Maurizio, L'armatura culturale del territorio. Il patrimonio culturale come matrice di identità e strumento di sviluppo, Franco Angeli, Milano, 1999

Carta Maurizio, Next City: culture city, Meltemi, Roma, 2004

Carta Maurizio, Creative city, Actar, Barcellona, 2008

Carta Maurizio, Urban Centers italiani: agenti creativi per il rinascimento urbano, in Bruno Monardo, Urban Center. Una casa di vetro per le politiche urbane, Officina, Roma, 2007

Cross Nigel, Designerly ways of knowing, design discipline versus design science, in Design plus Research, Conference Proceedings, May 1998, Milano 2000

Cross Nigel, Designerly ways of knowing, Birkhauser, Berlin, 2007

Cross Nigel, Engineering design methods: strategies for product design, John Wiley and Sons, Chichester, 2008

Cross Nigel, Developments in design methodology, John Wiley and Sons, Chichester, 1984

Cross Nigel, L'architetto automatizzato, Liguori, Napoli, 1985

German Federal Cultural Foundation, Shrinking cities. International research, Vol.1, Hatjie Cantz, Berlin, 2005

Guala Alessandro, Grandi eventi, immagine, comunicazione: Torino e le olimpiadi invernali del 2006, atti del IV convegno nazionale dei sociologi dell'ambiente, Torino 19-20 settembre 2003

Guala Alessandro (Chito), Mega eventi. Modelli e storie di rigenerazione urbana, Carocci, Roma, 2007

Guidoni Delbene Giacomo, Proyecto BCN. Estrategias Urbanas y

Geografias Collectivas, Ajuntamento de Barcelona, Barcelona, 2008

Fiorani Eleonora, Grammatica della comunicazione, Lupetti, Milano, 2002

Fiorani Eleonora, La nuova condizione di vita. Lavoro, corpo, territorio, Lupetti, Milano, 2003

Fiorani Eleonora, I panorami del contemporaneo, Lupetti, Milano, 2005

Eleonora Fiorani, Moda, corpo, immaginario: il divenire moda del mondo fra tradizione e innovazione, Poli.design, Milano, 2006

Fiorani Eleonora, Diversamente il Novecento, Lupetti, Milano, 2007

Florida Richard, L'ascesa della nuova classe creativa: stili di vita, valori e professioni, Mondadori, Milano, 2003

Florida Richard, La classe creativa spicca il volo. La fuga dei cervelli: chi vince e chi perde, Mondadori, Milano, 2006

Flusser Vilèm, Filosofia del design, Mondadori, Milano, 2003Francesco

Indovina, La città diffusa, DAEST, Venezia, 1990

Ingersoll Richard, Sprawltown, Meltemi, Roma, 2005

Stefano Maffei, Design and situated collective learning. The Italian experience, Cumulus Working Papers, Conference Proceedings, UIAH Press, Colle Val d'Elsa, 2003

Maffei Stefano, Francesco Zurlo, Designing a competence. Design process as the result of a "learning by interacting" practice. Evidence from Italy, in Working Papers on Art and Design, vol. 1, Conference Proceedings Research into practice, Hertfordshire University, 2000

Maffei Stefano, Simonelli Giuliano, La costruzione di un sistema istituzionale della ricerca di design. Il caso italiano. ADI Design Index 2003, Editrice Compositori, Bologna, 2003

Maffei Stefano, Bertola Paola (a cura di), DRM, Design research maps. Prospettive della ricerca universitaria in design in Italia. Visions of academic design research in Italy : 2003-2007, Poli.design, Milano, 2008

Manzini Ezio, La materia dell'invenzione, Arcadia, Milano, 1989

Manzini Ezio, Jégou Francois, Quotidiano sostenibile. Scenari di vita urbana, Edizioni Ambiente, Milano, 2003

Manzini Ezio, Bertola Paola, Design Multiverso. Appunti di fenomenologia del design, Poli.design, Milano, 2006

Manzini Ezio, Il design in un mondo fluido in Design Multiverso. Appunti di Fenomenologia del design, Poli.design, Milano, 2006

Manzini Ezio, Jégou Francois, Collaborative services. Social innovation and design for sustainability, Poli.design, Milano, 2008

Mauri Francesco, Progettare progettando strategie: il design del sistema prodotto, Zanichelli, Milano, 1996

Koolhaas Rem, Delirious New York, Electa, Milano, 2001

Koolhaas Rem, Junkspace, Quodlibet, Macerata, 2006

Landry Charles, The Creative city. A toolkit for urban innovators, Eartscan, London, 2000

La Pietra Ugo, Abitare la città, Alinea, Firenze, 1983

Antonella Penati, Design come motore di innovazione di sistema in Design Multiverso. Appunti di Fenomenologia del design, Poli.design, Milano, 2006

Saskia Sassen, Le città nell'economia globale, Il Mulino, Bologna, 2003

Saskia Sassen, Una sociologia della globalizzazione, Einaudi, Torino, 2008

Virilio Paul, Città panico, Raffaello Cortina, Milano, 2004

Johnson, J., Virkkala, S.

Title: Learning Smart Specialisation Using the Ostrobothnian Model
Pilots, Demos and Experiment Case

Keywords: Smart specialisation, gap-analysis, entrepreneurial discoveries, policy learning

Summary
The EU is building an Innovation Union with a regional policy initiative that includes Smart Specialization (S3). Smart specialization is characterized by search for new growth opportunities on a regional level. The potentials for growth are discovered through analysis of unique regional strengths.

Especially public agents have to play a proactive role in these entrepreneurial discoveries. The aim in this process of discovery is to concentrate resources on activities that are likely to transform existing economic structures, and open up for emerging opportunities. These discoveries may be made through different types of analysis. The Regional Council of Ostrobothnia has responded to the challenges of regional development with an own model based on connectivity analysis i.e. measurement and identification of the networks and gaps in the regional innovation system and triple helix (universities, industry, government) network.

The model is mapping the structures of the networks which make up relations between various forms of knowledge producers and users, including gaps measured as tensions between expectations and experiences. The model has been developed together with university partners and the core of it is to measure gaps in the triple-helix connectivity and through structured stakeholder dialogues find the instruments to bridge the gaps.

The elements in the model are:

1. Elaboration of an overall vision of a "connected region" that provides innovative growth by related variety;

2. Analysis made by measuring helix connectivity with survey and gap analysis looking for gaps between innovation partner experience and expectation;

3. Governance by visionary leadership and triple-helix co-ordination;

4. Identification of priorities by selecting the most important gaps and structured stakeholder dialogue on the gaps;

5. Definition of policy mix by measures to bridge observed gaps;

6. Monitoring and evaluation by repeating the survey: Have the gaps been bridged?

The model has been successfully applied during two rounds in Ostrobothnia, Finland and in Nordland, Norway. The regional dimension in the national approach to S3 in Finland has been tottering. From initially ignoring the dimension, new initiatives like ERM (Finnish acronym for foreseeing structural change) holds elements of S3 and designing the implementation could draw on the Ostrobothnian model.

This article will elaborate on the steps in the model and the implementing experience.

Overall vision

The overall vision for the Ostrobothnian Smart Specialisation is being a "connected region". The analysis of the AMCER-project[1] concluded that the Ostrobothnian innovation system was business-driven, the industry largely outward oriented and well integrated globally. This implied that the regional innovation system planning could potentially both draw on the regional stakeholder experiences, many with longstanding involvement in the region and also on the innovation that occurred in the business networks outside of the region. Thus the overall vision was one of a place-based development building on outward orientation.

An observation also leading to the vision was also the doubling of development efforts due to lack of connectivity among actors resulting in that similar ideas were being discussed in different fora. The actors in the Ostrobothnian innovation system consists of multiple stakeholders from all the helixes: public sector, university and business life. The representatives in the region are also made up of local, regional and regional state representatives all with different perspectives. The vision is to get a process of entrepreneurial discovery on-going as a result of a shared perspective on the regional challenges

The implication for the continued work of this was: First, horizontal triple-helix coordination would further foster innovation in the region. Second an innovation model was needed for the purpose of stakeholder communication. Finally since elements of Smart Specialisation already existed in the region before the terminology was introduced it was not a question of building an innovation system but of identifying the most urgent defaults in the existing one and introduce measures and priorities to remedy for them. This lead to a gap-analysis as a base for Smart Specialisation in the region. The strategy adapted a triple-helix model to the analysis and connectedness implied small gaps between and within the helixes.

Analysis

The analysis underlying the model builds on the central role of networks in the creation and diffusion of new knowledge. Networking reflects the growing interactivity in innovation processes. The more networks there are between the actors located in different helices, the more the helices are interacting and the more connected the region is.

Following this line the connectivity was studied through network-analysis:

- by identifying the partners of each of the actors in each helix as well as their location in the triple helix structure and in different geographical scale
- by evaluating the importance of these partners and by geographical scale and;
- by mapping how well connected the three helices are both internally and externally

[1]. **The project benchmarked the innovations systems of eight European regions:** Andalusia, Catalonia, Bretagne, East of England, Flanders , Lower Saxony, Tuscany, PACA, Ostrobothnia

In the case of Ostrobothnia the innovation partnership was classified in three categories by geographical proximity whether the partner was within the region of Ostrobothnia or Central-Ostrobothnia due common clusters. Moreover whether the partner was located within (but outside Ostrobothnia) or outside Finland.

A notion behind the Ostrobothnian strategy is that industries working in a global environment are more innovative and the base for the priorities have been the export-oriented clusters like energy, boat and fur industry comprising the bulk of the Ostrobothnian export. This has also been the base for selecting the respondents as they are assumed to have strong insights in the working of the innovation system

The original method of gap analysis developed by Ranta and Takala (2007) focused on measuring company risk levels in decision making and included quite complex calculations. We have transferred gap analysis from industrial management to the regional level in order to describe the strength of the relationship between and within helices (i.e. the connectivity). This analysis includes two key figures of "expectation" and "experience". We measured them on a scale 1-10 in order to describe the perceived utility of an innovation partner. When both are at a high level, the relation can be seen as strong, indicating a good solution in terms of regional development policy. It can then be proposed as good practice, and other actors could learn something from the strong relationship. When both expectations and experiences are low, the relation is weak. When expectations are high and experiences are low, there is a development challenge that should raise concerns for regional development planners.

By extending a survey to the respondent and analysing the gaps in networks and also the expectations of key enabling technologies "now" and "in the future". The results are compiled and the analysis of gaps forms the base for the subsequent focus seminar with the respondents discussing the underlying reasons for the gaps and finding of measures that needs to be undertaken in order to remedy for the gaps.

Following the focus seminars on the gaps that needs to be remedied for the Regional Council holds a LFA-workshop (Logic Framework Approach) with the purpose of setting the gaps into context, seeking the underlying roots for the gaps and making recommendations on the allocation of funds within the Regional Cooperation Groups (Finnish Maakunnan Yhteistyöryhmä, MYR). The process is intermittently repeated with the purpose of bridging gaps and a high score on the variables is assumed to foster innovation and resilience.

The analysis forms the innovation part of the Regional Scheme and is also integrated in the work of the Regional Cooperation Groups. The discussions of the focus groups are limited to the stakeholders but the results are communicated openly and any following measures are approved by respective authorities. The decision making on allocation of funds for innovation take place in a multi-level format with municipal, regional, national and also European financers. No single authority is able to determine the implementation of the policy in the region. In practice the policy is implemented in a multi-level dialogue, where the strategy forwards the issues that are central for the development of the Ostrobothnian innovation system.

Governance

The innovation system governance in Finland is "dirigiste"[2] implying that the initiative is centrally led. An argument for such a system would be that it

[2]. See: p. 56 of the below report classification building on Cooke (2002; 1998)
https://www.espon.eu/export/sites/default/Documents/Projects/TargetedAnalyses/AMCER/FR/AMCER_Final_Report_FINAL.pdf

would enable a higher degree of coordination but experience has shown that the system despite being centrally led has included a large flexibility enabling the regions to pursue their own development goals although formally pursuing central strategies. Strategies are not written as a learning process but as a trigger for financing. This holds the disadvantage the experience and tacit knowledge among the stakeholders are not compiled as a base for learning required for a leadership aiming at continues policy development.

The learning in the Ostrobothnian model occurs as it focus on gap-analysis and underlying reasons for these. In order to pursue targeted policy improvements more insights needs to be gained on the underlying reasons for the gaps. Moreover on possible new gaps that occur when new needs on the innovation system changes.

Thus does the governance occur in a form of a triple-helix coordination and a visionary leadership communicating and learning on the gaps that needs to be bridged. This differs from the current centrally led innovation system where the governance system has mainly been concerned with selecting the entity that should be involved with the administration of the funds.

Formally does the board of directors of the Regional Council decide on the funds available to the Council but that forms only a part of the funds available for the work on innovations. The larger part of the governance comes from the capability to act in networks with multiple stakeholders requiring a problem solving oriented approach.

Identification of gaps and selecting priorities

The onset in designing a model was to create a place-based tool that corresponded to the competencies and reality in which the Council is working. The aim of the model has been to identify the most urgent gaps in a changing world.

The concept of an innovation system stress the flow of technology and information among people, enterprises and institutions as key to the innovative process. Although the concept in itself can be said to be a novelty the idea of knowledge supported regional development has formed a part of the thinking in Finland for quite some time. For instance, Finland has pursued a decentralized university system since the 60ees where one of the leading thoughts was to support the regional development.

This implies that the onset for the development work is not create and innovation system but the seek ways of improving and strengthening the existing one with targeted measures. Moreover by mapping and seeking to strengthen the underlying innovations system conditions for resilience and innovation by related variety is created. Since the economic environment is under continuous change the measures undertaken does also need to change. For this reason it is important to engage all the stakeholders in a structured dialogue as a base for policy development.

To this date two rounds of a structured dialog have been carried out and the gaps observed have lead the Council to work with calls on living labs, internet of things, advanced materials and similar. This has all been in response of a possible “lock-in” situation and weak technological position of SMEs forming a part of the value-added chain of the large exporting companies. The experience from this work show that the pressure on existing funds are not very high although Ostrobothnia is among the well-off regions in Finland thus possessing less development funds. Getting closer to the reasons and

sources of the problem also complicates the solution leaving less able actors in the field. Increasing the number of actors in the field is however a common learning curve for all the stakeholders involved in the process; beneficiaries; implementers; decision-makers and financers.

The process has also led the Council to a process of policy development through transnational learning on triple-helix gaps. Building on the experience in the region the Council is in the process of launching a Baltic Sea transnational policy learning partnership. Transnational learning on policy issues provide a needed outsider view on the problem faced and is a valuable instrument for inspiration and policy development.

Definition of policy mix

The notion of policy mix builds on the assumption that the Council could uniquely determine the policy and that there would be funds set aside for the purpose. The reality however is that the policy formulation takes place in a multi-level format where a great number of actors determine the outcome and thus the formulation of the policy takes place through a continues learning on what needs to be undertaken. It is thus a question on the ability to influence the networks and to generate policy initiatives and to generate project that may influence the outcome. We will below describe the kind of results the process has produced so far.

The World Bank[3] introduces a metaphor in the form of gardening for measures that can be undertaken to support innovation: 1) "Watering the plant" would be by providing appropriate financial support to innovation and other measures like cluster initiatives etc.; 2) "Removing the weeds and pests" would include removing institutional, regulatory or competitive obstacle to innovation etc.; 3) "Fertilizing the soil" would include strengthening the knowledge base through investments in education and research; 4) Finally "preparing the ground" would include educational policy and cultural initiatives and similar actions.

Following this distinction the results of the process and subsequent policy instruments initiatives have been of the categories "Watering the plant" and "Removing weed". The triple-helix stakeholders are able to identify concrete short-term measures that should be undertaken and also to point out dysfunctional policy instruments. This also corresponds to the position of the Regional Council in the innovation system and its political role of communicating dysfunctional arrangements and confirms the position of Carayannis et al (2015) on the role of the methodology and its potential role in a multi-level setting.

The methodology also complement traditional political processes where the results many times have been on the "preparing the ground nature", clearly linked to innovation but not very targeted and thus mostly requiring unavailable substantial financial resources. The challenge in the execution of the measures consist in that the results produced will be a learning curve for the developers and implementers as it requires very specific competences linked to gaps identified. This implies that the further implementation of the methodology also will have implications on the organization of the public sector activities with gearing the activities more towards horizontal needs and place-based development.

Monitoring and evaluation

The model, in terms of its evaluation and monitoring stage, uses the gap index as an output indicator of S3. The policy measure with an objective for

[3]. World Bank (2010): Innovation Policy A Guide for Developing Countriesf

better connectivity in the region is a success if the gap index is reduced after the policy intervention. The idea is to repeat the connectivity measurement to identify bottlenecks and to have a continuous policy process where the success of the interventions is evaluated.

This monitoring is also combined with other qualitative indicators such as stakeholder perceived improvements, quality participation in the focus groups and reflection of the issues following the structured dialogue. This forms part of the policy learning following how the process is gaining momentum with a larger number of stake-holders in the region.

In addition to monitoring the process and the gaps, the Revealed Comparative Advantage (RCA) introduced by Balassa (1965) is used in monitoring the degree and change of specialisation in the regional economy.

Observations on the process

The first round has been a learning process, which has extended understanding and permitted more targeted actions based on evidence. However, the biggest impact of applying the model is in encouraging reflection among stakeholders on innovation partnerships, which in turn prompts closer triple helix connectivity. The model with structured dialogue between companies, universities and public administration is a method of entrepreneurial discovery because it helps to improve regional innovation cooperation by presenting the bottlenecks affecting it and by focusing support on the biggest issues. The dynamics of gap indices can be seen as a process of economic self-discovery.

A similar methodological approach has also been applied in the Nordland Region, (Mariussen, Gjertsen, Løvland & Lindeløv, 2013). The application of the model enabled comparison and learning between the regions because Nordland also used gap analysis and focus group seminars. For instance, the first round showed that Ostrobothnian enterprises were more content with the local educational system than the corresponding companies in Nordland. This finding then raises the question of what is done differently in Ostrobothnia and whether this experience can be transferred. Through learning seminars, this knowledge can be codified, transferred and internalised between regions (Mariussen & Virkkala, 2013)

The model also holds a format for transnational learning in Smart Specialization. The learning that has been piloted with Nordland and the Regional Council of Ostrobothnia is now putting forward a proposal for transnational learning following the approach of triple-helix innovation gap analysis LARS (Learning among Regions on Smart Specialization). The purpose of the LARS project is to extend the learning as discovery process within and between regions in six different counties around the Baltic Sea.

References

AMCER report (2012). Advanced monitoring and coordination of EU R&D policies at regional level [Report]. Retrieved from http://www.espon.eu/export /sites/default/Documents/Projects/TargetedAnalyses/AMCER/DFR/AMCER_Draft_Final_Report_v1.pdf.

Balassa, B. (1965), Trade Liberalisation and Revealed Comparative Advantage, The Manchester School, 33, 99-123

Capello, R. & Kroll, H. (2016). From theory to practice in smart specialization strategy: emerging limits and possible future trajectories. European Planning Studies, 24(8), 1393–1406.

Carayannis C; Grigoroudis E; Pirounakis D (2015) Tech Monitor Jul-Sept 2015 (pp 19-27) http://techmonitor.net/tm/images/0/0a/15jul_sep_tm_final.pdf

Foray, D. (2015). Smart specialisation: Opportunities and challenges for regional innovation policy. Abingdon: Routledge.

Foray, D., Goddard, J., Beldarrain, X., Landabaso, M., McCann, P., Morgan, K. , Ortega-Argilés, R. (2012). Guide to research and innovation strategies for smart specialisation (RIS3). Europe: European Commission.

Johnson, J. (2014). The role of smart specialisation strategies in regional strategies. In S. Virkkala, A. Mäenpää & Å. Mariussen (Eds.), The Ostrobothnian model of smart specialisation (pp. 15-20). Proceedings of the University of Vaasa, Reports 196.

Mariussen, Å, Gjertsen, A., Løvland,J. & Lindeløv, B. (2013). Smart 4H: Forslag til smart spesialisering for Nordland. (NF Rapport 4/2013). Bodø: Nordlandsforskning.

Mariussen, Å. & Virkkala, S. (2013). Methodologies and methods of transnational learning. In Å. Mariussen & S. Virkkala (Eds.), Learning transnational learning (pp. 155–195). Abingdon: Routledge.

Ranta, J.-M. & Takala, J. (2007). A holistic method for finding out critical features of in-dustry maintenance services. International Journal Services and Standards, 3(3), 312–325.

Virkkala, S., Johnson, J. & Mariussen, Å. (2014). Summary and conclusion. In S. Virkkala, A. Mäenpää & Å. Mariussen (Eds.), The Ostrobothnian model of smart specialisation (pp. 118-132). Proceedings of the University of Vaasa, Reports 196.

Kumar, S., Aarrevaara, E.

Title: Corporate Social Responsibility & Sustainable Development Initiatives In The Indian Corporate Sector

Pilots, Demos and Experiment Case

Abstract

Corporate sustainability and CSR have become part of corporate strategy in India with the aims of reducing poverty, unemployment, illiteracy and achieving sustainable development. Corporations operating in India with annual turnover of INR 5000 million or with a net profit of INR 50 million annually should invest 2% of the net profit in CSR programmes. The authors present a brief introduction on CSR and corporate sustainability and provides three cases on how CSR and corporate sustainability is implemented in companies. The first case is about ITC Limited highlighting how a single product tobacco manufacturing company transformed itself to become a world class Indian company through a strategy of marketing, diversification and social welfare. The second case is a $5 billion brand Amul owned by a farmer´s cooperative that transformed India into world´s largest milk producer. The third case is the success of a women´s cooperative Lijjat organisation in empowering women through a philosophy called `Sarvodaya movement´ meaning `welfare of all´.

Keywords: Corporate Sustainability; CSR; e-Choupal; LEED; Operation Flood; Sarvodaya; Swacch Bharat campaign; 1USD=66.79 INR

Corporate Sustainability

Corporate sustainability is defined as 'the company's delivery of long term values in financial, environmental, social and ethical terms' (UN Global Compact, 2014). Corporate sustainability is ingrained in the value system of the company and is the basic principle applied to the business and industry in carrying out businesses. The five defining features of Corporate Sustainability are '1. Principled business, 2. Strengthening society, 3. Leadership commitment, 4. Reporting progress, and 5. Local action' (UN Global Compact, 2014). The ten principles of United Nations Global Compact are:

1. "Business should support and respect the protection of internationally proclaimed human rights; and
2. Make sure that they are not complicit in human rights abuses.
3. Business should uphold the freedom of association and the effective recognition of the right to collective bargaining;
4. The elimination of all forms of forced compulsory labour;
5. The effective abolition of child labour; and
6. The elimination of discrimination in respect of employment and occupation,

7. Businesses should support precautionary approach to environmental challenges;

8. Undertake initiatives to promote greater environmental responsibility; and

9. Encourage the development and diffusion of environmentally friendly technologies.

10. Business should work against corruption in all its forms, including extortion and bribery" (UN Global Compact, 2014).

Evolving concepts of Corporate Responsibility and Corporate Sustainability

In June 1889, Andrew Carnegie, in the article "Wealth" published in the 'North American Review' offered a statement of trusteeship or stewardship concept of business. In 1906, Arthur Hadley, the Yale President advised business leaders that the businesses must align their sense of ethics and obligation to the public and act as trustees of the public. During the 1920s, the practice of philanthropy was adopted in dealing with labour and community issues associated with neighbouring plants and company towns. In 1926, Owen D Young and Gerard Swope of the General Electric Company initiated cooperation between business, labour, government and community. In the 1950s, Morrell Heald described that business leaders go beyond philanthropy to cooperation, and be responsible for leadership in community initiatives such as higher education, becoming good neighbourhood, and support for arts (CEBC, 2010).

Corporate Social Responsibility

According to World Business Council for Sustainable Development, Corporate Social Responsibility is defined as "the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and the society at large, to improve their quality of life" (WBCSD, 2002). Archie B Carroll identified the four responsibilities of business, namely the economic, legal, ethical and philanthropy (Carroll, 1979, 1991).

Table 1: Evolution of Corporate Responsibility and Corporate Sustainability

Evolution of Corporate Responsibility		Evolution of Corporate Sustainability	
1970s	Shareholders	1970s	Quality Management
1980s	Philanthropy	1980s	Health & Safety
Early 1990s	Corporate Governance	Early 1990s	Environmental Management
Late 1990s	Stakeholder Engagement	Late 1990s	Health, Safety & Environment
Early 2000s	Corporate Accountability	Early 2000s	Triple Bottom-line
Late 2000s	Responsible Competitiveness	Late 2000s	Sustainable Markets

(Source: Visser, 2010)

CSR and Corporate Sustainability in India

ITC LIMITED

ITC Limited is an Indian conglomerate established in 1910 and rated among the World's Best Big Companies, Asia's 'Fab 50' and the World's Most Respectable Companies by Forbes magazine (ITC Limited, 2016). The company has presence in a wide range of businesses from Fast Moving Consumer Goods (Foods, Personal Care, Cigarettes and Cigars, Branded Apparel, Education and Stationary Products, Incense Sticks and Safety Matches), Hotels, Paper Boards & Specialty Papers, Packaging, Agri-Business and Information

Technology. During 2015, ITC Limited had a revenue of US$7.5 billion, total asset worth US$4.8 billion. ITC had employed 25959 employees as on 2013. ITC has a market capitalisation of US$40 billion (ITC Limited, 2016). Chairman of ITC, Mr Y C Deveshwar states that "the aspiration of ITC to create enduring value for the nation is the motive force to sustain growing shareholder value" (ITC Limited, 2016). ITC's website states "Our Businesses create around 6 million sustainable livelihoods. ITC is the only company in the world of comparable dimensions to be carbon positive, water positive and solid waste recycling positive" (ITC Limited, 2016).

History of ITC Limited

British American Tobacco Company (BAT) established an office in Calcutta, India in 1906 for the manufacture and selling of granulated tobacco. Granulated tobacco was not acceptable to the Indians. BAT decided to set up several tobacco re-drying units across India under the name 'Imperial Tobacco Company' in 1912. The company dealt in tobacco and related products such as tobacco paper till the 1970s and later diversified extensively into non-tobacco businesses. To promote tobacco business, BAT encouraged social initiatives such as sports, farming, weaving, art and other activities. When India became independent in 1947, several foreign companies quit whereas Imperial Tobacco Company invested heavily, and employing Indian managers to lobby with the government and supported nation building although the main focus of the company was in tobacco, company renamed Indian Tobacco Company in the 1970s. The company established handlooms in Eastern India, employing around 1800 people supporting the government in employment generation. Through focussed marketing efforts, diversification and social responsibility, the company has been able to win over the hearts of the Indian people and the government (Kumar S et al, 2014).

Sustainability at ITC Limited

'India has 17% of the world's population, only 2.4% of arable land, 4% of water and 1% of forest resources. Nearly 300 million people are in a state of endemic poverty. About 12 million young people take up new employment every year. Food security, water security, energy security and livelihood are the challenges facing the country. The government and the society alone will not be able to meet all these basic needs of the people. Business can play an important role in bringing about transformation, bringing together economic and human resources to deliver goals for societal gain. It is this idea that has shaped ITC in building a sustainable enterprise of tomorrow' (ITC Sustainability Report, 2015).

Strategy to achieve sustainable and inclusive growth

ITC Limited was able to create world-class Indian brands by leveraging the strengths and effectively utilizing its resources and opportunities, thus offering a value to the Indian consumer. The brands created by the ITC enabled the company enhance its competitiveness of the value chain, which includes farmers and rural communities. ITC uses renewable energy sources in its efforts to reduce carbon footprint, and invested in forestry projects in wastelands. More than 43% of the ITC's total energy consumption is derived from renewable energy sources. ITC Hotels and facilities are powered by renewable energy and the contribution of renewable energy to the total energy is expected to increase by 50% by 2020 (ITC Sustainability Report, 2015).

All luxury hotels of ITC are LEED (Leadership in Energy and Environmental Design) certified. The ITC Green Centre in Gurgaon is the highest rated green building in the world. The ITC Grand Chola is the world's largest LEED Platinum certified green hotel and is rated 5 Star GRIHA (highest national rating for

Table 2: ITC's Social Initiatives

Programme	Purpose	Beneficiaries	Outcome	Action plan 2017-2018
Integrated Rural Development programme	To create a vibrant rural ecosystem, livelihood creation, capacity building	Farmers in rural areas	Raising the rural income	
e-Choupal initiative	Information on best agricultural practices, crop pricing, weather to farmers on internet	Supported 4 million farmers in 40,000 villages	Transparent discovery of prices, agricultural services	
Afforestation programme	Transform private waste land into green plantation	Poor tribals, small farmers	Greening nearly 200,000 hectares of wasteland, 90 million person days of employment	Additional 92,000 hectares to be planned
Integrated Watershed Development programme	Soil and moisture conservation	Benefitted 160,000 families	Over 200,000 hectares of land, 4.7 million person days of employment	Additional 182,000 hectares of land to be planned
Livestock Development programme	Animal husbandry services	Off-farm livelihood option for 460,000 cattle owners	Helped over 1 million milch animals	Will extend the service to 630,000 milch animals
Women's Empowerment programme	Sustainable livelihood	Women	43,000 women were benefitted by this programme	Plan to include 25,000 more women
Primary Education programme	Increasing enrolment, minimising drop-outs, Infrastructure support to government schools	Rural school children	Benefitted 400,000 rural school children, helping them build a better future	Additional 145,000 children to be targeted
Vocational Training programme	Skill building & employability	Youths	Benefitted over 19,000 youths	Another 33,000 youths will be covered in the next three years
Health and Sanitation Initiative	To support the Government in its 'Swacch Bharat' campaign	Rural community and households	Constructed over 8000 family toilets	To construct additional 8250 toilets

(Source: ITC Sustainability Report, 2015)

ITC is an enterprise committed to achieving excellence through creating value to the society and stakeholders with a firm belief that large scale social investments will continue to make meaningful contributions to nation building.

green buildings). The `ITC Green Centre` located in Manesar is LEED Platinum certified. (ITC Sustainability Report, 2015). The company engaged in rainwater harvesting both on site and off site at watershed catchment areas. The company enhanced resource efficiency by making efforts to reduce wastage, maximise reuse and recycling, and use post-consumer waste as an input in its facilities (ITC Sustainability Report, 2015).

'The Social Investments Programme of ITC identified three groups of stakeholders for its CSR projects spread across 14 states covering 71 districts. These stakeholders include rural communities living around the operational areas of the company, communities living close to the ITC's facilities and Government to encourage Public-Private Partnership. The company framed CSR policy based on the Companies Act, 2013. Today, ITC's businesses and value-chains generate sustainable livelihood to around 6 million people, many of whom belong to the weakest sections of the society' (ITC Sustainability Report, 2015).

Amul

Amul is story of a cooperative movement which began in India in 1946 by the farmers of a small town Anand in Gujarat. The farmers agitated against the unfair and manipulative practices followed by the traders and formed a cooperative union to produce, process, and market and distribute milk. The Kaira District Cooperative Milk Producers Union began with diary cooperatives producing 247 litres of milk from two village dairy cooperative societies (GCMMF, 2016). Today, the revenue of all products sold under the Amul brand of milk and dairy is to the tune of US$5 billion. The Amul Model helped India emerge as the largest milk producer in the world with Amul ranked as the 13th largest dairy farm organisation (GCMMF Press Release, 2016).

Gujarat Cooperative Milk Marketing Federation Limited (GCMMF), the parent organisation of Amul procures milk 16.97 million litres per day from 18545 village milk cooperative societies, 18 member unions covering 33 districts, and 3.6 million milk producer members. The annual sales turnover of milk for 2015-2016 is valued at US$3.5 billion. Amul and Sagar brands of GCMMF are distributed through 56 sales offices with a dealer network of 10000 dealers and 1 million retailers (GCMMF, 2016).

Milk and Sustainability

In India, milk, the largest commodity, is valued at US$65 billion per annum. Milk influences the livelihood of over 150 million farmers in India, most of who are small and marginal. After Amul had initiated the 'Operation Flood' campaign in 1970s, the milk production increased and the consumption of milk from a low level of 112 grams/day in 1968-69 to over 226 grams/day in 2002. This helped stabilise milk prices, adequate supply and improved quality of milk delivered to the consumers (GCMMF, 2016).

Table 3: Milk production in India

Period	Milk production in India (Metric tonnes)
1968-1969	21.2 million
1980-1981	31.6 million
1990-1991	53.9 million
2001-2002	84.6 million
2011-2012	122.0 million

The dairy cooperatives have contributed to socioeconomic revolution and economic empowerment of women and landless labourers in rural India. According to the National Dairy Development Board, the number of women engaged in dairy farming increased from 0.62 million in 1986-87 to 2.47 million in 2001-02. Although the milk production is growing at a rate of 4.5% per annum, the yield per milch animal is 3 litres/animal/day compared to that of 30 litres/animal/day in developed countries. 'Operation Flood' had a positive impact in the multicultural and diverse Indian society (GCMMF, 2016).

The milk producers of Gujarat Dairy Cooperatives organise mass tree plantation drives every year. During the last eight years, they have planted 51.8 million saplings for which the dairy producers of Gujarat have received 'Good Green Governance Award' from Srishti. International Dairy Federation awarded Amul for the 'Best Environment Initiative' under the 'Sustainability' category at the 4th Global Dairy Conference in Salzburg in 2010 (GCMMF, 2016).

Table 4: Saplings planted by milk producers of GCMMF

Year of plantation	No. of saplings planted	No. of saplings survived	Survival %
2007	1.9 million	11 million	58%
2008	5.3 million	2.6 million	49%
2009	8.4 million	3.8 million	45%
2010	8.4 million	3.9 million	47%
2011	7.3 million	3.4 million	47%
2012	5.7 million	2.6 million	45%
2013	7.2 million	3.4 million	47%
2014	7.7 million	3.6 million	46%
2015	7.4 million	3.4 million	46%
Total	59.2 million	27.8 million	47%

The first sapling plantation was carried out on the ´Independence Day` on 15th August 2007 wherein 'one member planted one sapling'. In the second year, on 15th August 2008, 'one member planted three saplings'; and, subsequently, in 2009 and 2010 with 'one- member planting five saplings' respectively (GCMMF, 2016).

Strategy

'Operation Flood', also called the 'Amul Model' is the strategy implemented by ´National Dairy Development Board` during the 1970s till 1996 that helped in the transformation in Indian dairy industry. The objectives of 'Operation Flood' were to enhance milk production, augment rural income and distribute the profits generated through milk marketing among the farmers. Small farmers appreciated the low capital requirements, short operating cycle and steady return on investments. Dairying was made feasible to the marginalised farmers and the landless who grazed cattle in the forests. The small farmers who hold one or two milch animals contributed 70% of milk production. As a result, about 22.5% of the income of the rural household is generated from milk (GCMMF, 2016).

The Amul Model has three levels- First level is the village level dairy cooperatives for procurement of milk, where the individual farmer is a member. The second level is district level union for centralised milk processing and the third level is state level (regional level) marketing federation.

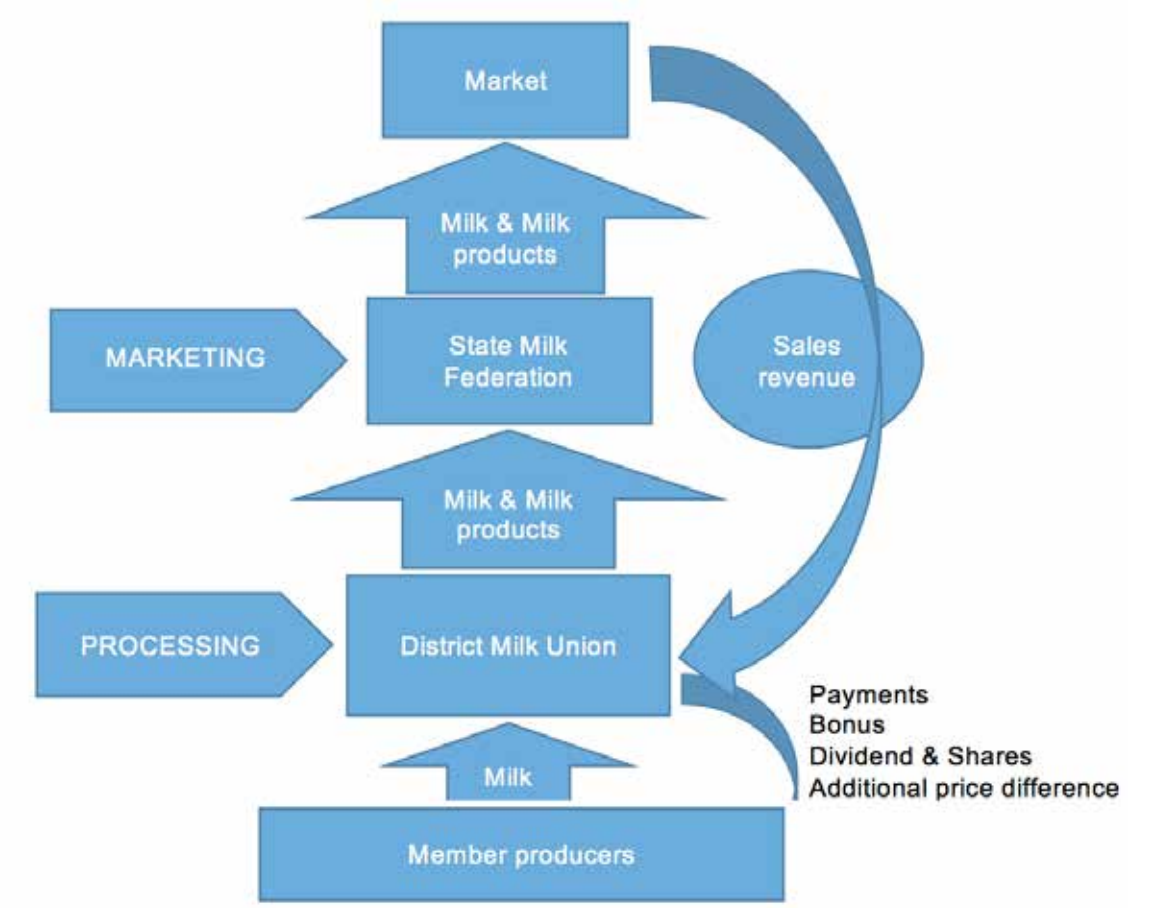


Fig.1: The Amul Model (Source: Adapted from GCMMF, 2016)

In contrast to the dairy cooperatives worldwide where the dairy cooperatives end up as suppliers to the companies that own brands and market products, the three main stages- procurement, processing and marketing in the 'Amul Model' cooperative is controlled by the farmers. Eliminating middlemen in the procurement and marketing of milk, the Amul cooperative have been able to reduce the price variance caused by seasonal changes. This helps the farmers with a steady income free from exploitative practices.

When food security is of prime importance for India, Amul plays a significant role in delivering value added milk and dairy products and helped India achieve recognition of becoming the largest milk producer in the world. More than 3.37 million farmer members have been benefitted by the value added marketing and technological innovation of the Amul cooperative (Kumar S et al., 2014).

Lijjat pappad

Shri Mahila Griha Udyog Lijjat Pappad, also called Lijjat, is an Indian women's cooperative manufacturing Fast Moving Consumer Goods. 'Lijjat' is a common household name for a crispy and spicy bread. With a humble beginning in 1959, Lijjat supports more than 40000 women members following the philosophy of self-reliance and trusteeship. The organisation is managed by a committee of 21 members who decides on the functioning of the organisation. The profits are shared among all the members based on their contribution. The concept behind the success of Lijjat organisation is 'Sarvodaya Philosophy' (Kumar S et al., 2014), and effort to create sustainable livelihood (Lijjat, 2016).

Sarvodaya Philosophy

The Sarvodaya movement was started by Gandhi to eliminate the roots of violence. 'Sarvodaya' represents higher moral idealism, a dynamic political ideology, and a more radical culture. Sarvodaya movement is based on the principle of truth, non-violence and love. The word Sarvodaya means "upliftment or welfare and good of all" The goal of Sarvodaya is to establish a peaceful society – a society with no exploitation of any kind. Every individual, irrespective of economic, social, political or cultural influence will have equal opportunity for all round development (Narayanasamy S, 2003). Gandhi believed that 'if we take care of the means, the end will take care of itself' (Bondurant J V, 1958). The Sarvodaya Samaj is free from domination immorality and injustice and followed a decentralised pattern" (Dharmadhikari C, 2014).

The core values of Lijjat organisation is based on three concepts- Concept of business, concept of family and concept of devotion. "All business activities are carried out on a sound and pragmatic footing. Quality goods are produced at a reasonable price. All affairs of the institution are carried out in a manner similar to that of a family carrying out its daily household chores. The member sisters have adopted mutual family affection, concern and trust. The institution is not merely a place to earn one's livelihood. It is a place of worship to devote one's energy not for one's own benefits but for the benefits of all. Work is considered worship in the organisation" (Lijjat, 2016).

Any quality conscious woman willing to come forward, adopt the vision and values, and contribute to the team can become the co-owner of the Lijjat cooperative. Equality is respected in the Lijjat organisation. 'Lijjat has a policy of electing the highest office bearer from the lowest ranks' (Chaki D, 2013). Today, Lijjat is a brand with that has crossed US$200 million in sales value, with presence across several countries. 'The Lijjat's current workforce come from the poorest sections of the society for whom a life of dignity would otherwise seem difficult' (Chaki D, 2013; Kumar S et al., 2014).

References

Bondurant J V, 1958. 'Conquest of Violence: The Gandhian Philosophy of Conflict'. Princeton University Press, New Jersey, p 6-7

Carroll A B, 1979. 'A three-dimensional conceptual model of corporate social performance'. Academy of Management Review, Vol. 4, pp. 496-505

Carroll A B, 1991. 'The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders'. Business Horizons, Vol. 34, pp. 39–48

CEBC, 2010. 'Corporate Social Responsibility' The Shape of a History, 1945-2004. Centre for Ethical Business Cultures. Accessed from http://www.cebcglobal.org/wp-content/uploads/2015/02/CSR-The_Shape_of_a_History.pdf viewed on July 2016

Chaki D, 2013. 'From $1 to $200m: An Indian Success Story' Accessed from http://www.aljazeera.com/indepth/features/2013/09/tasting-success-with-crispy-snacks-201392212475990671 8.html viewed on July 2016

Dharmadhikari C, 2014. 'Contemplating Gandhi' Essays on Mahatma's Life and Thought Accessed from http://www.mkgandhi.org/ebks/contemplating-gandhi.pdf viewed on July 2016

GCMMF, 2016. 'About Us – The Amul Model' Accessed from http://www.amul.com/m/about-us viewed on July 2016

GCMMF Press Release, 2016. "Amul spearheads 'Make in Rural India' with 187% growth in six years" Accessed from http://www.amul.com/files/pdf/GCMMF-Press-Release-for-Annual-General-Meeting-on-17th-June-2016.pdf viewed on July 2016

ITC Limited, 2016. 'About ITC'. Accessed from http://www.itcportal.com/about-itc/profile/index.aspx viewed on July 2016

ITC Sustainability Report, 2015. 'Chairman's Statement – Sustainability Report 2015'. Accessed from http://itcportal.mobi/sustainability/sustainability-report-2015/chairmans-statement.aspx viewed on July 2016

Kumar S, Kundi J, Kumar K, 2014. "Comparative study of strategic corporate social responsibility, corporate sustainability and value creation among companies operating in India". A doctoral thesis submitted to Universiteit Twente, Netherlands.

Lijjat, 2016. 'Core Values/ Organisation'. Accessed from http://www.lijjat.com/Organisation/CoreValue.aspx viewed on July 2016

Narayanasamy S, 2003. 'The Sarvodaya Movement- Gandhian Approach to peace and Nonviolence'. Published by Mittal Publications, First Edition, New Delhi

UN Global Compact, 2014. 'Guide to Corporate Sustainability' United Nations Global Compact. Accessed from https://www.unglobalcompact.org/library/1151 viewed on June 2016

Visser, 2010. ‘CSR 2.0, The Future of Corporate Social Responsibility’. Accessed from http://www.csrinternational.org viewed on December 2015

WBCSD, 2002. ‘Corporate Social Responsibility, The WBCSD’s Journey’. Accessed from http://www.cecodes.org.co/descargas/publicaciones/publicaciones_wbcsd/CSR-WBCSDsJourney.pdf viewed on June 2013

Kylänen, M., Keski-Mattinen, T., Sore, S.

Title: Synergy of Service Design and Digitalization – From Digital Services to Digital Development Processes

Research Article

Abstract

Service design has gained an increased interest among both academicians and practitioners. Service design aims at holistic, user-centric development of services. Service design tools are also applied to more comprehensive tasks, such as designing processes and strategic guidelines. For a company, to increase one's degree of processing value by shifting from industrial production of material goods to more immaterial business possibilities, is a strategic change process.

Also digitalization challenges the status quo of market and business development. Companies are struggling with omnichannel solutions, as the business logic has shifted from brick-and-mortar to more digitalized marketplaces and hybrid business models, even entirely digital platforms. This has placed e-commercial aspects in the focus. Additionally, consumer-to-consumer driven sharing economy calls for digital processes and digital business logic. Companies need new competencies to leverage the growth potential of the digital economy.

Service design and digitalization also interconnect. To manage an increasingly omnichannel user experience and to design user-friendly digital services, companies should tackle new possibilities and challenges of business development. This article has, hence, three objectives. We discuss the interconnected nature of digitalization and service design by introducing service design as a valuable approach in development of digital services. Also, we will identify similarities between a professional IT-system development process and design thinking. As our main result, we will present an illustrated matrix that combines both designing of digital services and digital service design approach. We, hence, problematize the degree of digitalization of development work.

Empirically, the article presents two development project cases delivered by digiMensa research, development and innovation (RDI) project, funded by the Finnish funding agency for innovation. The project aims to generate tools and methods for digitalized business environment in enabling companies to acquire and utilize customer information in their business activities. A Finnish technology company has commissioned two development tasks for Lahti UAS' IT and service management students. The cases have, thus, demonstrated three aspects of digital business development. Firstly, the cases highlight the importance, yet challenges, of user-oriented development of digital services. Secondly, the cases shed light on the potential and problems of digitalization of IT-system development and service design processes. Thirdly, the project cases illustrate altogether seven features through which the digitalization of development work can be further elaborated.

Keywords: Service design, digitalization, IT-system, digital service design

Introduction

Service design deals with holistic, user-centric development of services and service encounters. Service design gives form and meaning to a service and crystallizes its added value for the user. Increasingly, service design tools are used in more comprehensive tasks such as designing processes, and strategizing. (See Polaine, Løvlie & Reason 2013; Wetter-Edman 2014.)

Indeed, service development tasks often shift from single-service design to development of product–service systems. The systemic design processes, thus, deal with organizational entities, strategic guidelines and integrated processes. (Vezzoli, Kohtala & Srinivasan 2014.) Hence, high-quality service delivery calls for holistic service culture (Zomerdijk & Voss 2010, 78-79).

Accordingly, for a company, it is a tremendous transformation in managerial thinking to shift from industrial manufacturing of goods to delivery of personal services, let alone creation of unique, even transformative experiences. To leverage higher profit margins, sustainability and value to different stakeholders, companies should increasingly harness their business operations with a credible and explicit user-centric approach. However, this calls for strategic change. (Pine & Gilmore 2011.)

Creation of unique user experiences demands thorough user-insight, placement of the user in the very centre of the development process, and overall understanding of humanity (Korn & Pine 2011). Furthermore, there is an attitudinal challenge to move from designing for users to designing with them (Sanders 2002, 2-4). Business developers should understand what creates value to the customer – and how they could co-create value accordingly.

Pine and Korn (2011) underline that to manage unique customer experiences – and to co-create value – companies should increasingly integrate physical and virtual aspects. By adopting a holistic approach, companies can use technology in every phase of the service process – before, during and after. According to Shapiro (2011, 5-6), due to technological development companies, brands and services are seamlessly connected to each other via social media and web communities.

Similarly, digitalization appears as a strategic transformation and an organizational challenge. Digitalization is debated in alternative forms from social media and cloud computing to Internet of Things (IoT). However, companies struggle to benefit from different shapes of digitalization in creating user and business value. To meet the challenges of the changing consumer behaviour, technological development, tightening global competition over people's time, attention and money, and the new business logic of the experience economy, companies need to transform their business practices (see Pine & Korn 2011).

This article discusses how service design and digitalization increasingly intertwine. The article focuses on possible synergies between digital and IT-oriented aspects and service design viewpoints on three levels. Firstly, service design can be used in designing digital services and omnichannel solutions from a user's perspective. Secondly, IT-system development has consistencies with user-centric service design. Thirdly, the article discusses possibilities of digitalization of service design itself, i.e. how the use of technology could create value to the design process.

Next, we introduce service design, omnichannel business possibilities and IT-system development. Then we present a 2-by-2 matrix to discuss the degree of digitalization of development work. After that, we exhibit two cases where business students of Lahti UAS have solved commissioner-based development tasks. The cases are reflected on the aforementioned matrix and the application of IT during the process. We conclude our article with key findings and some limitations and recommendations.

Service design in digitalization

Service design underlines the value of user-centrism. Instead of the company, the manager or the rather abstract idea of "the markets", nor the product itself, service designers place the user in the centre of their development activities (Wetter-Edman 2014, 29).

Service design is discussed both as holistic thinking and a set of fine-grained methodologies. Indeed, service design covers several hands-on tools to user-centric development. It can capture the logic and meaningfulness of a service, a brand or an organization. Service design is commonly characterised by the following aspects (e.g. Polaine, Løvlie & Reason 2013, 18-20; Wetter-Edman 2014, 31-38):

- Holistic approach – simultaneously specific and abstract by focusing to internal and external realities and alternative futures.
- The user first – driven by the user's perspective either directly (e.g. involving the user) or indirectly (e.g. user profiles, user-insight).
- Visualization – ideas are concretized with illustrations, such as customer journeys, blueprints and storyboards.
- From heroic designers to facilitators of design activities – design and designer are not nouns but verbs to enhance co-design and to involve multiple stakeholders.
- Systematic procedure – nevertheless being creative and ad hoc, it follows a phase-to-phase process from user-insight and idea-generation to conceptualization.

Due to the omnichannel and convergent nature of business, service design is increasingly applied to comprehensive and systemic development challenges. Instead of one stable service environment with modest selection of offerings, users encounter the company in numerous channels either directly or indirectly via co-users and intermediaries. In the digitalized marketplace, unique customer experiences are co-created in the interface of physical and virtual service environments (Nilsson & Ballantyne 2014, 377).

Although being downgraded as a buzzword, digitalization is an evident trend and a tremendous dilemma for organizations. However, it is wise to begin to discuss digitalization by discerning its forms, as the debate evolves on a number of fronts; e.g. social media, cloud computing, IoT, big data and mobile applications. Whereas social media deals with communication between a company and its stakeholders, cloud services enable an unlimited access simultaneously from different devices via Internet. IoT, respectively, connects sensors and devices to the Internet enabling automation and smartness. Big data is used to create business intelligence, and via mobile devices users can be reached 24/7.

As Chaffey (2015, 8-17) summarizes, whether we are boosting competitiveness or developing of e-transactions via digitalization, the management of digitalization calls for holistic understanding. Additionally, to the "big picture", it is important to realize the relationships between the increasingly electronic and user-driven market dynamics as the context, the digital business possibilities and challenges in terms of value co-creation, and the necessity of change management.

However, the digital business transformation, alone, does not necessarily make the companies struggle. When everything is digitalized, companies should rather ask: "How companies manage the changing consumer behaviour, new buying preferences, the consumer power, and more extended competition?" (Bloomberg 2014; Ernst & Young 2016.)

According to Capgemini (2011, 17-23) digital solutions that deal directly with the customer experience still seem to predominate. However, the most business value may lie in digitalization of operational processes or, furthermore, digital business model innovations. Obviously, these three categories of digitalization also intertwine on an organizational level (Figure 1).

Customer experience	Operational process	Business model
Customer understanding	Process digitization	Digitally-modified business
Top line growth	Worker enablement	New digital business
Customer touch points	Performance management	Digital globalization

Figure 1. Three categories of digitalization (Capgemini 2011, 17)

As digitalization and the changing customer behaviour intertwine, also, service design and digitalization should be more interconnected. Indeed, customers are demanding more touchpoints to interact with companies, on their own terms. However, although customer interaction has become more omnichannel, the value of personal service seems to prevail. Digitalization does not necessarily make brick-and-mortars to collapse, but they become showrooms and test platforms (Cho & Trincia 2012).

The integration of service design and digitalization is also evident in the case of entire IT-systems. Development of IT-systems follows a three-phase process of ordering, production and delivering (Figure 2). During the first contact, the client needs and the type of the system are described. This might lead to a call-for-tender, a detailed procedure to get the offer from a system supplier. The call-for-tender and the supplier's tender include more accurate product specifications and options.

Figure 2. IT-system's development process

In the case of digitalizing business operations, service design comes in the picture. The client's customers' behaviour and needs and value propositions depend on the client's business strategy. Indeed, the design aspect facilitates the implementation and living up to the expectations. Service design may be separated into its own project to win time and to focus in-more-detail to the service features. To understand the users' needs and the aim of the solution, meetings are arranged with the supplier, users and analysts.

In IT-system development, user stories and use cases are applied. They help to identify crucial system requirements and crystallize a clear picture and purpose of the aimed situation. Use cases are various scenarios how users interact with the product when using it for certain purposes, while user stories describe product features. (Zhou 2014, 29-36.)

According to Cohn (2004, 17-27), user stories should follow the acronym "invest":

- Stories should be independent; as one story describes one situation when the user is using the program.
- To keep them negotiable, stories are usually written in numbered story cards in a quick, simple way.
- User stories are valuable for users and the purchaser, and they should be formulated accordingly.
- Sufficient technical knowledge is required to keep the written stories estimable.
- Good stories are also small to be transferrable to computer's code language.
- Finally, stories should be testable.

After the agreement and planning, actual and specific production-phase begins with coding, testing and demos (Figure 2). Agile software development often follows flexible and cross-functional working methods. Finally, the system will be installed to client's use and re-tested, and client's employees will be trained.

Interestingly, there is a significant overlapping in the processes of service design and agile IT-system development with a user focus, procedural, yet flexible, approach and concrete operationalisation of abstract, multi-disciplinary features. Also, both value visualisations to ensure a mutual understanding between the development team and the client and the users.

From designing digital services to digital service design

To design user-friendly digital services, companies should learn from new possibilities and challenges of business development. However, in this article we also problematize the possibilities and challenges of digitalization of the development processes, generally, and service design and IT-system development, particularly. In the 2-by-2 matrix (Figure 3), the Y-axis refers to the type of services under scrutiny, i.e. whether being more physical, delivered offline (e.g. an in-store service or an IT-expert service), or digital, delivered online (e.g. a mobile application or an IT-system), by nature. The X-axis stands for the type and nature of the service design process (and IT-system development), and the continuum ranges from physical (mainly face-to-face activities) to digital (mainly virtual activities).

This produces four quadrants varying from physical services designed physically (quadrant 1, the left bottom corner) to digital services designed physically (quadrant 2, the left top corner). The two quadrants on the left represent a more or less traditional service design (or IT-system development), as the most of the activities are completed in face-to-face meetings, e.g. with pen and paper – and taking notes. The quadrants on the right from physical services designed virtually or digitally (quadrant 3, the right bottom corner) to digital services designed virtually or digitally (quadrant 4, the right top corner), respectively, highlight more digital design and development activities (e.g. virtual meetings and e-brainstorming).

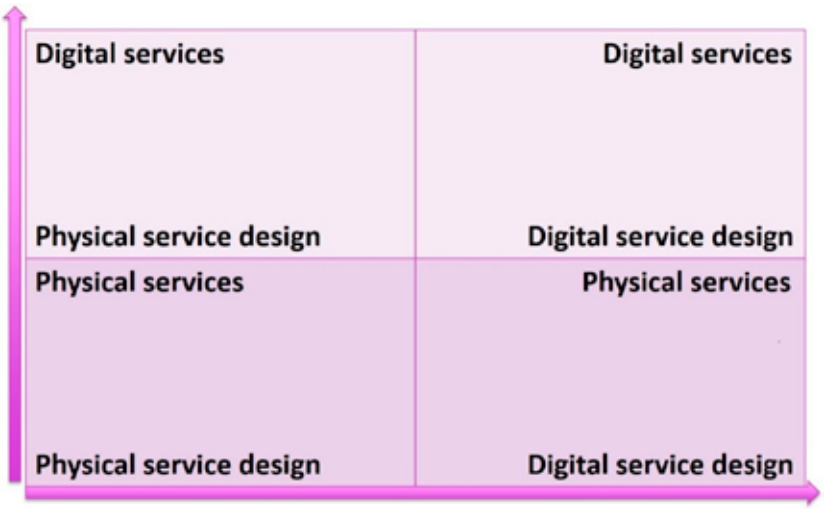


Figure 3. The matrix for designing of digital services and digitalizing service design

Digital service design may refer to user-driven design of service experience in which digitalization is applied so that both the service and the digital aspect create value to users and service providers. The creation of value is not, thus, limited to the service only, but also to the design and development process itself. As the working life seems to transform towards hubs, co-working, swarming and remote work, also design and development activities will follow (Hinchcliffe 2016).

Also, design games and gamification are more frequently used in service development work. They combine an easy-going atmosphere and productive outcomes by offering an inclusive and participatory platform for idea-generation and experimentation. (Vaajakallio 2012, 208-210.)

Recently, some software and mobile applications have been developed to digitalize design and development activities. However, digital solutions for development work mostly deal with project management (e.g. Trello, Planner, Kanban, Scrum), intra-organizational communication (e.g. Slack, XTune) or social/digital workspace/networks and social collaboration (e.g. Skillhive). Some examples have, indeed, inspired the matrix (Figure 3).

ExperienceFellow enables designers to experience a service from the user's perspective. With the mobile diary application, the designers can better understand how users consider the service at hand with the help of mobile ethnography, as it gathers systematic and real-time user data during the entire customer journey. (ExperienceFellow 2016.)

Lahti PocketCity offers cities and city experience designers an easily accessible tool to gather user data quickly and to involve people in participatory design and co-innovation processes. PocketCity focuses on the holistic city experience and brings together both the city planners and the inhabitants. (Makkula 2016a; 2016b.)

Our third example of digital service design is a well-known solution for digitalizing notes, Padlet.com. Also wearables and other augmented virtual reality (AR) solutions help to digitalize design and development work, such as the Microsoft HoloLens. 3D-scanning is an example where technology is used within the design process, not just as the object of design but as a means to an end.

More recently, two interesting start-ups have been introduced. Altogame is an entire virtual environment for cost-effective rapid idea-generation. Viima helps to gather and refine ideas with multiple users on an intuitive, visual interface.

To date, digital service design has been mostly referred to as designing of digital services. However, it is also acute to ponder to which degree we could digitalize the service design (or IT-system development) processes. In what type of situations, the replacement of physical contact with digital sessions could create added value?

Two business case projects as co-design platforms

Commissioned projects can offer higher education institutions (HEIs) concrete learning environments to analyse and enhance the value of digitalization and user-centrism as the imperatives of business development.

DigiMensa, an RDI-project, financed by the Finnish funding agency for innovation, concentrates on identifying tools and methods for customer wisdom in the digitalized business environment (DigiMensa 2014). To analyse how to acquire and utilize customer information to support competitiveness, one of the project's business partners, an electronic business solutions company for corporate clients, Avenla Ltd., commissioned two project cases for Lahti UAS based business students.

In the first project, in autumn 2015, IT-students aimed to find and model new potential ways to collect client's customer wisdom during the IT-system

development processes (Figure 2). Students' assignment was to design a web-based software that would improve communication during the development process between the client, the client's customers and the supplier. They studied the case in workshops dealing with common ordering, production, and delivering processes. On the basis of the analysis of inter-member interaction, they designed possible solutions to improve discussion, information gathering and storage in an easily accessible way in every step of the process.

Students worked in small groups and produced demos of different solutions that help to collect, share and visualise relevant information between essential members. The results ranged from online chats, email, and project management tools to new solutions, which makes the handling processes user-friendly, digital and more informative and visible. Also, the solutions help the commissioner to turn the often tacit customer wisdom into an explicit format.

The cooperation with Avenla was continued next spring 2016, with a more service design oriented task. A group of five Service Management students run a project from January to May to identify new business possibilities in mobile marketing automation. During the process, the student group generated totally over 40 ideas how location-based technology could support service development. The students focused on one concept through which Avenla can crystallize the added value of digitalization, particularly positioning and location-based mobile technology, for a retailer client. The solution deals with digital services for the retailer to measure and analyse real-time consumer behaviour. Via marketing automation tools Avenla can adapt to changing consumer practices and improve the client's service productivity and user-orientation.

In the cases, the degree of digitalization of the development processes varied. The projects followed a similar type of pattern from data gathering and analysis to idea-generation and from experimentation/testing to conceptualization.

In the first case, live workshops were arranged, but certain phases of the process could have been executed virtually. Actually, the students could have applied the same solutions suggested for Avenla to their own work. When an assignment is well-known, the actual work can be moved to digital platforms. When members know and trust each other, digitalized work promotes productivity. Also, personal timetables and flexible work methods can be integrated smoothly, as the students are not necessarily tied to the same location at the same time. To build mutual trust and to get a solid overview of the task at hand, the early phases should be done face-to-face.

In the second case, students had a more blended pedagogical approach consisting of contact sessions, workshops, research and field work, and individual and group assignments. The project was managed and documented as a combination of Scrum and Trello. The phases and elements of the process that did not take part within the weekly contact sessions were mainly virtual. However, the groups also met in-between the teacher-involving contacts. The group prioritized physical group meetings over virtual ones when creating ideas, whereas reporting and data-mining was usually done individually online/offline. In terms of the Figure 3, the case projects stand in-between the quadrants 1 and 4.

Conclusion and recommendations

The paper has approached the interconnectedness and synergy of service design and digitalization from three perspectives. First, we have introduced

service design as a potential cavalcade of user-centric tools to solve increasingly digital service dilemmas, e.g. omnichannel solutions. Secondly, we have presented an IT-system development process that also places the user in the centre of development work. Thirdly, we have problematized the digitalization of service design process and how we could develop the process by using technology.

To summarize, we have identified seven elements to further elaborate to what extent digital and virtual sessions could replace physical contact in development work, and in what type of situations we should prioritise face-to-face get-togethers over the digitalized process.

1. the **phase** of the process; whether digitalization is more reasonable during e.g. data acquisition and gathering of user information than ideation

2. the state of **connectedness**; it may be valid to differ online- and offline-working

3. **timing** and duration; as it deals with for how long and when technology is used, or pace of working (quick/lingering)

4. type of **work**; group vs. individual work, and inclusive/participatory vs. exclusive/individual type of working

5. **nature** of work; e.g. degree of creativity, are we digitalizing creative/inspirational, or routinized, even boring, work

6. **style** of work; active/passive style of working – as technology (e.g. gamification vs. database search) can activate or passivate the user

7. **outcome** of work/phase; is the certain phase or session of the process considerably more/less meaningful for the whole, e.g. at the beginning of the process it may be crucial to enable team-building and community involvement.

Through these seven indicators, we can further discuss whether it is, firstly, possible to conduct a design process virtually, either partly or entirely, without physical contact among the participants. Secondly, it is possible to evaluate the value of digital and physical working methods around a service development project. Thirdly, it is notable to identify, if/when there are certain parts of the process where physical contact cannot be replaced at all. The fourth theme to be further discussed, is a set of in-between situations where e-tools are used during a physical contact.

Indeed, the aforementioned seven indicators could operate as variables for a more rigorous quantitative study or for themes of a thorough qualitative research. Also, it can be used as a check-list.

References

Bloomberg, J. 2014. Omnichannel – more than a digital transformation buzzword. [Accessed 2 December 2016]. Forbes. Available at: http://www.forbes.com/sites/jasonbloomberg/2014/09/30/omnichannel-more-than-a-digital-transformation-buzzword/

Capgemini 2011. Digital transformation – A roadmap for billion-dollar organizations. [Accessed 2 December 2016]. Available at: https://www.capgemini.com/resource-file-access/resource/pdf/Digital_Transformation__A_Road-Map_for_Billion-Dollar_Organizations.pdf

Chaffey, D. 2015. Digital business and e-commerce management. Strategy, implementation and practice. Sixth edition. Harlow: Pearson.

Cho, D. & Trincia, B. 2012. The Future of Retail: From Revenue Generator to R&D Engine. Rotman Magazine, Winter. https://www.ideo.com/images/uploads/news/pdfs/THE_FUTURE_OF_RETAIL.pdf

Cohn, M. 2004. User Stories Applied: For Agile Software Development. Addison-Wesley Professional.

DigiMensa 2014. Successful Finnish customer wise organizations – The management and measurement of customer value in business models in the digital era project. Lahti UAS and Lahti School of Innovation of the Lappeenranta University of Technology. Project plan. Unpublished. http://asiakasviisaus.fi/en/projects/digimensa

Ernst & Young 2016. The digitisation of everything – How organisations must adapt to changing consumer behaviour. [Accessed 2 December 2016]. Available at: http://www.ey.com/Publication/vwLUAssets/The_digitisation_of_everything_-_How_organisations_must_adapt_to_changing_consumer_behaviour/$FILE/EY_Digitisation_of_everything.pdf

ExperienceFellow 2016. Slip into your customers' shoes. [Accessed 2 December 2016]. Available at: http://www.experiencefellow.com/

Hinchcliffe, D. 2016. Social Collaboration Trends and Strategy Approaches for 2016. [Accessed 2 December 2016]. Available at: http://www.slideshare.net/dhinchcliffe/collaboration-trends-and-strategy-approaches-for-2016

Korn, K.C. & Pine II, B.J. 2011. The typology of human capability: a new guide to rethinking the potential for digital experience offerings. Strategy & Leadership 2011; 39(4), 35-40.

Makkula, S. 2016a. Lahti Pocket City. An interview on 19 April '16. Bay City Play project. Lahti UAS. [Accessed 2 December 2016]. Available at: https://www.youtube.com/watch?v=8BTU-r6W07s.

Makkula, S. 2016b. PocketCity – Compare City Experience. A conference presentation in Smart Cities in Smart Regions 2016. Lahti, Finland. 10 May 2016. [Accessed 2 December 2016]. Available at: http://www.lamk.fi/tapahtumat/smart-cities-in-smart-regions/Documents/Makkula_Tuesday_B1_14.30.pdf

Nilsson, E. & Ballantyne, D. 2014. Reexamining the place of servicescape in marketing: a service-dominant logic perspective. Journal of Services Marketing, 2014; 28(5), 374-379.

Pine, B.J. & Gilmore, J.H. 2011. Experience economy. Work is theatre and every business a stage. Updated edition. Boston: Harvard Business School Press.

Pine, B.J. & Korn, K.C. 2011. Infinite possibility: creating customer value on the digital frontier. San Francisco: BK Business.

Polaine, A., Løvlie, L. & Reason, B. 2013. Service design: from insight to implementation. New York: Rosenfeld Media.

Sanders, E. B.-N. 2002. From user-centered to participatory design approaches. In J. Frascara (ed.), Design and the Social Sciences: Making connections. Taylor & Francis Books Limited, 1-8. [Accessed 2 December 2016]. Article/chapter available at: http://maketools.com/articles-papers/FromUsercenteredtoParticipatory_Sanders_%2002.pdf

Shapiro, A. 2011. Users not customers: the hard lesson that all businesses must learn now. New York: Portfolio.

Vaajakallio, K. 2012. Design games as a tool, a mindset and a structure. Doctoral Dissertations 87/2012. Helsinki: Aalto-yliopisto. [Accessed 2 December 2016]. Available at: https://aaltodoc.aalto.fi/bitstream/handle/123456789/11660/G4_vaajakallio_kirsikka_2012.pdf

Vezzoli, C., Kohtala, C. & Srinivasan, A. 2014. Product-service system design for sustainability. Learning Network on Sustainability. [Accessed 2 December 2016]. Available at: http://www.lens.polimi.it/uploads/award/9781909493698_web.pdf

Wetter-Edman, K. 2014. Design for service – A framework for articulating designers' contribution as interpreter of users' experience. Academic Dissertation. University of Gothenburg. [Accessed 2 December 2016]. Available at: https://gupea.ub.gu.se/bitstream/2077/35362/5/gupea_2077_35362_5.pdf

Zhou, Q. 2014. User Stories and Business Impact. In J. Münch (ed.), Data- and Value-Driven Software. Engineering with Deep Customer Insight. Proceedings of the Seminar No. 58314308. University of Helsinki. Department of Computer Science, 29-35. [Accessed 2 December 2016]. Available at: https://helda.helsinki.fi/bitstream/handle/10138/152785/dvdsedci14_proceedings.pdf?sequence=1

Zomerdijk L. G., Voss C. A. 2010. Service design for experience-centric services. Journal of Service Research, 2010; 13(1), 67-82.

Ojasalo, J., Holopainen, K-M.

Title: Challenges and Opportunities of Pre-Commercial Procurement for Cities' Innovation: Empirical Findings from a Smart City Research

Research Article

Abstract

The purpose of this article is to increase knowledge of the challenges and opportunities of using pre-commercial procurement (PCP) in the innovation collaboration between a city and external actors. The external actors refer to private companies,3rd sector organizations, and research institutions.

This study belongs to a larger 2-year research project on Open Innovation Platforms in Smart Cities, in the Urban Research and Metropolitan Policy Program (in Finnish: "Kaupunkitutkimus ja Metropolipolitiikka"). One of the issues addressed in the study concerns challenges and opportunities of using pre-commercial procurement (PCP) in the innovation collaboration between a city and external actors.

Public procurement has a great potential to enhance innovation and diffusion of new services and products. However, using public procurement as an innovation policy tool in cities which truly considers user and customer needs, market demand, and legislative restrictions is a challenge.

So far, the literature includes very little knowledge of the applicability and use of pre-commercial procurement for enhancing external actors' innovation for needs and problems of cities. There is a clear need to increase knowledge in this area. The present empirical study responds to this need.

This qualitative explorative study is based on data from 65 in-depth interviews and co-creative multi-actor workshops, and its analysis with open coding and selective coding in terms of the grounded theory method.

As a result, this article identifies several challenges related to the use pre-commercial procurement in the innovation collaboration between a city and external actors, and gives a brief overview of them.

Keywords: Pre-commercial procurement (PCP), Public Procurement for Innovation (PPI), Public Procurement, Collaborative innovation, Smart City

Introduction

The potential for using public procurement as an instrument for innovation is considerable, since in many industries public procurement represents a key source of demand for private companies (Edler & Georghiou, 2007). Construction, health care and transport are examples of such industries. Some studies have found public procurement to more effective way to boost innovation than R&D subsidies. Based on their study, Rothwell and Zegveld

(1981; see also Rothwell, 1984) concluded that, over longer time periods, state procurement triggered greater innovation impulses in more areas than did R&D subsidies. Similarly, Geroski (1990) argues that public procurement is a far more efficient instrument in stimulating innovation than any of a wide range of frequently used R&D subsidies. Indeed, since cities are responsible for a large share of public procurements in the society, they possess a substantial potential to enhance innovation through their procurement.

Pre-commercial procurement (PCP) is the procurement of research and development of new innovative solutions before they are commercially available (EU Pre-commercial procurement, 2015). It belongs to a larger strategic approach of Public Procurement for Innovation (PPI) which includes several approaches, and PCP is one of them (Edquist & Zabala-Iturriagagoitia, 2012; see also Edler,2009; Edquist & Hommen, 2000; Hommen & Rolfstam, 2009; Uyarra and Flanagan, 2010). According to Edler & Georghiou (2007), pre-commercial procurement refers to the procurement of (expected) research results and is a matter of direct public R&D investments, but no actual product development. Moreover, it does not involve the purchase of a (non-existing) product, and no buyer of such a product is therefore involved. This type of procurement may also be labelled “contract” research, and may include development of a product prototype (Edquist & Zabala-Iturriagagoitia, 2012). According to Edler & Georghiou (2007), pre-commercial procurement is applicable for innovative products and services for which further R&D needs to be done. The risk related to innovation process is shared between the company and the city. Products and services are still in the pre-commercial phase, the products and services delivered are not “off the shelf”. The procurement is actually an R&D service contract, given to a future supplier in a multi-stage process, from exploration and feasibility to R&D up to prototyping, field tests with first batches and then, finally, commercialization. The justification for this approach stems from the argument that R&D-intensive procurement needs more intensive interaction and cannot be judged on the basis of written specifications and proposals.

Pre-commercial procurement process

PCP involves different suppliers competing through different developmental phases. The risks and benefits are shared between the procurers and the suppliers under market conditions. The risk-benefit sharing under market conditions is when procurers share the benefits and risks related to the IPRs resulting from the research and development (R&D) with suppliers at market price. Competitive development in phases is the competitive approach used in PCP by procurers to buy the R&D from several competing R&D providers in parallel. The procurer compares and identifies the best value for money solutions available to address the PCP challenges. R&D is divided into phases (solution design, prototyping, original development and validation/testing of the first products) with the number of competing R&D providers being reduced after each evaluation phase (EU, Pre-commercial procurement, 2015).

PCP and its phases are described by Deciepher PCP Project (2013) based on EU Commission (2007) as follows. PCP is an approach for acquiring R&D services which enable public procurers to (1) share the risks and benefits of designing, prototyping and testing of new products and services with the suppliers and other stakeholders such as the end-users, (2) create the optimum conditions for wide commercialization and take-up of R&D results through standardization and/or publication, and (3) pool the efforts of several procurers. PCP gives an opportunity to develop different ideas in parallel where one, or few of the initial ideas will eventually be selected for commercial public procurement in accordance with the Procurement Directives. It

starts earlier in the innovation cycle of a product than a more conventional procurement project would do. Moreover, it is a competitive process where solutions are step by step selected or abandoned (Figure 1). It is attempt to highlight existing possibilities for public agencies to procure innovation within existing legal frameworks. The First phase in PCP may involve a pre-study or 'solution exploration' where several different solutions are explored. The second phase may include prototype development of the solutions that are considered most promising. This can be followed by the development of a small test-batch of some of the remaining solutions. Finally, one or few of the remaining solutions are selected for commercial roll-out (Deciepher PCP Project, 2013).

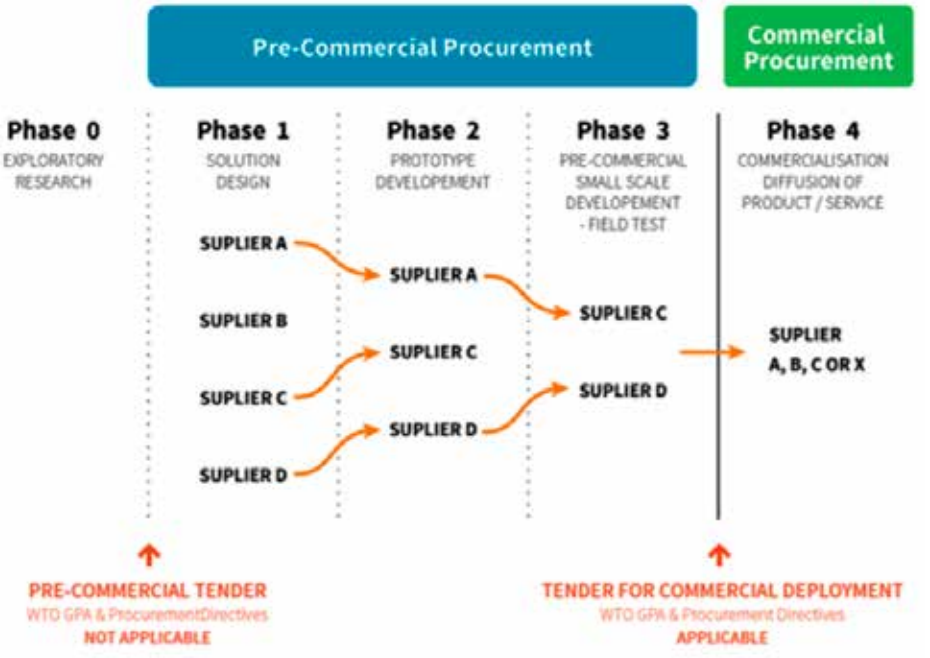


Figure 1. Pre-commercial procurement process (Deciepher PCP project, 2013)

Method

This article emerges from stems from a larger 2-year research project on open innovation platforms in Smart Cities (Ojasalo, 2015a; 2015b; 2016). The project addresses several themes. One of them concerns the challenges and opportunities of using pre-commercial procurement (PCP) in the innovation collaboration between a city and external actors. The results shown in this article relate to this particular research theme. The research method is qualitative based on data from in-depth interviews and co-creative workshops (Gummesson 2000). The data of this article include 65 in-depth interviews. The interviews were audio recorded and transcribed for later analysis. The interviewees also had a chance to make drawings during the interviews. The drawings were photographed, collected, and interpreted in the analysis.

Empirical Results

Based on the current empirical study, this study found several challenges and opportunities of using pre-commercial procurement (PCP) in the innovation collaboration between a city and external actors. They are shown in the Figure 2 and Figure 3. Due to the limited length of this article, only a brief overview of the identified challenges and opportunities is presented here rather than a detailed description.

Challenges

The following challenges of using pre-commercial procurement in cities were found in this study. The study showed that PCP and public procurement of innovation (PPI) are vague and ambiguous concepts. They have no commonly agreed precise definitions. Several interviews were suspicious about the PCP instrument's fitness for use and to stimulate the market. This is mainly because they know it is presently rather unknown, the process is long, includes several evaluation phases, and bureaucratic. Decision makers in city departments lack support for interpreting Act of Public Contracts in R&D cases. Although the current Act on Procurement Directives offers already a variety of dialogue methods to conduct innovative procurement and development work, but the cities do not take sufficient advantage of them to develop new solutions. Cities do not recognize the procurement process as a problem, but other actors find it limits the creation of new solutions. Cities' procurement experts and departments do not have sufficient knowledge of the external actors. The available means and resources to adequately identify them are insufficient. When defining a city's problem related to PCP, better expertise in co-creation is required. Cities alone are not able to solve and develop new operating models, but need more and more expertise from other actors already in the problem definition phase.

The research data shows that organizational, professional, and motivational factors prevent the adoption of a user and customer-oriented way of thinking in cities. The challenge is that cities have not defined long-term procurement strategies that would be based on future societal problems and needs. Cities' administrations have too little time and resources to reflect on strategic renewal as well as to create new alternative development paths alongside the existing ones. Co-creation is often hindered by a lack of confidence and transparency between the city and external actors, as well as by the diversity of values. Furthermore, cities are sceptical about companies' ability to understand their processes and objectives because companies operate on business principles. The uncontrolled experimental culture is perceived as a threat because cities have limited time and human resources. PCP and PPI procurements can be implemented if their costs are examined through the life-cycle costs and repayments. The challenge is to justify the investments to policy makers.

The investigation revealed that there are relatively few Finnish companies involved in EU-funded transnational PCP projects. The challenge is to get external small and medium-sized actors interested in these projects and in gaining international experience. Challenges and problems are identified, but the greatest challenge for the public sector lies in acknowledging problems and defining needs as well as in agreeing on targets together with external actors. Moreover, the planning and the preparation of procurements will require more vision, when the current operating model shifts towards demand- and user-driven innovative procurements. In this case, not only procurement law and price-oriented thinking but also the need, objective and outcomes of dialogues will determine a suitable procurement method when public agency decides to procure. Also, the research data also showed that it is difficult for external actors to find someone within the city organization to discuss new product and service solutions.

The research data showed that SMEs are happy to sell to cities, but the procurement criteria are not always attractive for them to make an offer. Moreover, intellectual property rights give rise to intense discussions between companies and cities. In the current operating model cities are used to buy the ownership of products developed by other actors and do not consider

further commercialization opportunities of the end solution from the companies' perspective. In addition, the commercialization and introduction of new solutions have not been systematized in cities, nor is it clear how they could be shared and spread to other cities. Moreover, external actors perceive cities sometimes as difficult or less smart contracting parties. They appear to be unreasonable, inflexible and rigid before and after the contract is concluded. Furthermore, demand-centric and user-centric innovative public procurements require a new kind of attitude and capability from both city purchasing officials and external actors. The co-creation of product and service concepts between city departments is insufficient because the value of interaction and co-creation across departmental borders is not recognized nor are the problems in processes opened up to external actors.

Moreover, the research data shows that cities' service production is perceived as a stable and long-term actor. It has a strong role as a welfare service provider. It is perceived, however, as cost-inefficient and slow to reform because of insufficient competition. The challenge is augmented by inability or unwillingness to recognize business opportunities because such authority has not been delegated to anyone in cities. For this reason, the use of PCP is low. Political decision-making does not encourage cities to undertake PCPs and PPIs. Also, cities find PCP processes to be long and laborious, as the projects require a long-term commitment of resources. The study showed that cities do not yet perceive the PCP method as useful because R&D is not seen as an investment. The challenge often lies in justifying and evaluating PCP and presenting the end result to the political decision makers. The research data shows that PCP method and PPI strategies are introduced slowly or the city waits until other cities test them first. Procurement experts and city departments have to challenge themselves to try and learn other less-used dialogue procurement methods in order to create innovative service solutions.

Moreover, cities' silo and annual budgeting and current information systems hamper radical innovations created across city departments. Also, the establishment of strategic partnerships is hindered by public procurement law issues and the difficulty to draw up development partnership agreements. Also, a challenge lies in the fact that PCP requires a new kind of knowledge and resources. Cities have less experience and expertise in project management and administration than many external actors, such as companies engaged in research and product development.

Also, a city is often too small a unit to be a PCP buyer. The study showed that it would be worthwhile for cities to perform PCPs jointly so that it is possible to share the costs and risks of R&D as well as experience. In addition, cities slowly open up their service production processes for examination by others. Cities are afraid of criticism, organizational changes and risk-taking. The opening up of processes would reveal that cities do not have a strategy to develop their services or that the strategy has not been integrated in the activities of the organization.

Furthermore, the study shows that PCP is not suitable for situations where the solution is needed quickly or the market solves the problems quickly. The study shows that cities' decision-makers are reluctant to invest in R&D activities if the end result is uncertain. Furthermore, the procurement law centered mindset makes it more difficult to discuss the city's challenges and problems with external actors. The challenge is an important requirement set out in the Act on Public Contracts providing an equal, non-discriminatory and transparent treatment of all actors. Moreover, cities do not want to take too much risk due to the fear of failure since they are using public money and

there is no separate budget for implementing R&D projects. Enterprises are not very eager to take part in projects that do not generate business in the near future. SMEs and third-sector actors expect immediate business benefits and do not become interested in projects that are too long if the financing is not available or the demand is not certain. Finally, the research data indicates that market dialogue on, PCPs requires, among other things, strong commercial, procurement, technical, financial and legal expertise. The challenge experienced is that there are not yet enough skills and expertise to initiate market dialogue, even though it is recommended for wider use in the preparation of public procurements.

Figure 2. Challenges of using pre-commercial procurement in collaborative innovation in cities

Opportunities

The following opportunities of using pre-commercial procurement in cities emerge from this study. The research data shows that PCP can be an encouraging option for both the city and external actors because it commits the participants to target-oriented research and development. Pre-commercial procurement allows for a new type of co-creation between cities and external actors where both parties significantly share and develop both their own know-how and the city. Cities and external actors had not only the negative experiences mentioned above, but also positive experiences of market dialogues where new innovative product and service concepts for future challenges were sought through open discussion.

Also, cities should be more engaged in co-creation and joint procurement and harmonize processes and operating models, as the needs of many cities and their residents are universal. Pre-commercial procurements allow to develop new customer-oriented product and service concepts more cost-effectively for the various needs of the organization and residents of the city, to share the development costs among several cities and to implement a joint procurement. PCP allows external actors to develop their own business together with city experts when a genuine future need for a new product or service concept is identified. In R&D collaboration, cities develop business- and customer-oriented thinking. Moreover, cities have to shift from growth management to an active urban environment and the development of its services by creating a strategic business and innovation policy that will have a wide-ranging ripple effect on society. PCPs present the opportunity to create cost-effective and sustainability-promoting innovative procurements. Cities need both research and development organizations and financiers as partners so that the cities begin a wider R&D collaboration with external actors.

Moreover, there should be a national organization consisting of public procurement experts that would guide and service the public sector and other actors in both pre-commercial procurement projects and other public procurement as well as provide support for cities' procurement units and external actors, on a centralized basis. An organization consisting of experts could look for financing options and identify development targets as well as external actors who can provide innovative unbiased solutions to future problems of cities. The future major challenges require national and strategically important pre-commercial procurement projects because the needs of cities are very much universal, although each city has its specific characteristics. Finland's small population and size speak in favor of national projects.

The research data shows that officials and those responsible for strategic procurements should become more familiar with EU Commission-funded PCP projects and actively participate in them in order to develop services and industry. Pre-commercial procurements are used to genuinely promote the development of product and service concepts of SMEs because they are most in need of testing platforms and testers, as well as references. Companies and third-sector actors who are developing their own product or service concepts are interested in specific development projects such as PCPs.

Moreover, a city should try different procurement methods with other cities more boldly as well as share knowledge and experiences and systematically improve their usability. Also, cities should be encouraged to invest in the purchase of research and development by allocating funding to PCP and PPI procurements. In addition, there is a need for an entity or actor that would promote and increase their chances of being realized between external actors and cities and provide concrete support to the parties in their execution.

Finally, the research data indicate that cities have good experiences of developing services with external actors. This requires that both the city official and the other actors develop new attitudes towards each other. Those responsible for city procurements have to understand that external actors need a profitable business in order to develop customer-oriented service concepts.

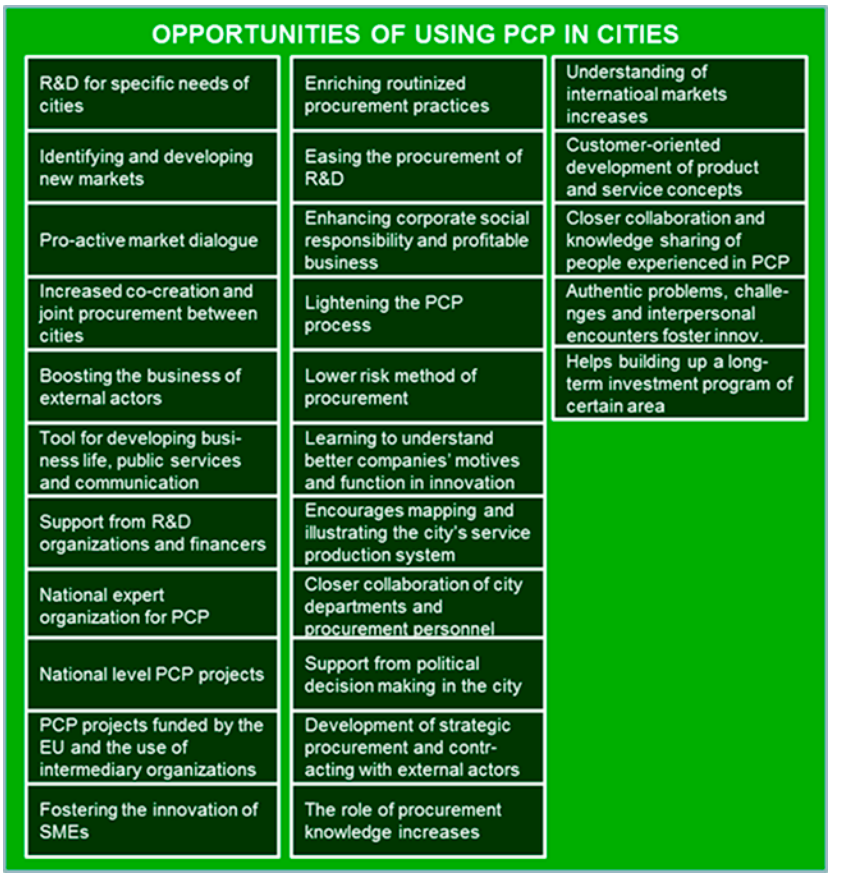


Figure 3. Opportunities of using pre-commercial procurement in collaborative innovation in cities in cities

Conclusions

The purpose of this article was to increase knowledge of the challenges and opportunities of using pre-commercial procurement (PCP) in the innovation collaboration between a city and external actors. It was based on data from 65 in-depth interviews and co-creative multi-actor workshops. As a result, this article identifies several challenges related to the use pre-commercial procurement in the innovation collaboration between a city and external actors, and briefly explained them.

References

Deciepher PCP Project. 2013. http://www.decipherpcp.eu/project-overview/what-pcp Accessed 17 May 2016.

Edler, J. 2009. Demand Policies for Innovation in EU CEE Countries. Manchester Business School Working Paper No 579, The University of Manchester. 2009; 1-36.

Edler, J. & Georghiou, L. 2007. Public Procurement and Innovation-Resurrecting the Demand Side. Research policy 2007; 36. 949-963.

Edquist, C. & Hommen, L. (Eds.). 2000. Public Technology Procurement and Innovation. Dordrecht: Kluwer Academic Publishers. 5-170.

Edquist, C. & Zabala-Iturriagagoitia, J.M. 2012. Public Procurement for Innovation as Mission-Oriented Innovation Policy. Research Policy 2012; 41. 1575-1769.

EU Commission. 2007. Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe. http://ec.europa.eu/invest-in-research/pdf/download_en/com_2007_799.pdf Accessed 17.5.2016

EU. Pre-commercial procurement 2015. http://ec.europa.eu/digital-agenda/en/pre-commercial-procurement#Newsroom Accessed 16 Apr 2015.

Geroski, P.A. 1990. Procurement policy as a tool of industrial policy. International Review of Applied Economics 1990; 4(2). 182-198.

Glaser, B.G. 1978. Theoretical Sensitivity. The Sociology Press 1978.

Gummesson, E. 2000. Qualitative Methods in Management Research. 2nd ed. California: Sage Publications.

Hommen, L. & Rolfstam, M. 2009. Public procurement and innovation: towards a taxonomy. Journal of Public Procurement 2009; 9(1).17–56.

Ojasalo, J. 2015a. Open Innovation Platform in a Smart City: Empirical Results. The Journal of American Business Review, Cambridge 2015; 4(1). 195-202.

Ojasalo, J. 2015b. Open Service Innovation Platform in a Smart City. In: P.R. Dameri & L. Beltrametti (Ed.), Proceedings of the 10th ECIE European Conference on Innovation and Entrepreneurship. Genoa, Italy, 2015; 521-528.

Ojasalo, J. 2016. Building An Open Service Innovation Platform For a City's Needs: An Empirical Study On Smart Cities. In: L.G. Chova, A.L. Martínez, & I.C. Torres (Eds.), INTED2016 Proceedings, 10th International Technology, Education and Development Conference, March 7th-9th, 2016. Valencia, Spain, IATED Academy, 2016; 6172-6181.

Rothwell, R., 1984. Technology based small firms and regional innovation potential: the role of public procurement. Journal of Public Policy 1984; 4 (4). 307–332.

Rothwell, R. & Zegveld, W. 1981. Government regulations and innovation—industrial Innovation and Public Policy, London. In: Rothwell, R., Zegveld,W. (Eds.), Industrial Innovation and Public Policy, London, 116–147.

Uyarra, E. & Flanagan, K..2010. Understanding the innovation impacts of public procurement. Territorial Industrial Development Policies and Innovation 2010; 18 (1). 123–143.

Talvela, J.

Title: To Patent or Not to Patent – Hard Decisions for Smes

Research Article

Abstract

Inventions have long been recognized as key driver for wealth creation of nations. As intellectual property (IP) rights are costly and difficult to acquire and enforce, it is often argued that SMEs are disadvantaged in their ability to utilize IP rights. Against the background of the patent upsurge, we conduct a research of semi-structured interviews to gain a deeper understanding to the motives and challenges that SMEs face considering their position in IP generation, protection and IPR operations.

The results of the study show that Finnish SMEs, and especially the smaller companies, are failing to make use of IPRs. A clear contrast is seen when compared with larger companies well experienced and knowledgeable in the IPR regime.

Interviews with private inventors, SMEs and large companies show, that the general knowledge of the global patent system, and capabilities to operate with IPRs, are low among SMEs. This leads to unjustified high expectations of economic benefits of patenting, and eventually, disappointment with IPRs. Reasons for this development, and recommendations to the Finnish SMEs are discussed.

Keywords: Patent, SME, Intangible Asset, Intellectual Property, IPR,

Introduction

"There is nothing permanent, except change" describes well contemporary businesses. Following the great shift from agricultural to industrial economy, a shift to post-industrial era was observed in the 1970's. Service sector became, then the leader in formation of new jobs. During four decades, manufacturing jobs were roughly halved, in the industrialized world, while new jobs in services doubled the sector's share to about 40% of all jobs (Carnevale & Rose 2015).

Contemporary business is more than ever globalized, as reaching foreign markets is easier and faster. Exports, overseas production and international business co-operations are supported by information networks, ease of travel and trade agreements.

Businesses conduct research and development (R&D) to increase their competitiveness through new products, services and processes. R&D is one of the most important contributors to productivity growth and its diffusion (OECD 2016 p. 19-20). As R&D processes are expensive and challenging, they pose a high risk for the innovator. Commencing R&D does not automatically lead to success. R&D projects may fail to reach their goals, or provide lesser than anticipated outcomes. An OECD (2016, 26-28) research of some 11.000 companies in the OECD database, representing a large proportion of the world GDP, shows that the companies exhibiting high productivity and high growth

spent much more on R&D than other companies. This requires risk taking capability and a long-term focus on innovations. For the economy to prosper, there should be more of these companies.

Nations support companies doing R&D by tax incentives, R&D grants, publicly funded research, and by granting protection to their intellectual property (IP) outcomes. Patents are the most important method to protect novel, useful and industrially applicable inventions. Granting a patent provides the applicant(s) with a limited term monopoly on the commercial use of the technology, in the countries/regions where the patent is granted. The Paris convention agreement, initially signed in 1883[1] laid the foundation for the global patent system. Local Patent and Trademark offices (PTOs), together with international bodies, such as the European Patent Office (EPO) and the World Intellectual Property Organization (WIPO) operate the patent system.

Starting from the 1970s the rise in patenting has been rapid. 1984-2014 the number of applications almost tripled (WIPO 2015). Newcomers Japan, Korea and China, have led the growth swarming the playground with patent applications (Figure 1). The popularity has boosted importance of patenting in technology businesses appropriating their R&D investments. Patenting is considered more a large companies' game[2] . It is often argued that small and medium sized companies (SMEs) are disadvantaged in their ability to efficiently utilize patenting (Arundel 2001, Olander, Hurmelinna-Laukkanen, & Mähönen 2009). Patenting motives and patenting routes of different size companies have been researched by Jell (2012), Veer & Jell (2012), Blind, K., Edler, Frietsch, & Schmoch (2006). For research on IP protection in SMEs, see Zaby (2010), Rassenfosse (2011), Holgersson (2013), and Picano & Teece (2007). Research on SMEs' enforcement of IP rights (IPR) is covered by authors, such as Hughes & Mina (2010), Brant & Lohse (2013) Granstrand & Holgersson. (2012), and Ruther (2012).

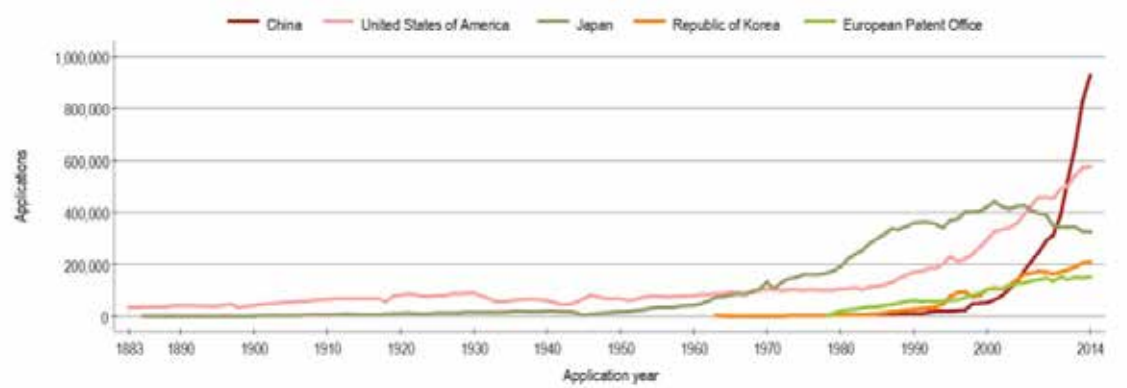


Figure 1. Global trends in patent applications of the top-5 patent offices
Source: WIPO (2015).

Previous literature, evaluates IP protection practices, experiences, challenges and trends in many ways. This opens us a research gap in seeking to understand the initial considerations and decision processes of SMEs, while weighing the benefits and challenges to the company's business of intellectual property and IPR. Realizing the growing importance of IPR, most SMEs possess but a vague know-how and knowledge to make any justified, solid decisions on IPR matters. Talvela (2016) describes the lack of awareness and capabilities of IPR matters among SMEs.

[1]. More on the Paris Convention at http://www.wipo.int/treaties/en/ip/paris/.
[2]. WIPO (2015, p. 22) presents a list of top 100 patent families. 96 of these belong to large multinationals, and four are connected with Chinese universities.

From these considerations attempting to fill the gap, the research objectives for this paper are:

1. To describe the behavior of Finnish technology oriented SME companies in IPR matters to understand the situation of the SME companies.

2. To list the variables that affect SME decision making in IPR related matters.

3. To make recommendations on SMEs' conduct of IP protection, taking into account the global trends in the IPR field.

IP protection consists of a number of methods. Figure 2 displays the formal and the most common informal methods. In this paper we present results from semi-structured interviews and describe what Finnish technology oriented SME companies think about IP and its protection. Realizing the increased openness of global markets and the potential threat of limitations to freedom-to-operate, posed by competitors' patents, the companies are pondering if they, too, should seek to strengthen their position within the IPR regime.

Figure 2. IPR methods – formal and non-formal
Source: Author

The variables affecting SME decisions in IPR related matters are sought and extracted from the interviews and analyzed. We set a hypothesis, that the general attitude of SMEs towards patenting is negative in a "nothing to do with us" manner. This hypothesis is then tested in the interviews.

Finally, recommendations are made as to how SMEs could benefit and make use of IPR, better.

This research focuses through a qualitative approach on documenting the decision making in Finnish technology oriented SMEs on the use of patenting as a means of IP protection. In addition to patenting their own inventions, firms can use patents to find technological and competitor information from freely accessible global patent databases.

The rest of this paper is organized as follows. Chapter 2 presents the data and the methodology that we use. In chapter 3 the results are presented and analyzed. Chapter 4 discusses the results and chapter 5 draws the conclusions and suggest some future research to consider.

Data and Methodology

Research strategy

This research is an empirical qualitative study concerning IPR behavior of technology oriented SME companies in Finland. In the background we observe the global surge of intellectual property rights as their forming into a general production factor. Particularly this is vital for modern industrial countries mainly competing in innovative products and services.

This study intends to increase the basic knowledge and understanding on the motivation and concerns of SME companies towards IP and its protection by the company itself, the competitors or other operators on the market. Through new knowledge we may propose improvements to enhance the SME development in the field.

Strategic use of patenting and various operational motives of SMEs are discussed by Jell (2012), Zaby (2010), and Thomä & Zimmermann (2013). They assume that SME decision makers possess necessary skills for optimal decisions. That's why this research is focused on the quality of such skills.

The research approach can be described to be qualitative interview method, descriptive-analytical, and based on empirical material collection: empirical descriptive, because in this stage of the study it is necessary to form an understanding of the basic decision making processes of SMEs in this aspect. Descriptive-analytical means that researcher seeks to make a systematic classification for the collected empirical data. Empirical material collection means that the research interviews personally the SME manager/ entrepreneurs playing a key role in this topic. As the basic awareness within some interviewees is limited, it happens that the researcher may influence on the views of the interviewees. The researcher intends to avoid this effect by all means, but the influence is not totally excluded in the semi-structured interviews. The nature of interviews and the nature of knowledge interest in this research makes the research strategy action research and hermeneutic by nature. The main purpose is to understand and explain the SME companies conduct in intellectual rights field.

Interviewee selection and topics discussed

To gain understanding on the IP protection related decision making in the target group requires obviously, interviews with the said group. A set of semi-structured interviews were conducted to gather data on the topics of the research objectives, presented in the first chapter. In addition to target group SMEs, other interviews were also conducted with private inventors and large companies. Table 1 describes the types of interviews carried out in this research. All corporate interviewees a) were in technology oriented industry or high-tech service business, b) presented an inventive capacity by either possessing patents or displaying an interest in IPR matters, and c) were conveniently approachable and the interview was possible and uncomplicated to agree upon. A more detailed description of the interviewee selection can be found in Talvela, Karvonen, Kässi, & Ojanen (2016).

Table 1. Interviewed organizations and private inventors
Source: Author

Organization type	Count	Interview duration	Position	Interviewee experience
Large companies	3	454 min	IPR Managers	Responsible for company's invention and IPR processes
SME companies	12	1542 min	Entrepreneurs	Manager/inventor with or without experience in patents and other IPR
Private inventors	5	Telephone/email	Individuals	Applicant and/or owner of IP rights with no affiliation to a company

Inputs from private inventor and large company interviews have enhanced the general issue understanding and filled in gaps as to the reasons for operating with IP protection and identifying the preferred methods. Feedback from large companies is used to set the scale on the high-end of patent activity. Interviewed large companies all were active in using patent protection for their inventions, as well as making use of the patent system to estimate the directions for development in their respective business fields. Individual inventor interviews were carried out to gain understanding how private inventors without direct integration with a firm might consider patent protection, and their experiences with the IPR regime. For definition of company size, we use the European Union (2015) categorization of SMEs, as presented in Table 2.

This research has a qualitative rather than quantitative approach to collect and analyze data on the research topic. The selection of the interviewees was based on accumulation of new knowledge throughout the interview process, rather than on a statistically representative sampling. Thus, the convenience factor allows the interviews to be conducted in companies and organizations that lie within the scope of the research and fulfill the other two criteria.

Table 2. SME definition by the European Commission
Source: European Union 2015

Category	Headcount	Turnover	or	Balance sheet total
Medium-size	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

All interviews were semi-structured in a way that certain topics were brought into discussion either naturally in conversation, or by the researcher asking necessary questions. Altogether 20 such interviews have been conducted, 15 of them face to face with an average duration of 127 minutes, each. Five interviews targeting private inventors are conducted over the telephone and/or by email. Within all interviews the following topics were among those, either raised or merged naturally into discussion. The list is not comprehensive, but provides information on the discussion topics relevant to this paper.

1. The interviewee's self-estimated level of the understanding and awareness of intellectual property and the IPR system, and experiences with IP generation, protection and operation.

2. The motives of seeking to protect company/own IP and the various means and ways of doing this, either formal or informal.

3. Sources of information, knowledge and know-how concerning IPR. Networks, contact points and service providers to discuss these topics with. Necessary level of awareness and understanding to make justified decisions upon IPR.

4. Own or learned experiences of patenting and operations with patents. Reflections of how these experiences affect their attitude towards patents or other IPR, and their decisions on IPR matters.

Results and analysis
The interviews have provided an insight into IPR considerations and practices among private inventors, SME manager/entrepreneurs and large company IPR managers. The results from interviews with these three groups are firstly presented, one by one, below, followed by an analysis comparing the differences and similarities between the groups. The analysis covers the approach to the three research objectives, as presented in the first chapter.

Interviews with private inventors
The five private inventors were approached by email and telephone. Originally, 20 private inventors were approached, but at the end only five of them agreed to participate in the research. Due to the geographical dispersion of the participants, it was not practical to setup face-to-face meetings. Instead, email and telephone conversations were found the best possible means to carry out the interviews.

All five private inventors had applied for and got granted at least one patent. Four of the five that provided background information on their patenting activities can be characterized as “serial inventors” and had made inventing a sort of a hobby. Their employment status varied, as two were entrepreneurs, one an employee and one retired from working life. Two main reasons were mentioned for applying for a patent in their own name, instead of having a company applicant. Firstly, the company they were attached to at the time of the invention was not interested, or did not claim the ownership of the invention. Secondly, they considered inventing a hobby, and once bouncing into a considered-useful solution, they would apply for a patent.

The private inventors were clearly unsuccessful in monetizing on their IPR. In their experience the benefits of the IPR system are greatly exaggerated and only serve large companies, patent lawyers and patent agencies. They declared a need for public support to cover the high costs of patenting and its commercialization. The main motivator for the private inventors was to gain respect through being able to call themselves “inventors”.

This group of the interviewees demonstrated the least understanding of the IPR system in general, whether selecting a proper means of IP protection, awareness of the functioning of the IPR regime, knowledge of how to plan proper patent protection for inventions, understanding of patent enforcement, or appropriating their investments. The misconception most often encountered with private inventors was that patents per se “protect” their inventions from competition, which, of course is not the case as patents rather present the holder a right of veto which must be enforced with proactive conduct.

Interviews with SMEs
The 12 SMEs that were interviewed displayed a variance of IPR capabilities. Three out of the twelve were active and experienced in the IPR regime. They represented the medium-size end of the SME scale and each had several patents in force, and exhibited a good understanding about patenting and

operations with IPR. Six of the smaller interviewed SMEs, while active in patenting, displayed a lesser understanding of the challenges and opportunities thereof. It was typical for these companies to have applied for a patent without a clear understanding what to do with it. A patent would be considered an option to monetize an invention, but the ways to do it remained unclear. The last three micro and small companies did not possess patents, and were not interested to enter into patenting, although it could be seen that the interviews had some effect in their general interest towards IPR matters, as observed from the questions and comments made during, and towards the end of the interviews. It is here, that the action research character of these interviews, reported in this paper, is most clearly observed.

The interviewed SMEs differ in their awareness of the employee invention act governing how inventions by company employees must be dealt with. The requirements set forth by the law are not well understood in smaller companies. Medium sized companies, on the other hand are displaying a far better awareness of the necessary processes, approaching the smooth and well documented processes abundant in large companies. The reasons for smaller companies not fully complying with legal requirements were reported as follows; fear of needing to pay employees excess amounts for their inventions, and consideration that invention activity in the company is limited to manager/entrepreneurs, themselves, or a clearly defined small team of business partners.

To compare different kinds of IP protection methods is not easy for SMEs. As most of them miss the basic understanding of the various protection methods, and some even the concept of what is intellectual property, it is obvious that being able to realistically compare different methods to select the best ones for the company to use is just too much asked for. Thus, those SMEs that enter into IP protection tend to go for patenting to start with. Following the recognition of a possibly patentable invention, they will soon involve a patent agent to consider and draw the initial application. Patent agent depending, they might be instructed towards considering the business value of the protection, or they are merely served with a patent application, which is then entered into the application process. In the first case, companies soon learn about IPR and gain knowledge of its various instances. In the latter case, the application is processed and either leads to a patent grant, or in some cases, is modified into lesser protection by a utility model. The real strength and usability of the patent/utility model remains very unclear for these companies, and they need to further their understanding by experimenting with the protection.

The experimentation with IPR in the interviewed companies have led to twofold results. Some of the companies consider having learned about IPR and are eager to experiment further. This does not indicate their knowledge being on sufficient level to become instantly successful with IPR, but they are exhibiting a positive attitude towards the system. Another group of the companies have encountered negative experiences in a form of a large competitor infringing their patent, and they lack the resources and know-how to deal with it. Also, incapability to monetize the invention, observed weakness of the granted patents and fear of litigation by competitors are reported reasons for disappointment with the IPR system.

The variables affecting the companies' decisions on IPR related matters were not obvious to most SMEs. Yet, the interviewees reported some factors that are considered important in the process including the following:

- Lack of time to make sense of IPR matters (for less experienced companies)
- Missing financial resources to go for a full patent protection. A need to satisfy with one or too few patents to efficiently protect the invention from all angles (for more experienced companies)
- Missing or insufficient sources for IPR education and information
- Not having a peer level network to discuss IP matters with
- No trust in IPR protection. Feeling that the system is for large companies only
- Lack of understanding how IPR might be used to promote business
- Enough business without entering into IP generation and protection activities

Lack of awareness and understanding of patenting, let alone any IPR, is significant in all SMEs. The interviewees reported a need for improvement in educating inventions, IP protection and commercial use. Target for such education was diverse, including entrepreneurs, engineers in a company, all engineering students, additionally all business and art students. Lawyers were by default considered knowledgeable about IPR, but their judicial approach is not applicable in SMEs, unless a dispute or law suit is at risk.

Interviews with large companies
The three large companies interviewed presented the "high-end" of IPR capability. Each company possessed a large number of patents and the IPR managers were not the only ones in the company to manage, operate and guide IPR activities.

These companies were characterized by three basic elements: Clearly defined and managed processes for employee inventions, a written IP(R) strategy in coherence with the corporate strategy, internal IPR management functions well organized and dispersed on all organization levels, including top management involvement.

Experiences of large companies of dealing with IPRs is mostly positive. They operate and maintain an IPR portfolio actively used in business. New IPR protection is sought based on the strategy, and inventions are protected sufficiently from all necessary angles with usually more than one patent. The IPR portfolio includes domain names and trade names conceived part of the intellectual property assets. Trademarks and design rights are included in the IPR toolbox, too.

For large companies the IPR is a playground quite different from the SMEs. Large companies are fully aware of the competitive field, where others possess IPRs, as well, and operate with them through licensing, blocking, limiting the freedom to operate, obscuring, or any other means. Being part of that game is natural and various forms of exchange, co-operation, interconnection or enforcement actions may be brought onto the table with competitors or other stake holders. SMEs possessing single or few patents are not considered interesting or credible, in most cases.

Analysis

As private inventors might be active in inventing and applying for patents, they exhibit a sever lack of business skills. Their invention processes would take unaccounted times with iterations. They would file a patent application in the early stage of the development just “to protect their invention”, and then carry on with the development of their technology towards a perfect solution. Instead of using the patent pending time to search for a market and build a network to monetize the invention, they would rather hold back and focus on perfecting their solution. Without a doubt, this leads in most cases to severe problems, as patenting fees from international phases keep cumulating, and no income or cash flow is seen in the horizon.

SME applicants are more business oriented than private inventors which is visible in their use of patenting. Especially, medium size companies are quite well positioned in using the IPR regime and are display skills to make use of it. On the smaller scale of the companies, the lack of understanding of the employee invention act poses a challenge. For micro and small companies, not understanding the rights and obligations set forth in the law hinders them from making full use of the potential of employee inventions. It is yet to be studied how many good inventions the companies miss, or what sort of disputes they encounter due to this shortage, but there are indications that such mishaps are existent.

Differences between micro/small companies and the middle sized and large companies in their capability to operate with IPRs is big. The dividing line of IPR capability seems to lie somewhere between a “small” and “middle sized” company size with middle size companies far better positioned in the IPR matters. Large companies consider many small companies innovative and capable of producing interesting and novel technological solutions with lots of business potential. These solutions might however not prove interesting to large companies if the IP protection is missing or poorly constructed. Whereas small companies are thrilled about a possibility to enter into co-operation with a large company and become a part of its value chain, their large counterparts are usually reluctant to even talk to the smaller players, unless they exhibit a thorough understanding of IP protection, and due execution of such.

Smaller companies at an earlier stage of their IPR life demonstrate a bigger variation of awareness and capabilities. Great expectations of patent strength and value might often turn into great disappointments, as adverse events take place exposing their weakness and lack of control of their IP, IPR and even business processes. Trust in the fairness of large companies is low and the general attitude towards them is dubious. SMEs consider that the ’patent game’ is played by large companies’ rules and might feel incapable to hold their stand, in case of contradicting interests with a large company. Differing from large companies, SMEs who find their patents infringed might not have very much that they can do about it. If letters of notice don’t provide wanted results, resources and capabilities are too weak, and risks too high to enter into litigation. This leads to some SMEs to “close their eyes” in case their patent is infringed, and consider it better to concentrate on the daily business, instead of legal processing. Such problems might be avoided and managed if relevant education was better available and served to entrepreneurs, engineers and business people.

Discussion

The interview discussions with private inventors, SME manager/entrepreneurs and large company IPR managers have provided new insight into SME patenting capabilities and activities. Following the line of though in Arrow (1962) it is obvious that R&D is a risky business. Reasons for not commencing R&D are:

- Inventive activity is costly and risky. When embarking on a problem-solving exercise, it is uncertain whether a solution can really be found.
- Information on how to solve a problem possesses characteristics of what economists call a 'public good' and adds to the pool of knowledge -> many people can simultaneously use it, and the problem solver often cannot prevent re-production of the information
- Firms operating in competitive markets may forgo inventive opportunities to avoid wasting resources, should a problem-solving effort fail
- If competitors can immediately free ride on a successful solution, the inventing firm may reap little financial reward

In order to encourage inventive activities in private enterprises, governments support private companies' R&D by three methods, namely:

a) Governments support publicly funded research taking place in universities and public research organizations. Such research often pushes the scientific knowledge frontier with no commercial applications in immediate sight

b) Governments fund R&D activities of private firms, by means of public procurement contracts, R&D subsidies, soft loans, prizes, tax credits and related mechanisms

c) Governments grant IP rights as a way of mobilizing private financing for privately undertaken R&D

Despite public efforts to boost private innovation, patenting by SMEs in the EU remains low. For the EU as a whole 79 % of all patent technology can be attributed to large firms and 17 % to SMEs (Vervenne, Callaert & van Looy 2014) as displayed in Figure 3. In Finland most applicants (84%) are large companies. This could be due to various reasons, including Finnish SMEs low performance in IPR related matters, or low number of SMEs, in general, as compared to the EU-27 average. A more detailed explanation for this behavior is yet to be found.

A patenting surge observed on the global scale mainly originates from developing economies. Patenting rates in Finland, rest of Europe and the USA, remain on a more or less constant level, as the newcomers to the patent world increase the total number of patent applications. As seen above, in Figure 1, China's growth in patenting is remarkable and has put her in the global lead position in patenting.

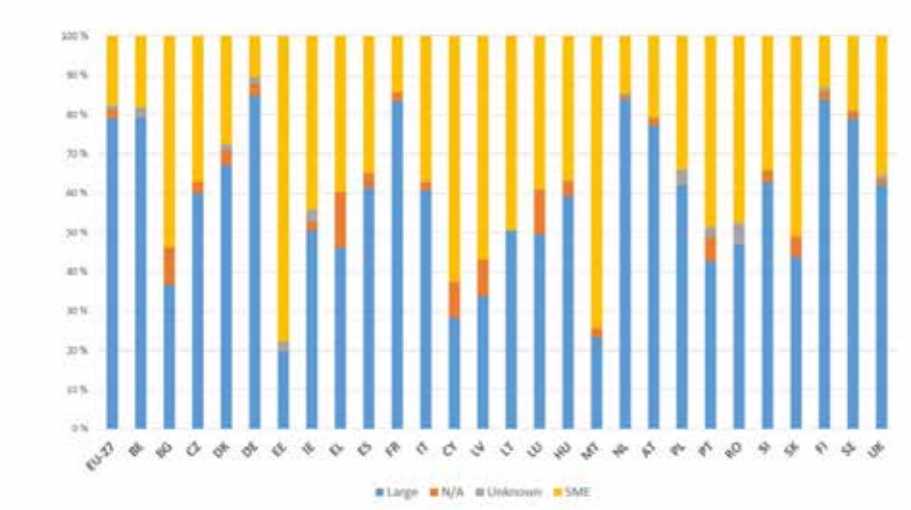


Figure 3. Patenting by large companies and SMEs in the EU
Source: Author's drawing based on data from Vervenne et.al. (2014)

SME companies are not unaware of the patent surge penetrating the global innovation market. As the capabilities of most SMEs are limited to follow patenting activities even within their own field of business, let alone to take action to prevail on the market, it is recommended that a solution be researched for an industry level co-operation network, or similar, to involve IP interested parties from certain industries to get together to share their knowledge and enrich each other with their experiences. Such networks could quite well be organized by chambers of commerce, or similar operators.

Finnish private inventors and SMEs often display an unrealistic conception of the value of their patents. The actual value of IPR is difficult to define, and might not be possible to calculate accurately. Conception of the patent value varies with the perspective of a stakeholder. As proposed in (Kapoor, Karvonen & Kässi 2013) Researchers are interested in the science and technology value of an invention. Technology managers and entrepreneurs might be interested in how much licensing income or increase in sales a patent might generate. Top managers might value the business expansion possibilities of IP protection, while lawyers and patent strategists could find most value in the possible damage that a patent can cause to competitors. Additionally, societal value of a patent is based on the social wellbeing, technological capability and GDP growth. Smaller companies not experienced to operate with patents, while maybe possessing some awareness of the variability of value formation, approach the valuation through a quite limited path. Formulating the patent value without a wider visibility to the range of IP functionalities and IPR operations, such that are readily in use at larger companies, leads to little more than a guess of the true value of the patent.

A deep rooted misconception of patents among smaller companies, as well as private inventors, is the character of its protection. Far too often patents are considered a protective tool that will stop anyone from making use of one's invention. As it happens, in real life matters are more complicated. Patents are tools that can be useful in conducting business activities. But patents do not stop anyone from misusing the invention behind the patent. It is the duty of the patent holder to monitor the business field and observe potential infringements, and duly, take action against such infringement. Failing to do so is equal to wasting money, time and work into gaining a patent, and then just flushing the whole thing down the sewer. Companies, and smaller ones especially, should learn that a patent is a sword – not a shield! It is an attack

weapon that can and should be used against anyone bold, careless or stupid enough to mess with the right of the patent holder.

From this observation it is recommended that raising of basic awareness and understanding upon inventions, patenting and commercial use of patents be added to the list of national curriculum targets. It is argued that improving capabilities, skills and knowledge on these topics would lead to significant improvement of national invention activity, and subsequently, increase innovation basis of the country.

Conclusions and future work

This paper presents results from semi-structured interviews carried out with 20 Finnish technology oriented large companies, SMEs and private inventors. The research has been conducted firstly in order to describe the behavior of Finnish technology oriented SME companies in IPR matters to understand the situation of the SME companies. Results from the interviews provide an understanding of smaller size companies with a very limited awareness and understanding of the IPR regime, and subsequently somewhat irrational behavior in dealing with IP and IPR.

Secondly, the research has aimed at listing the variables that affect SME decision making in IPR related matters. Understanding that IPR is on a strong growth path globally, some of the SMEs feel the urge to become active in the field. As in most SMEs a comprehensive business strategy is missing, let alone there be an IP(R) strategy in place, business decisions are made more or less unplanned and on the run. In consideration of various IPR supportive and opposing arguments the decision brew in a dynamic, ever changing stew, until some solitary action might pop out and be conducted. Thus, a list of variables needs to be considered a more comprehensive understanding of the variability present in the realm of the life cycles of different companies.

Thirdly, the research has aimed at identifying and making recommendations that SMEs could follow to become better positioned in IPR regime. The two main recommendations include forming of a co-operative network for exchange of IPR knowledge among companies within certain industries, and boosting of national education efforts in invention and IPR matters to enhance the national innovation performance.

This work is not without limitations. As the study has intended to increase the basic knowledge and understanding in this field the list of topics discussed in the interviews was quite broad and open. With increased understanding there is clearly a need to carry on research with a more narrow focus on the selected topics. Some suggestions for future research would include:

a) A study where the company details were observed in more detail in relation to IP generation and protection, and operation within the IPR regime. Such details would include the company size, its management structure, ownership, orientation (technology vs. market vs. invention), company age, and business sector. Such a research would add also to the work of Olander et.al. (2009).

b) A study to estimate the effects of better education service providing invention, IP generation, protection and IPR operation training and knowledge building. Such a research could focus on estimating the actual impact of education to the said themes, or could extend to looking at the consequent changes in national innovation performance accordingly.

References

Arrow, K.J. 1962. Economic Welfare and the Allocation of Resources for Invention. In R.R. Nelson (ed.), The Rate and Direction of Inventive Activity: Economic and Social Factors. Princeton: Princeton University Press. 609-626

Arundel, A. 2001. The relative effectiveness of patents and secrecy for appropriation. Research Policy 2001; 30. 611–624

Blind, K., Edler, J., Frietsch, R. & Schmoch, U. 2006. Motives to patent: empirical evidence from Germany. Research Policy 2006; 35. 5. 655–672

Brant, J. & Lohse, S. 2013. Enhancing IP Management and Appropriation by Innovative SMEs. International Chamber of Commerce (ICC). Innovation and Intellectual Property Series [accessed 6.2.2016]. Available at http://ssrn.com/abstract=2380212

Carnevale, A.P. & Rose, S.J. 2015. The economy goes to college - The Hidden Promise of Higher Education in the Post-Industrial Service Economy. The Georgetown University Center on Education and the Workforce. McCourt School of Public Policy. Washington D.C. USA [accessed 7.5.2006]. Available at http://cew.georgetown.edu/economygoestocollege

European Union. 2015. User guide to the SME definition. Luxembourg: Publications Office of the European Union

Granstrand, O. & Holgersson, M. 2012. The anatomy of rise and fall of patenting and propensity to patent: The case of Sweden. International Journal of Intellectual Property Management. 2012; 5 (2). 169-198

Holgersson, M. 2013. Patent management in entrepreneurial SMEs: a literature review and an empirical study of innovation appropriation, patent propensity, and motives. R&D Management. 2013; 43. 21-36

Hughes, A. & Mina, A. 2010. The Impact of the Patent System on SMEs. Centre for Business Research. University of Cambridge. Working Paper 411. UKIPO [accessed 29.5.2016]. Available at http://www.cbr.cam.ac.uk/pdf/WP411.pdf

Jell, F. 2012. Patent filing strategies and patent management. Germany: Gabler Verlag. Springer Fachmedien Wiesbaden GmbH

Kapoor, R., Karvonen, M., & Kässi, T. 2013. Patent value indicators as proxy for commercial value of inventions. Int. J. Intellectual Property Management. 2013; 6 (3). 217–232

OECD. 2016. OECD Business and Finance Outlook 2016. OECD Publishing Paris [accessed 29.5.2016]. Available at http://dx.doi.org/10.1787/9789264257573-en

Olander, H., Hurmelinna-Laukkanen, P. & Mähönen, J. 2009 What's small size got to do with it? Protection of intellectual assets in SMEs. International Journal of Innovation Management. 2009; 13 (3). 349–370

Picano, G. & Teece, D.J. 2007. How to Capture Value from Innovation: Shaping Intellectual Property and Industrial Architecture. California Management Review. 2007; 50 (1). 277-296

Rassenfosse, G. 2012. How SMEs exploit their intellectual property assets: evidence from survey data. Small Business Economics. 2012; 39. 437–452

Ruther, F. 2012. Patent Aggregating Companies: Their strategies, activities and options for producing companies. Germany: Springer Gabler. Springer Fachmedien Wiesbaden

Talvela, J. 2016. How to improve the awareness and capabilities of Finnish technology oriented SMEs in patent related matters. In: Venesaar, U. & Küttim, M. (ed), Proceedings of the International Conference on Knowledge, Innovation and Technology Across Borders. Tallinn University of Technology. Tallinn Estonia: KITAB, 2016. 259-273

Talvela, J., Karvonen, M., Kässi, T. & Ojanen, V. 2016. How individual inventors and SMEs exploit intellectual property rights: The case of Finland. In: Proceedings of PICMET'16: Technology Management for Social Innovation. Honolulu, USA. 1645-1658

Thomä, J., & Zimmermann, V. 2013. Knowledge protection practices in innovating SMEs. Jahrbücher Für Nationalökonomie Und Statistik. Lucius & Lucius Verlagsgesellschaft mbH, Stuttgart‚ Germany. 2013; 233(5). 691-717

Veer, T. & Jell, F. 2012. Contributing to markets for technology: A comparison of patent filing motives of individual inventors, small companies and universities. Technovation. 2012; 32. 513-522

Vervenne, J-B., Callaert, J. & van Looy, B. 2014. Patent statistics at Eurostat: Mapping the contribution of SMEs in EU patenting. Science and Technology Collection. Manuals and Guidelines. Luxembourg: Publication Office of the European Union

WIPO. 2015. World Intellectual Property Indicators. Economics & Statistics Series. Geneva: World Intellectual Property Organization

Zaby, A. 2010. The Decision to Patent. Berlin Heidelberg: Springer-Verlag

Vänni, K. J., Korpela, A. K.

Title: Present State of Digital Storytelling in Commercialization Processes among Universities in Tampere Region

Research Article

Abstract

New innovations are an important topic in Finland just now because Finnish society needs new ideas for activating new business and better export. Universities in Tampere region (Tampere3) started in the beginning of 2016 a development project, which focuses on developing innovation activities. Our aim was to assess how Tampere3 universities were marketing research results and new innovations, and how well they were using the possibilities of digital storytelling (DS) in marketing. We conducted a questionnaire survey where we inquired opinions of the innovation professionals regarding needs for digital storytelling. We collated the survey results with our earlier research results among Finnish Universities of Applied Sciences (FUASs) for comparing the results of Tampere3 and FUASs. The results presented that DS would be an important method in innovation marketing but researchers are neither familiar with concept of DS nor processes of producing digital stories or delivering stories over social media.

Keywords: Digital storytelling, commercialization, visualization, computer games, crowdsourcing, animation, crowdfunding

Introduction

According to Finnish government Finnish society needs new ideas for activating new business and better export. It has been reported that innovations are the key drivers for new business and the most innovative countries have succeeded well (Reynoso 2015). For being competitive internationally, the Finnish government has launched the program for activating universities and research centers. As a part of the program the Finnish Funding Agency for Innovation (TEKES) launched the KINO funding for universities and science centers. This study is based on part of the results of KINO Tampere3 project, where three universities in Tampere area Finland are developing together new methods for finding, developing and commercializing new ideas. The project includes five work packages and one of them is digital storytelling. During the last years we have noticed that information in written form is not always the best option to recruit partners, funders and customers (Cowan & Foray 1997). The potential partners and funders have had difficulties to understand the written descriptions, and difficulties to imagine how new ideas might advance their businesses. Quite often descriptions of new innovations emphasize technical issues and scientific novelty, instead of business potential and added value. Therefore, we ended up the idea to develop digital storytelling for offering new tools to codify information into visual form.

We are telling and listening stories because those are thrilling, funny or embedded with learning objects such as Aesop's fables (Horgan 2014). It has been studied that human brains loves storytelling (Zak 2014). The reason why

people love stories is based on neurobiology function of brains, which produce oxytocin, a hormone which is able to enhance our sense of empathy (Zak 2014). Zak (2014) and his team discovered that good stories sustain an attention and develop tension in brains for sharing the emotions of the characters in stories, and after a story ends, people are mimicking the characters' behaviors. From a storytelling point of view, the secret to keep audience's attention, is to continually keep tension and to build 'hooks' in stories (Zak 2013).

There are many appreciated storytellers in history such as Dante and Homer (The Telegraph 2016), as well as modern masters such as Jobs (Ivey 2011). Storytelling is a strong method for representing and conveying complex, multi – dimensional ideas (Snowden 2000, 215-226) and influencing people's emotions (Denning 2002; Merchant, Ford & Sargeant 2010, 754-762) and business behavior (Denning 2006, 42-48). It has been reported that a competent storyteller is able to adjust a story according a case and the audience (Sole & Wilson 2016). Unfortunately, it is not always possible to be available and to tell a story in person. That is the reason why digital storytelling as a method is welcome in presenting the ideas which not yet exist. Digitalism is going to chance the channels of storytelling and according to Ivey (2011) the bloggers are the modern storytellers. The strength of social media as a channel of stories has been recognized among the companies but so far the universities have been conservative in using social media as a marketing channel. However, social media is important channel of digital storytelling and there are variety of methods such as animations and games to produce and visualize stories.

Storytelling is quite traditional and old method where a teller tries to tell a story which is exiting, funny, sad or pedagogical (Horgan 2014) and, able to get an audience's attention and keep mental tension. The basic idea behind digital storytelling replicates traditional storytelling but includes novelties of digitalism. We have defined that digital storytelling is an approach, which includes a story where are main characters, a scene, timeline and episodes delivered by modified by digital modalities such as animations, simulations, interactive games, videos, movies and digital still pictures and audio. In addition, those are delivered over digital channels such as social media. Table 1 presents some schemas of digital storytelling.

Table 1. Schemas of digital storytelling

	Type/Domain		
	Cinematography film	Video/Data visualization/Info graphics	Computer games/Simulations
Focus	Discussion/Image	Arguments/Specs	Virtual introduction
Social media channel	Facebook/Youtube	Web-pages/ LinkedIN/Slideshare	Web-pages
Aim	Emotionality/ Identification	Sharing information	Virtual experience
Characterictics	Cinematoprahpy	Pedagogical approach	Gamefication
Special Requirements	Artistic / Post production	Building arguments	Game programming
Tools	Movie Editing software/Cinema 4D/Studio Max 3D	Video editing software	Unity game environment

Digital storytelling is not new as a tool (Meadows 2003, 189; Barrett 2006, 647–654; Couldry 2008, 41-60; Robin 2008, 220–228; Sadik 2008, 487–506; Göbel, de Carvalho Rodrigues, Mehm & Steinmetz 2009, 43-53; Hung, Hwang & Huang 2012, 368–379) but it is not yet widely used in innovation marketing among universities (Vänni & Korpela 2016). Digital stories can be delivered over social media or over traditional communication channels. However, at the moment, channels of social media seem to be the most interesting methods for delivering digital stories (Figure 1). Recently, the development of technology has offered new platforms, virtual reality (VR) and augmented reality (AR) as methods of immersive storytelling (Bimber, Encarnação & Schmalstieg 2003, 87-95; Di Salvo 2013; Prater 2016) but as far as we know, the use of VR and AR are still limited among universities in innovation marketing. It is well-known that storytelling is a powerful tool but we do not have enough experience about the power of digital storytelling.

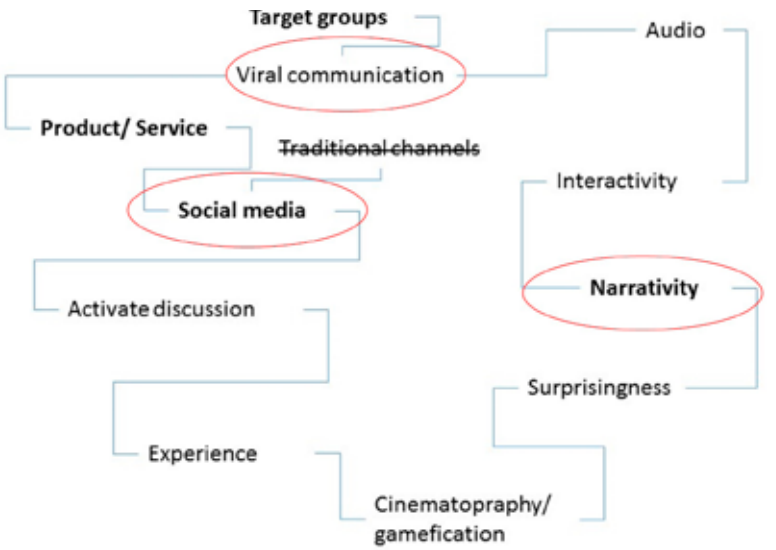


Figure 1. Elements of digital storytelling

Being based on our empirical research, we consider that there are four different stages in innovation process where the digital storytelling would be useful. First, in the beginning of process when trying to convince the validity and reliability of innovative ideas inside universities. Second, when motivating and recruiting co-researchers and funders. Third, when activating and selling ideas to business partners and fourth when introducing innovative products or services into end-users. Digital storytelling is a great tool as a part of crowdsourcing (Crowdsourcingweek 2016) when inquiring how new ideas (Boudreau & Lakhani 2013) might meet the end-users' expectations, as well as a part of crowdfunding (Corrado 2015) when seeking investors. From universities point of view, we hypothesize that there are two cases where the digital storytelling would be really useful. First, in the beginning of innovation process when the company partners are needed. Second, during the scientific research when seeking new funding and partners, especially in the point where lot of research has been done but financial resources are still short for getting e.g. a prototype ready. In both cases universities have to convince the partners and funders that the innovation would be useful and able to generate revenue.

Materials and Methods

This study is quantitative and hermeneutic and it tries to give an insight into digital storytelling in universities in Tampere region compared with Finnish Universities of Applied Sciences FUASs. The aim of our study was to explore how the University of Tampere, the Technical University of Tampere and the Tampere University of Applied Sciences (Tampere3) were using digital storytelling as a method in innovation marketing and informing about new ideas. We conducted a targeted questionnaire survey in Tampere3 universities and organized also interviews regarding a topic "the needs of digital storytelling in advancing business". We selected only those people as respondents who were working with innovations. All together 11 innovation professionals participated. It is good to remember that there are only limited number of innovation professionals in universities and inquiring innovation issues form non-professionals would have skewed the results. In addition, we used our earlier research among 12 Finnish Universities of Applied Sciences (FUASs) as the reference material. On that research we conducted a survey where we asked opinions from 12 FUAS regarding digital storytelling and its possibilities in commercialization of innovations. Please, note that in this study, each FUAS has considered as one respondent, even if the common opinion of each FUAS was based on larger number of innovation professional among FUAS. The results of Tampere3 universities are presented as one wholeness, not separately university by university. Correspondingly, the results of FUASs are presented in a similar way.

Results

Survey

Regarding a questionnaire survey, we are presenting mainly descriptive results because data was limited for deeper statistical analysis. Our survey consisted of 13 structured questions and 'comments boxes'. The reply options employed Likert scale and five ordered response levels typically from 'poor' to 'excellent' with some exceptions. Some results of survey are presented in the following figures. Figure 2 shows that Tampere3 universities are marketing new ideas and innovations to potential customers actively or to some extent but not very actively, whereas FUASs seem to market innovations mainly to some extent.

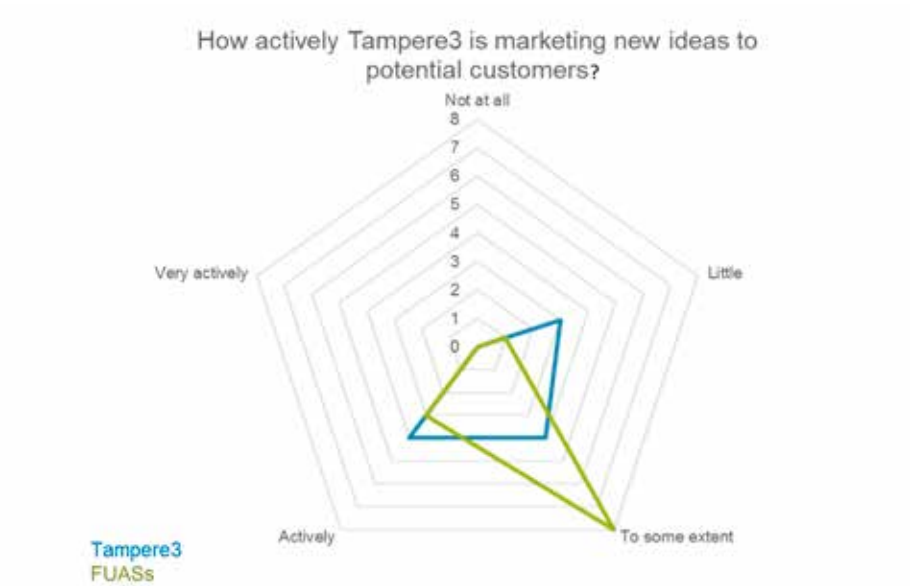


Figure 2. Activity of innovation marketing

We asked Tampere3 to assess how much they exploit digital storytelling (DS) in business communication and selling the new ideas to potential customers. Figure 3 shows that Tampere3 universities are not so active in exploiting DS compared with FUASs.

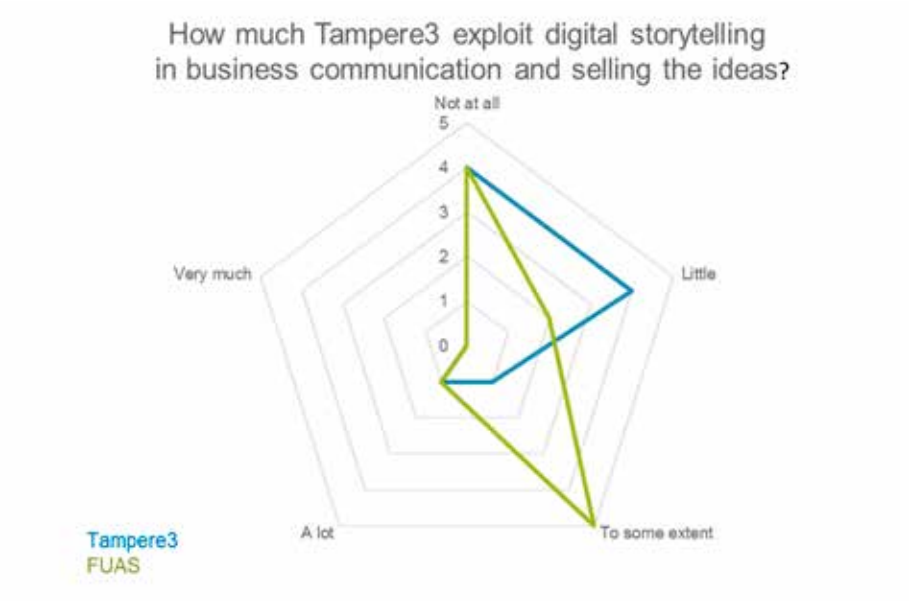


Figure 3. Awareness of digital storytelling in innovation marketing

We asked Tampere3 universities to assess how much DS could advance commercialization and marketing of new ideas developed in Tampere3. The respondents from Tampere3 and FUASs were quite convinced that DS could advance commercialization and marketing (Figure 4).

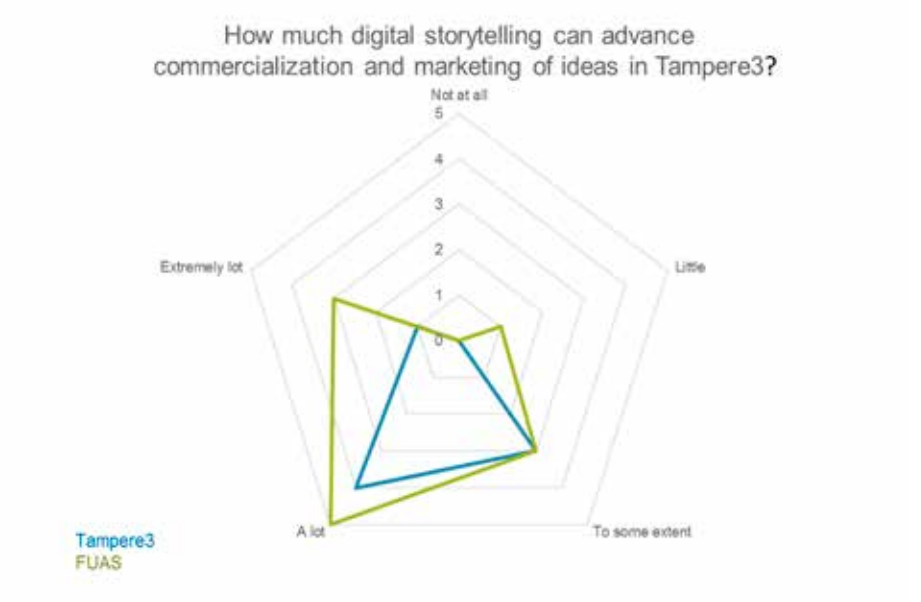


Figure 4. Role of digital storytelling in advancing commercialization and marketing

Being based on a survey and interviews among FUASs we had an intuition that one restrictive issue in exploiting DS among Tampre3 universities would be researchers' and innovators' poor competence to produce digital stories. According to survey results our intuition was right, and only some respondents stated that their researchers were able to produce digital stories (Figure 5).

Figure 5. Competence to produce digital stories

Figure 6 presents the methods and tools that were used in innovation marketing among Tampere3 universities and FUASs. It seems that universities still rely on web pages but the use of other methods such as animations are scarce.

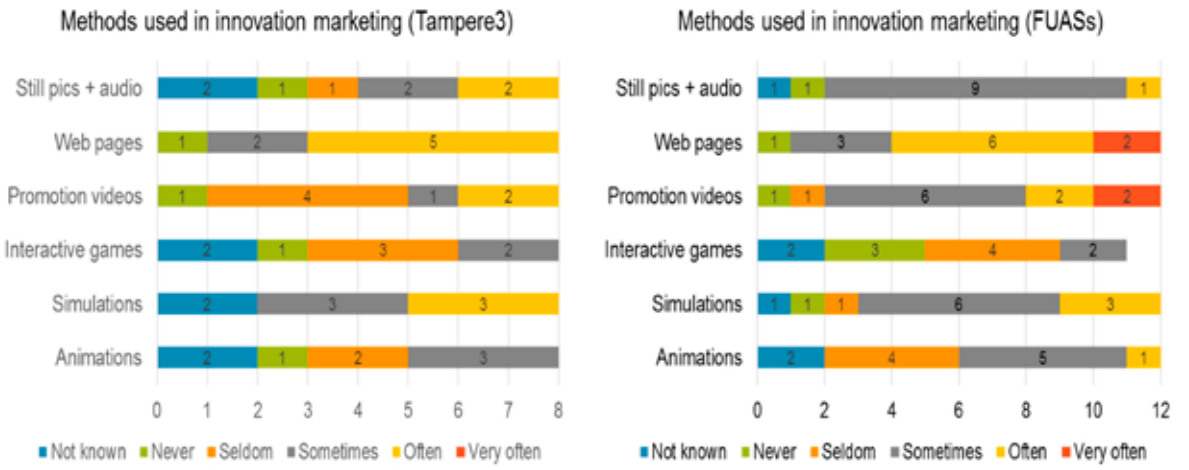


Figure 6. Methods used in innovation marketing

The survey results revealed that customers of universities request universities to show digital presentations such as animations seldom or only sometimes. That might be a reason for a relative low share of innovations where DS has been used in business communications. Figure 7 shows that Tampere3 universities and the greatest part of FUASs considered that they have used DS in innovation presentations in less than every tenth cases.

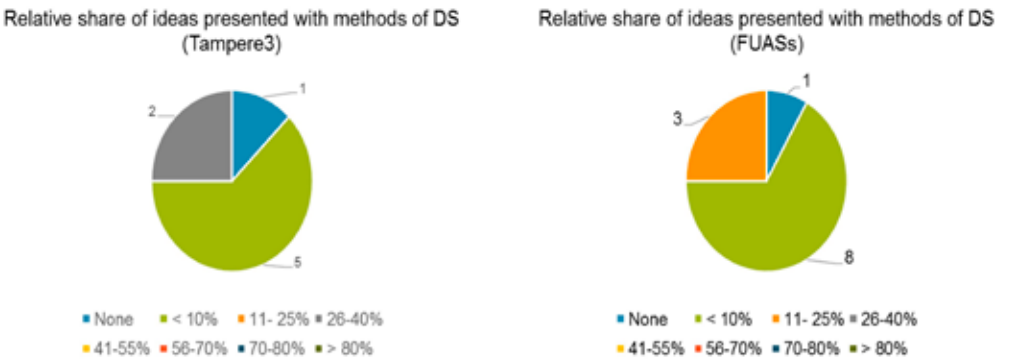


Figure 7. Relative share of cases where DS was used

Being based on our previous study (Vänni & Korpela 2016) we assumed that Tampere3 universities might need digital storytelling services. The survey results replicated the results of our study and presented that there would be average or high need of digital storytelling services in advancing innovations and projects both in Tampere3 universities and in FUASs (Figure 8).

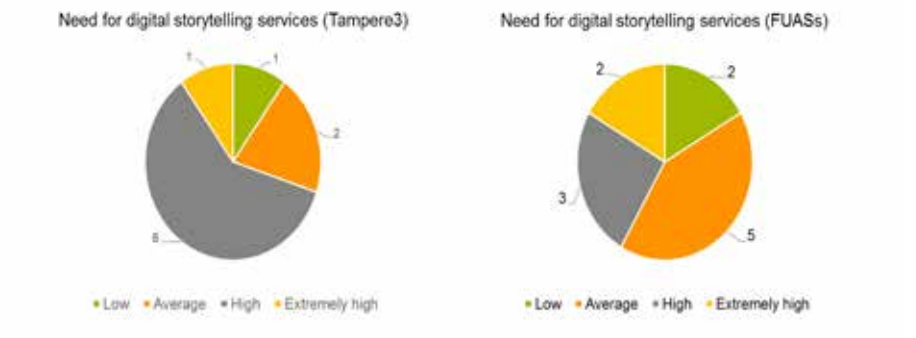


Figure 8. Current need for digital storytelling services

We asked Tampere3 universities to evaluate the interest to use DS in activating different stakeholder groups. Figure 9 shows that every stakeholder group was interesting but the most relevant were the customers, staff and students. The result replicated the survey results among the FUASs (Vänni & Korpela 2016).

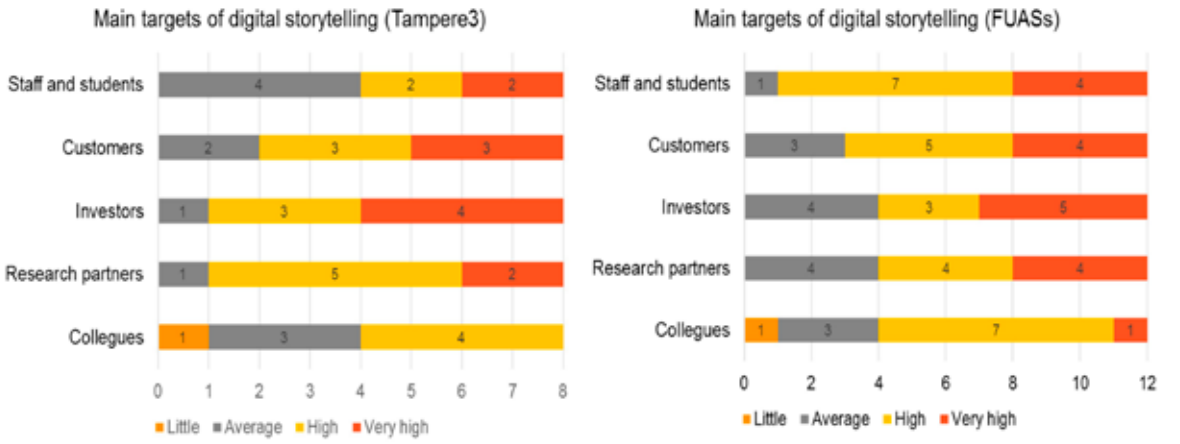


Figure 9. Interest to use digital storytelling among different groups

Discussion

We consider that digital storytelling is an interesting method in presenting the innovation ideas. We propose that DS is a powerful tool in science marketing, especially when trying to convince the business partners and funders. The basic idea of DS is to get people to interest in and to convince them that a new innovation would be important and worth participating. We found that there are four different stages and two main cases where digital storytelling would be useful. First case is in the beginning of innovation process when the company partners are needed. Second case is during the scientific research when seeking new funding options and partners. There seems to be high need for digital storytelling overall and so far only some innovations developed in Tampere3 universities and FUASs have been presented with tools of DS. The respondents from both Tampere3 universities and FUASs were quite unanimous and reported that DS would advance their innovation marketing.

Even if digital storytelling is a promising method in innovation marketing, only some innovation professionals were familiar with the concept. We found that the definition of digital storytelling was still unclear and only some people in Tampere3 universities and FUASs were familiar with the concept. We assume that ignorance of DS might be one reason why use of DS was limited among Tampere3 universities and FUASs. Another gap was that universities did not provide DS services for innovators and quite seldom researchers were able to visualize their ideas in digital forms. The research teams had communication plans but those were conservative with web pages and Facebook accounts. The interactive tools, such as games were missing and social media was not used to rumble the ideas. Possibilities of universities to organize DS services and resources such as devices and software correlated strongly with other factors such as knowledge to produce animations.

Even if storytelling is well-known method, the use of digital storytelling is still limited and sometimes challenging (Drew, Duncan & Sawyer 2010, 1677-88). We recommend the research teams to consider the use of digital storytelling and channels of social media for rumbling new and potential innovations. We suggest that Tampere3 universities and FUASs should re-consider their innovation processes and take into account the possibilities of digital storytelling in the early stage of processes. Digital storytelling would be useful as a part of crowdsourcing (Crowdsourcingweek 2016) as well as a part of crowdfunding (Corrado 2015) in innovation process and commercialization.

Conclusion

We consider that digital storytelling is an important method in science marketing, especially when convincing research partners, potential customers and funders. Even if storytelling is a well-known method in science marketing, the use of digital storytelling is still limited and challenging (Drew et al. 2010, 1677-88). We recommend universities to consider the use of digital storytelling with interactive elements and immersive stories when presenting their new innovations. We recommend also to consider the possibilities of new technology such as virtual reality (VR) and augmented reality (AR) as potential methods of digital stories (Bimber et al. 2003, 87-95; Prater 2016). Finally, we want to remind that whatever technical solutions, methods and media channels would be used, an immersive story itself would still be the most important element in digital storytelling.

References

Barrett, H. 2006. Researching and evaluating digital storytelling as a deep learning tool. In C. Crawford, et al. (eds.), Proceedings of Society for Information Technology and Teacher Education International Conference 2006. 647–654. Chesapeake, VA, AACE.

Bimber, O., Encarnação, L.M. & Schmalstieg, D. 2003. The Virtual Showcase as a new Platform for Augmented Reality Digital Storytelling. In proceedings of IPT/EGVE 2003 workshop. 87-95.

Boudreau, K. & Lakhani, K. 2013. Using the Crowd as an Innovation Partner. Harvard Business Review, April 2013. [cited 2016 Feb 12]. Available from: http://www.inventorsnetwork.org/wp-content/uploads/HBR-Using_the_Crowd_as_an_Innovation_Partner.pdf

Corrado, T. 2015. Digital Storytelling, Crowdfunding, And Social Media: How HONY Raised $1,000,000 Online [Internet]. [cited 2016 Feb 12]. Available from: https://www.bluestatedigital.com/news/entry/digital-storytelling-crowdfunding-and-social-media-how-hony-raised-1000000

Couldry, N. 2008. Digital storytelling, media research and democracy: conceptual choices and alternative futures. In: Lundby, Knut, (ed.) Digital storytelling, mediatized stories: self-representations in new media. Digital formations 2008; 52. 41-60. Peter Lang Publishing, Inc., New York, NY, USA.

Cowan, R. & Foray, D. 1997. The economics of codification and the diffusion of knowledge. Industrial and Corporate Change 1997; 6. 595-622. Available from: [http://www.cgl.uwaterloo.ca/~racowan/Codification.html]

Crowdsourcingweek. 2016. What is Crowdsourcing? [cited 2016 Feb 12]. Available from: http://crowdsourcingweek.com/what-is-crowdsourcing/

Denning, S. 2002. “Using Stories to Spark Organizational Change.” Journal of Storytelling and Business Excellence. [cited 2016 Feb 12]. Available from: http://www.providersedge.com/docs/km_articles/using_stories_to_spark_organizational_change.pdf

Denning, S. 2006. Effective storytelling: strategic business narrative techniques. Strategy & Leadership 2006; 34(1).42-48.

Di Salvo, P. 2013. Augmented Reality, Evolving Storytelling. European Journalism Observatory [cited 2016 March 24]. Available from: http://en.ejo.ch/digital-news/augmented-reality-storytelling-journalism

Drew, S., Duncan, R. & Sawyer, S. 2010. Visual storytelling: a beneficial but challenging method for health research with young people. Qual. Health Res. 20(12):1677-88. doi: 10.1177/1049732310377455

Göbel, S., de Carvalho Rodrigues, A., Mehm, F. & Steinmetz, R. 2009. Narrative Game-based Learning Objects for Story-based Digital Educational Games. In Proceedings of the 1st International Open Workshop on Intelligent Personalization and Adaptation in Digital Educational Games, Graz, 2009. 43-53.

Horgan, J. 2014. Aesop's Fables [cited 2016 January 9]. Available from: http://www.ancient.eu/article/664/

Hung, C.-M., Hwang, G.-J. & Huang I. 2012. A Project-based Digital Storytelling Approach for Improving Students' Learning Motivation, Problem-Solving Competence and Learning Achievement. Educational Technology & Society 2012; 15(4). 368–379.

Ivey, M. 2011. Steve Jobs and the Power of Storytelling. [cited 2016 Feb 12]. Available from: https://www.socialmediaexplorer.com/social-media-marketing/power-of-storytelling/

Meadows, D. 2003. Digital Storytelling: Research-Based Practice in New Media. Visual Communication 2003; 2. 189. doi: 10.1177/1470357203002002004

Merchant, A., Ford, JB. & Sargeant, A. 2010. Charitable organizations' storytelling influence on donors' emotions and intentions, Journal of Business Research 2010; 63(7). 754-762. doi: http://dx.doi.org/10.1016/j.jbusres.2009.05.013.

Prater, A. 2016. A New Storytelling Perspective Through Virtual and Augmented Reality. Edelman Digital. [cited 2016 April 12]. Available from: http://www.edelman.com/post/virtual-augmented-reality/

Reynoso, RE. 2015. The global innovation index 2015. Cornell University. [cited 2016 March 10] Available from: [https://www.globalinnovationindex.org/content/page/data-analysis/]

Robin, BR. 2008. Digital Storytelling: A Powerful Technology Tool for the 21st Century Classroom. Theory Into Practice 2008; 47. 220–228. doi: 10.1080/00405840802153916

Sadik, A. 2008. Digital storytelling: a meaningful technology-integrated approach for engaged student learning. Education Tech Research Dev 2008; 56. 487–506. doi 10.1007/s11423-008-9091-8

Snowden, D. 2000. “The Art and science of Story or ‘Are you sitting uncomfortably?’”

Business Information Review 2000; 17(4). 215-226.

Sole, D. & Wilson, D. 2016. Storytelling in Organizations: The power and traps of using stories to share knowledge in organizations. [cited 2016 April 16]. Available from: http://www.providersedge.com/docs/km_articles/Storytelling_in_Organizations.pdf

The Telegraph. 2016. Famous storytellers. [cited 2016 Feb 12]. Available from: http://www.telegraph.co.uk/expat/expatpicturegalleries/9769881/Famous-storytellers.html?frame=2438602

Vänni, K. & Korpela, A. 2016. The Role of Digital Storytelling in the Innovation and Commercialization Processes among the Finnish universities of applied sciences. University Industry Interaction Conference 2016, Amsterdam, Netherlands. Available from: https://www.university-industry.com/mobile/presentation/id/161

Zak, P. 2013. How Stories Change the Brain. Greater Good. The Science of Meaningful Life. University of California, Berkley [cited 2016 May 4]. Available from: http://greatergood.berkeley.edu/article/item/how_stories_change_brain

Zak, P. 2014. Why Your Brain Loves Good Storytelling. Harvard Business Review [cited 2016 May 4]. Available from: https://hbr.org/2014/10/why-your-brain-loves-good-storytelling/

Partners


HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI


LUT
Lappeenranta
University of Technology


Lahden Yliopistokampus


Aalto University


LADEC
LAHDEN SEUDUN KEHITYS


LAHTI


MANAV RACHNA
MANAV RACHNA
EDUCATIONAL
INSTITUTIONS
NAAC ACCREDITED 'A' GRADE
UNIVERSITY & PROFESSIONAL INSTITUTIONS

The publication series of Lahti University of Applied Sciences, part 27
ISSN 2342-7507 (net publication)

ISBN 978-951-827-264-2