XAMK BEYOND 2020

At Your Service – Business Development, Co-operation and Sustainability

Marja-Liisa Neuvonen-Rauhala (ed.)

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FOREWORD

Universities are based on open knowledge and public interaction. This universal idea of openness and publicity is not only about the results of academic research, but all activities in higher education institutions.

Traditionally, the reading of texts has been, and it still is, the common way in the context of higher education institutions to learn, share ideas and to get to know the latest activities of other higher education institutions.

In order to be a part of the internationally open and ever-growing universe of knowledge, it is vital to be active in opening and sharing one´s ideas and experiences. In the new social media environment, there are various opportunities for this purpose. However, I believe that a well-structured and not too short academic text with good references has a special role in the openness of the Universities of Applied Sciences.

Sometimes it makes sense to write and read slowly and thoroughly.

In Finland, the Universities of Applied Sciences have a strong connection with business, industries and regional development. Thus, the audience of the articles published by the Universities of Applied Sciences has been mainly professional and regional.

In order to share these regional and professional experiences more widely, there should be more interaction between regional developers and higher educational institutions. Xamk Beyond is responding to this need.

Xamk Beyond aims to give voice to teachers, researchers, other staff members and our partners in South-Eastern Finland in a form of academic texts. I hope this publication could be of interest to other similar institutions and regions abroad.

Xamk Beyond gives the readers a good insight on what kind of themes and problems are relevant to the teaching and research staff at the moment in the University of South-Eastern Finland. Thus, Xamk Beyond reflects the reality professional communities meet in South-Eastern Finland.

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INTRODUCTION: FROM PROFESSIONAL TO ACADEMIC PUBLISHING – A RESPONSIBLE AND SUSTAINABLE DEVELOPMENT

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The first Xamk Beyond is out. What will it offer to its readers? Why has it been launched? These are necessary questions at least to me and in this introduction I will introduce some obvious reasons based on the roles of universities of applied sciences (UASs) especially in Finland.

In 2008, Professor Jussi Välimaa (Välimaa & Neuvonen-Rauhala 2008) and I assessed that UASs are in transition towards more academic disciplines due to promotion of research and development (R&D) activities and recruitment of more academic staff. Also, the steering guidance of the Ministry of Education and Culture has supported this development by requiring UASs to have size and strength to provide degree education and to conduct R&D activities (Välimaa & Neuvonen-Rauhala 2010).

These goals have been achieved if we consider the expansion of R&D funding or quantity of Bachelor's and Master's Degrees. According to statistics, in 2010 the amount of graduates in Bachelor's degrees was 20 667 and in Master's degrees 1254, while in 2019 it was 24315 and 3330. In 2011 R&D funding (competed) was around 56 million and in 2018 106 million. In addition, the number of PhDs working in research and education has grown from 630 in 2011 to 744 in 2018. The number of publications has grown from 3548 in 2012 to 8029 in 2019. (see vipunen.fi/fi-fi/ammattikorkeakoulutus.)

These statistics show that the ecosystem of UASs has changed at least in the quantitative way of thinking. Let´s look more closely at what has happened as regards publications if we focus on the types of publications. Type A publications are meant for readers of the scientific field and type E publications for the general public. Nowadays we are also considering whether publications should be open science publications that are available in open networks. In this introduction, I will not investigate that dimension, because it is still quite new for further analysis.

Table 1. Types of publications (A-E) in all UASs in 2012 and in 2019 (Source: Vipunen.fi).

	2012	2012, %	2019	2019, %
Peer reviewed (A)	590	16,6	681	8,5
Not peer reviewed, but scientific (B)	396	11,1	206	2,6
Scientific books (C)	106	3,0	16	0,2
Targeted at professionals	1799	51,0	3979	49,5
Targeted at the general public	657	18,5	3147	39,2
All together	**3548**		**8029**	

As Table 1 shows, the amount of publications has more than doubled, but interestingly the increase has happened in publications targeted at the general public. The trend is understandable and essential while UASs work in connection to working-life and cooperate closely in practice-based contexts. The popularization and publicizing of the results of R&D is very important. However, the reason, why publications for professionals or academics do not increase accordingly, is not clear.

Another explanation might be found from the expansion of the UAS education and R&D activities, which take all the time, and there is no more time or space for researching and writing peer-reviewed or scientific articles. This is only a loose hypothesis and might be worthwhile of more close investigation. There is also a need for qualitative study of what kind of publications are published, and how widely they are spread and have impact among their target groups.

Ellen Hazelkorn and Amanda Moynihan (2010) argue that UASs in Europe have generally limited resources for research due to their history and mission. A research, whether it is conducted in the R&D projects or otherwise, requires time and facilities with a supportive ecosystem that encourages academic publishing along with contributions to popularized know-how.

R&D activities, publishing results, and reflecting what we are doing, why we are doing and how we are doing it, are important drivers of higher education impacts, if we are interested in evaluating responsible operations and effectiveness e.g. in the regions UASs are operating in. Evidence-based and researched knowledge in the fields of UASs is needed in the flows

of information and ever-changing contexts of working-life now and in the future. Xamk Beyond offers a forum to publish research-based articles for international readers who are interested to know what kind of research is carried out in Xamk's fields of study.

Developing R&D and teaching substances, competencies and operations in UASs is essential also in order for UASs to respond to the demands of global sustainable development in responsible ways. Responsible sustainable development is a crucial framework for all UAS operations. The Ministry of Education and Culture requires this framework in the next steering and financing agreements by stating that the starting points of operations are the newest knowledge, sustainable development, and international and global responsibility. UASs are expected to be active and cooperative in networks that solve global problems, and assume responsibility as influencers. (see minedu.fi/ohjaus-rahoitus-ja-sopimukset.)

Against this background, the social and responsible demand for Xamk Beyond is obvious. Though we are delivering R&D results and the main purpose of UASs is still to educate and develop working life environments and the professional know-how of students, we need to stay in the frontline of developing the competencies we need in the operations of education and R&D. This means that it is vital to embed research activity as a professional norm within the institutional culture (Hazelkorn & Moynihan 2010) and UASs professions.

In a pragmatic way of speaking, we need to foster activities that embed research-based practices and development into our professions. The world of working-life is changing fast and requires updating and obtaining new skills constantly. According to Hanna Vilkka (2020), academic writing can be seen as a method to think and produce new knowledge and to make it visible. Brokering information is also a part of interaction with working-life and especially with co-operation partners nationally and internationally.

This very first issue of Xamk Beyond is a collection of examples of RDI (Research, Development, Innovation) activities that are conducted in Xamk. The research approach is needed more and more in the context of UASs when we are developing responsible and sustainable solutions for teaching, learning, and running RDI activities. We need research information on our operations as well as the substances of operations as our operational contexts are becoming more complicated and globally interconnected.

Themes of this year´s Xamk Beyond articles cover business and digital development, cooperation with partners, and enhancing sustainable activities. So, the articles can be argued to be timely and their contexts also to be relevant from the perspective of the universities of applied sciences.

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TRAINING PROGRAMME ENHANCING ENTREPRENEURS' ONLINE RETAILING SKILLS

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ABSTRACT

Digitalization has dramatically changed the retail landscape in the last decades. E-commerce has become an almost imperative strategy for growth for SMEs. This paper discusses online retailing in micro enterprises, especially, how a training programme can enhance the entrepreneur's online retailing skills. The paper provides insight into one type of a training programme considering two issues: what was the curriculum of the training like and what learning outcomes were achieved. Empirical data were collected through observation, interviews and documents. The paper presents the starting points of the training, the curriculum and implementation and the achieved learning results. The findings are discussed and practical implications are considered from the micro enterprises' viewpoint.

Keywords: online retailing, micro enterprises, training, learning

1.   Introduction

Digitalization has dramatically changed the retail landscape in the last decades and the change continues (Verhoef et al. 2015, 174; Hagberg et al. 2016). Electronic commerce has become an almost imperative strategy for growth for micro, small and medium-sized enterprises (SMEs). Consequently, many purely physical (bricks-and-mortar) companies are changing to "clicks-and-mortar" conducting e-commerce as an additional marketing channel (Turban et al. 2015, 8).

Enterprises, basically, have two options in online retailing. They can establish their own platform or enter multi-sided digital platforms, such as Amazon.com. The latter option

means adhering to guidelines and commission models of the platform owner and usually competing with price. (Hänninen et al. 2018.) This paper discusses online retailing in micro enterprises and, especially, how a training programme can enhance the entrepreneur's online retailing skills. A micro enterprise has less than ten employees and its turnover or balance sheet is a maximum of 2 m€ (EC 2003). The paper focuses on an online retail business model in which the retailer possesses the platform, sells from the retailer's own inventory and possesses the transaction data.

Previous research has given only little attention to training programmes as tools to boost e-commerce adoption in SMEs. Darch and Lucas (2002) examined training as an e-commerce enabler in food industry; Gunasekaran et al. (2004) propose a framework for improving the effectiveness of an e-commerce education in universities; and Caskey and Subirana (2007) investigated blended e-learning as a training approach in the field of B2B for SMEs. Moreover, Kumar et al. (2015) report experiences from developing an e-retailing course and Özpinar and Yavuz (2011) present a case study of e-commerce training for SMEs integrating classroom training and an online commerce game. The subject is important for the rapid and continuing growth of e-commerce. It is important not only for the enterprises, but also from the government's perspective since enterprises' e-commerce adoption is a remarkable driver of regional development (Beynon-Davies 2010).

This paper aims at enhancing understanding of one means to boost micro enterprises' e-commerce adoption. It provides insight into one type of a training programme considering the following issues related to the substance, programme implementation and learning (Abaho et al. 2015; Yin 2018, 37):
 – What was the curriculum of the training like?
 – What learning outcomes were achieved?

The training was a main part of a project implemented between 2017 and 2019 aimed at developing SMEs' e-commerce adoption in South Savo region in Finland. The project was partly funded by the European Social Fund (ESF). An examination of Finnish EU-funded projects in the 2014–2020 programming period found few projects of the same type. However, numerous projects were found in which the e-commerce of an individual company had been developed. Development of a training programme, however, was not the goal of these projects.

The following sections review the skills needed in online retailing, discuss training and learning and describe the methodology and study findings. The final section includes discussion and practical implications.

2.   Online retailing skills

In this section online retailing skills are discussed since they have inspired the design of the curriculum. Online retailing requires strategies, capabilities and resources different from purely physical retailing (Stone 2014, 3). As an essential foundation an online store should have a strong competitive advantage and value proposition, giving *"reasons for customers to select the firm's offering"* (Yrjölä et al. 2018). Gregory et al. (2019, 8) suggest that a firm's e-commerce capabilities are related to its resources such as tangible (e.g. communications infrastructure, high-tech software/hardware) and intangible assets (e.g. skills, knowledge, expertise) available to the firm.

Nature of online retailing skills can be derived from the barriers influencing e-commerce adoption. Previous studies describe several barriers such as lack of knowledge of technology and lack of technical skills (Drew 2003, 84), as well as lack of SME specific information and lack of help (Caskey & Subirana 2007, 674). Research points out also other obstacles like lack of technology readiness or owners' innovativeness, costs and lack of management enthusiasm (Shemi & Procter 2018; Rahayu & Day 2017).

Finally, research on channel expansion brings forward various views. Sell et al. (2019) examined how microenterprises carried out channel expansions. They describe it as a dynamic and iterative five-phased learning process. The findings show that microenterprises struggle to balance technology, business, and customer demands with competence and resources. The authors propose that the learning process related to channel expansion is influenced by the poverty triad, that is poverty of finance, competence and time (Ibid., 83).

3.   Training and learning

This section considers training and learning in the workplace context. According to Kitching (2007) research often considers training as *what employers provide* and learning as *what employees do*. Noe (2010, in Stabile & Ritchie 2013) emphasizes that training is pre-planned and focuses on facilitating learning of job related competences and applying them to everyday activities. In SMEs training is often a tactical reaction aiming at impacting business performance (Jones et al. 2013, 60 -61). They structure the types of training according to whether it is formal or informal, whether it takes place in the workplace or outside, whether the trainer is in-house or external and what methods are used.

People learn in classrooms, workplaces and elsewhere. Learning is multi-dimensional seeking to develop an individual, change behaviour, solve problems or increase skill levels. It is

socially constituted, interactive and depends on the context. (Kitching 2007; Short 2019; Stabile & Ritchie 2013). Learning in workplace draws from experiential learning, *"a process whereby knowledge is created through the transformation of experience"* (Kolb 1984, 41 in Kolb & Kolb 2005). Accordingly, learning spaces should promote growth-producing experiences and the educational process should be a blend of challenge and support. Importantly, there should also be time for conversations and reflection (Kolb & Kolb 2005). In this study experiential learning approach has inspired the design of the curriculum.

Proper methods facilitate learning and several studies put emphasis on learner-centred methods. According to Darch and Lucas (2002) SMEs presumed that key stakeholders are involved in the development of the programme and the trainers understand the specific needs of their industry. Appreciated training strategies were, for example, seminars, supporting material, roadshows, hands-on trials, workshops and individual consultancy (Darch & Lucas 2002). In their study of educating SMEs in benefits of e-commerce, Caskey and Subirana (2007) favoured a blended learning environment. Studies also stress real-world experiences as a necessity in learning marketing and sales (Kumar et al. 2015; Rippé 2015; Bussiere 2017), as well as sharing between companies by networking and learning as a mutual process between companies (Stone 2014, 12-13).

Companies see training as an important tool of developing skills and business, however, the effects of training are rarely evaluated (Aragón-Sánchez et al. 2003, 957). Although research proposes various evaluation models, the most widely used is Kirkpatrick's four levels model (Ibid.; Kirkpatrick & Kirkpatrick 2015, 5-7). The model, however, is criticized for not providing clear guidance on how to measure the fourth-level learning. (Aragón-Sánchez et al. 2003, 958.)

4.   Methodology

The case study at hand is descriptive by nature aiming at *"developing a detailed portrayal of the phenomenon"* (Schwandt & Gates 2018, 346). The design of the curriculum constitutes a single case. The curriculum consists of the substance (what is expected to be learnt) and the process of implementation (approach, methods and timetable). In total four consecutive training programmes were conducted between March 2017 and February 2019. The data were collected through observation, face-to-face semi-structured interviews and documents. These methods are typical for case studies in order to understand the views, perspectives and experiences of the participants (Ibid.), the situation in their companies, as well as learning outcomes.

In this study observation had a remarkable role in data collection. As an observer, the author attended all four programmes, amounting to approx 190 hours of lectures and workshops. Although it was time-consuming, it deepened understanding of how the curriculum suited for the intended purposes. It also enabled taking the participant's perspective for later reflection (Stabile & Ritchie 2013, 76). Observation was documented as written notes (33 memos) and audio recordings (ca. 63 hours).

A total of 23 companies participated in the programmes (see Appendix 1) and individuals from each company were interviewed one at a time. The interviews were shorter case study interviews resembling guided conversations (Yin 2018, 118-119). The themes were formulated beforehand (see Appendix 2) and adjusted to the situation accordingly. The venue for the interviews was either in the premises of the university or the company. The interview sessions ranged from 15 to 58 minutes. They were recorded and transcribed into 80 pages of text. Moreover, several documents were reviewed, such as project plans; interim reports; internal memos of discussions; summaries and notes of the participants' feedback; online store analytics; and two self-evaluations of the project. Analysis of the data was performed in four parts, i.e. after each programme. Based on the empirical data mentioned above, reflective material was written to identify and interpret training events, describe them, analyze their causes, and evaluate the outcome (Stabile & Ritchie 2013, 79-80). In all, 19 blog postings and four articles were published online and two reports (altogether 29 pages) were written for internal project purposes.

5. Findings

In this section, first the issues regarding *the curriculum of the training and second, the learning outcomes* are discussed. The starting points for planning were the learners and experiential learning approach (Kolb & Kolb 2005) and real-time improvement of the online business. In order to obtain adequate understanding, the goals and business of each participant were discussed beforehand. In the first programme the participants were quite experienced in online selling and this was taken into account in the activities. The participants in the next three programmes were more inexperienced in online selling and thus, the training was modified accordingly. For example, international business was of little importance for them yet.

The training method was based on the use of several external trainers and took place outside the workplace. Three main themes were business strategies, customers and technology. The programme aimed at elaborating the enterprise's competitive advantage and strategies to grow and internationalize; improve the online store's functionality and sales performance; and improve the participant's practical skills to implement digital advertising and data

analysis. Importantly, one aim was to influence the participants' attitudes and mindset by inspiring and encouraging them to grow their business. During the two year project the programme was updated according to the collected data and participants' feedback. The final programme is presented in Appendix 3.

The group gathered together once a week in the evening to study four hours with the trainer. The lectures focused on knowledge creation and discussions while the workshops emphasized doings and hands-on experimentation. Learning in a small group enabled the participants to experiment new skills, for example, implement digital ads or e-mail newsletters, and confidentially share their views and reflect experiences. The participants were also entitled to gain firm-specific coaching on demand. Coaching sessions included guidance discussions as well as solving technical problems in the store. Furthermore, a common e-learning platform included additional video lectures and presentation materials. A discussion group in Facebook served as the channel of communication.

Learning outcomes are discussed in the levels of reaction, learning, behaviour and results (Kirkpatrick & Kirkpatrick 2015). The reaction level illustrates the overall satisfaction with the training. According to the oral and written feedback the participants seemed to be mainly satisfied with the implementation. They recognized several benefits obtained; presented ideas to improve the topics and practices; and evaluated the trainers' suitability and competences.

They appreciated the opportunity to meet other entrepreneurs face-to-face. Almost all participants punctually attended the weekly meetings and were committed to the programme. A couple of them left the programme due to work pressure.

Outcomes of the learning level are related to increased knowledge of online retailing issues and also know-how of required skills. First of all, the participants, especially the beginners, formed an overall picture of the requirements for running an online store. They were also able to recognize the focal objectives of development in their store. The more experienced retailers got ideas and support to improve their business. One of the most important lessons learned was the necessity of ICT skills as part of the online retailer's core competence together with a sales-oriented mindset.

The evidence of *behavioural change* was how the participants had put improvements into practice in their online store. It was evident that notable improvements had been realized in 14 online stores. Typically, better functionality of the store resulted from, for example, redesign of store layout; more qualified images and descriptions (texts); cross-selling proposals; simplified purchase process; and several options for customer service, payment and

delivery. Furthermore, the participants had planned and implemented ad campaigns in social media and carried out search engine advertising and, accordingly, were able to analyse the effects on customer traffic and sales. Finally, three online stores remarkably improved their preparedness for international selling.

The *results level* describes how the learned behaviour translates into business results. In online selling the improvements in the store should lead to measurable results such as increased visitor volume, better conversion rate (%), increased average purchase (€), sales growth (%, €) and also decrease of product returns and repayments. In a small newly established online store the sales growth percentage may appear high because of the low starting point. A notable sales growth was evident in the improved stores. Moreover, a few exceptionally successful results were achieved. One established online store carried out various improvements resulting in over 5 % conversion rate while the previous rate had been between 1 and 3 %. Another established store having already quite high turnover boosted their sales growth 150 % during one year. In their own words, the growth derived from a systematic use of digital advertising in order to increase the visitor volume. They constantly observed and analysed the customer data and managed marketing activities accordingly. Within two years they reached the third position in the national market in a high competition industry.

6. Discussion and conclusions

This section discusses the findings and practical implications, considers the limitations of the study and suggests further research. At first, one can consider what factors enabled the learning outcomes and thus the development of online stores. An important starting point was the goal-oriented participants who were committed to developing their own skills and business. The themes of the training were based on both previous research (e.g. Caskey & Subirana 2007; Kumar et al. 2015; Agnihotri, 2015; Pickernell et al. 2013; Gunasekaran et al. 2004) and mapping the needs of the participants (Darch & Lucas 2002). The sequence of the themes seemed to be logical, beginning with strategic issues towards more practical exercises and ending with growth and internationalization issues.

Second, the methods emphasized learning through experience (e.g. Bussiere 2017; Kumar et al. 2015; Rippé 2015; Abaho et al. 2015). The training was carried out in small groups of five to six companies which helped to create a confidential atmosphere. There was enough time reserved for an individual firm in both workshops and firm-specific coaching. However, it would be worth paying attention to the fact that the starting level of the participants in the small group is as uniform as possible. The programme was carried out on a tight schedule and an evening lecture or workshop once a week seemed to fit well with the schedules of

the participants. Finally, based on the user data the use of the e-learning platform could have been more active. Reminding could have activated the use.

Third, in the selection of trainers, their practical experience of e-commerce, pedagogical skills and, importantly, their ability to inspire and encourage participants were emphasized (e.g. Abaho et al. 2015¸ Gunasekaran et al. 2004, 7; Stone 2014, 10-13). The operating environment of e-commerce is constantly changing, so the trainers had to provide the latest up-to-date skills to keep the participants involved in the business. The curriculum was updated based on the experiences of each implementation and thus the latest programme was a fairly advanced version. Based on the above, it can be said that developing a good curriculum for a training requires several implementations and systematic collection and analysis of follow-up data.

A few practical implications can be considered from the micro enterprises' viewpoint. In their daily work entrepreneurs try to cope with both strategic development efforts and sales routines at the same time. It is crucially important to invest enough time in the development of the online store, especially, when expanding the current channels. Routine work in the existing physical store easily takes up all attention and skilful assistance would be valuable. Also, the roles of both physical and online store need to be clarified. Entrepreneurs often have an insufficient understanding of their target customers and rivals and this poses major challenges to defining and differentiating a company's competitive advantage.

Secondly, small online stores try to strike a balance between sufficient customer service and its costs. Customers expect as fast service as they are used to receiving in large online stores. For this reason, it is important for small online stores to gain knowledge of how the larger ones operate.

Lastly, management by data is a requirement for online selling. Monitoring data should be systematic and connected to ad campaign experimentations and optimization activities. The use of an analytics program, understanding numbers and interpreting the data for decision making should be one of the key skills of an online retailer. Also, the store platform has considerable influence on the functionality of the store and fluency of the daily routines. Thus, adequate ICT skills are the basic requirement for an online retailer. Technology-related functions cannot be fully outsourced in an online store.

In terms of the present paper, its results will be beneficial for SMEs, higher education institutions as well as public sector stakeholders in the formulation of activities for development of e-commerce. The paper describes in detail the starting points of the training, the curriculum and implementation and the achieved learning results.

However, this paper also has several limitations. The empirical material contains implementation of only four training programmes in a limited region and the total number of companies is small. Evaluation of their learning is not based on exact measurement before and after the course. It is more an estimation concluded from empirical data. The amount and quality of data are somewhat dissimilar between the participants and, thus, the results should be treated with caution. Although the curriculum of the program could be to some extent transferable into other contexts of similar type, the aim is not to generalize the results.

As further research, a follow-up study could be conducted to study how the online business of the participants has developed after several years of the training. For example, whether they have expanded into international markets, how data-driven their management is and how unique their competitive advantage and value proposition are.

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Appendix 1 Summary of the participants

Online store	Physical store	Industry	Micro enter-prise	Small enter-prise	Participant(s)
X	X	Retail, outdoor activities	X		Entrepreneur
X	X	Retail, optics	X		Online store personnel
X	X	Import/ retail, decoration	X		Entrepreneurs
X	X	Retail, sports goods	X		Entrepreneur Online store personnel
X		Advertising services	X		Planner
X	X	Retail, jewellery	X		Entrepreneurs
X	X	Retail, sports services	X		Entrepreneur
X	X	Manufacturer	X		Manager
X		Retail, sports goods	X		Entrepreneur
X	X	Retail, pet goods	X		Entrepreneur
X	X	Retail, equestrian goods	X		Entrepreneur
X	X	Manufacturer, arts and crafts	X		Entrepreneur
X	X	Retail, arts and crafts		X	Manager Online store personnel
X	X	Wholesale and retail, decoration	X		Entrepreneurs
X		Retail	X		Entrepreneurs
X	X	Retail and services, decoration	X		Online store personnel
X	X	Retail, babies' goods	X		Entrepreneur
X	X	Manufacturer, metal industry		X	Online store personnel Export manager
X	X	Advertising services		X	Online store personnel
X		Manufacturer, arts and crafts	X		Entrepreneur
X		Education	X		Manager Online store personnel
X		Retail	X		Entrepreneurs
X		Retail	X		Entrepreneurs

Appendix 2 Interview themes

- Current situation (channel structure/ online store), competitive business environment
- Personnel + resources
- Description of business goals (+ internationalization)
- Value proposition / competitive advantage(s)
- The main target group(s)
- Sales, marketing, advertising, analytics
- Customer service issues
- Product strategy
- Technical readiness + other issues (+ skills)
- Logistics and delivery issues, warehousing
- The most important challenges / subjects of development
- Views regarding online retailer's skills and competences
- Expectations / experiences in the training program

Appendix 3 Curriculum for the final programme.

Week (4 hours)	Theme/ topic	Practical exercise	Firm-specific coaching on demand
1	Introduction to e-commerce; trends, competitive advantage, organization; resources; platforms		X
2	Strategic choices; pricing; value proposition	Defining the strategy and value proposition	X
3	Processes and daily routines in the online store; online store functionality	Typical examples of practices	X
4	Online store functionality; selling; customer experience; customer service; logistics	"	X
5	Online store functionality continues	"	X
6	Search engine optimization; theory and practice	Experimentation of search engine optimization	X
7	Online marketing and advertising; Google Analytics; management by data	Web analytics experimentation	X
8	Online advertising; Google Ads	Planning and implementing ads	X
9	Facebook advertising	"	X
10	Google Ads and Facebook in practice	"	X
11	Customer relationship marketing; e-mail marketing	Planning and implementing e-mail newsletter	X
12	Growth hacking; internationalization (Amazon vendor); Feedback discussion		X

CREATIVE EDUCATIONAL AND RDI PRACTICES SUPPORTING BUSINESS RENEWAL AND GROWTH IN THE CREATIVE ECONOMY

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ABSTRACT

This paper investigates challenges and opportunities of utilizing creative industry knowledge in other business fields in Kymenlaakso region, Finland. The paper develops solutions for educational and RDI collaboration between different industry sectors and educational institutions which would enhance the value added of different businesses in the context of the creative economy.

The paper discusses the subject based on a review of regional and national creative economy strategies, structured interviews and focus group discussions. By reflecting the acquired data and using brainstorming in a multidisciplinary expert team the paper develops educational and RDI solutions in order to tackle challenges and to exploit opportunities perceived by the respondents. The results show that creative economy and regional smart specialisation focus industries' (RIS3) integration with creative com-

petences as well as their competitiveness can be boosted by a variety of interventions. Solutions range from development of creative spaces, new collaboration partnerships, campaigns, conferences, training camps, and programmes to curriculum development and longer-term educational initiatives and even basic research projects.

The paper contributes to the future model of collaboration between creative industry actors and traditional industrial and services companies as well as educational institutions in Kymenlaakso region. It provides practical advice to these stakeholders and Kymenlaakso Regional Council about what kind of initiatives and projects would enhance the utilization of different capacities of the creative economy to improve the competitiveness of RIS3 focus areas, companies and organisations in the region. Theoretically, the study contributes to discussions on regional creative economy ecosystems and their development.

Keywords: creative industries, creative economy, education, collaboration, business development, regional development

1.   Introduction

The cultural and creative sectors have an increasingly important role in new products and services (EU 2020). The cultural and creative sectors foster innovation in other sectors as they are situated in the interface of arts, business and technology (Voices of culture 2016). Creative firms contract a wide variety of work assignments for traditional industries. In the regional creative economy these co-operational network practices can facilitate better results in e.g. innovation processes, commercialisation, and sales. However, we find that this resource is underutilised due to problems in commercialisation of creative expertise, as well as lack of cooperation between engineers and designers and narrow perception of value-adding potential of creative and cultural products.

The creative economy includes also creative jobs within traditional industries (Oksanen et al. 2018, 9). Creativity is critical in innovation processes, creating and sustaining performance and change in organisations (Serrat 2017). On an individual level, creativity provides better results in productive work, art and science and has a significant role in interpersonal relationships. Advantages of creativity consist of adaptive problem resolution, independent thinking and success when faced with novel and unanticipated challenges. (Stana 2017) As the students graduating from universities of applied sciences are typically employed within their region, over 50% in South-Eastern Finland University of Applied Sciences (Xamk 2020), the capabilities they get from their studies carry on into regional organisations.

Also, research, development, and innovation (RDI) activities of educational and research institutions can facilitate the implementation of creative methods in regional development and partnering organisations.

Due to the domain specificity of creative skills (Cropley & Kaufman 2018), it is important that creative methods are included into the education of different study fields and/ or developed in cross-sectoral cooperation, as opposed to providing creative content separately on its own or within a creative industry. Research indicates that students' creativity dimensions can be enhanced through problem solving processes in experiential learning activities (Ayob et al. 2012).

The first part of the article sets the stage for the development of regional creative economy on the basis of recent discussions on creative economy in Finland. Next it presents challenges and opportunities of utilizing cultural and creative industry (CCI) competences in businesses in Kymenlaakso region as perceived by region's experts and managers of both within CCI and in other sectors of the economy. The results form the basis for brainstorming to produce cultural and creative industry education and RDI collaboration solutions which address the challenges and help exploit the opportunities. The article ends by critically evaluating the proposed solutions and the process before conclusion.
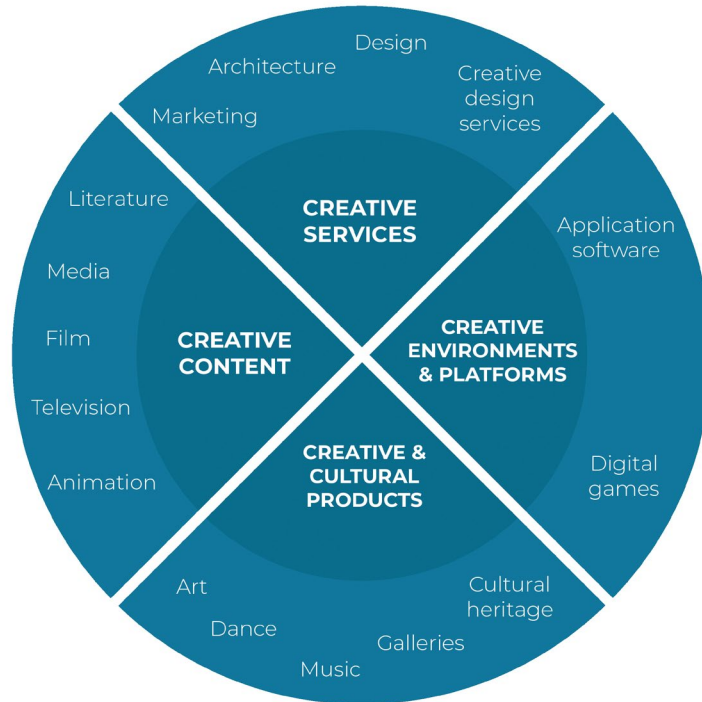
2.   Creative economy

The concept of creative economy highlights the relationship between culture and economy (Kylänen 2008). The main inputs of creative economy are creativity and human knowledge which can be perceived as infinite, making the resources of creative economy abundant rather than scarce (Guilherme 2017).

We define creative economy by the following four categories (Oksanen et al. 2018, 29-30):
- *Creative and cultural products*
- *Creative content*
- *Creative services*
- *Creative environments and platforms*

Creative economy sub-fields are outlined below in Figure 1. Various creative methods can be grouped in these four categories that highlight their relationship to creative economy. These creative fields form the basis of creative economy and contain different opportunities for cultural and regional growth.

Figure 1. Creative Economy Illustration

Based on previous research, it can be stated that major untapped development potential lies in the use of creative methods which form the basis of the four creative economy categories. Lucrative business opportunities can be identified in the interfaces of cultural and creative industries and other industries. Intellectual capital and intangible assets including creative skills, customer insight, brand value and innovation capabilities are generated through intangible value in organisations (Finnish Ministry of Education and Culture 2017, 27).

According to Yoon (2017), regional-innovation cluster policy can uplift R&D efficiency and support the development of regional creative economy. Industry renewal is needed in regions like Kymenlaakso which strongly rely on traditional industries like commodity products producing forest industry. According to Toppinen et al. (2017), the forest industry's future relies heavily on its ability to develop its innovation capacity, which again is dependent on strategic cross-sectoral partnerships. The creative economy's greatest value is its association with a diversity of regional capabilities and strengths deriving from cultural expressions. The creative economy consists of sets of arrangements between persons, institutions and governments, making it highly collaborative. (Guilherme 2017.)

Industry renewal in traditional industries can be supported by collaboration with creative industries and within regional creative economy. However, our data indicates that there are obstacles both in relationships and communication between the creative industries and traditional industry sectors. It has been presumed that education and RDI collaboration and business oriented applied research can help in mitigating these issues. For instance, creative and co-operational skills can be developed as part of different degree and continuing education programmes to better equip the workforce for working in the interface of traditional and creative industries.

That is why it is important to look into creativity and creative networks in education and RDI within universities of applied science. We ask: How creative industry education and RDI collaboration can overcome the challenges and exploit the opportunities identified by cultural creatives, business creatives, and traditional industries?

3. Regional creative economy in Kymenlaakso

The focus areas of smart specialisation (RIS3) in Kymenlaakso area, Finland, include logistics, bioeconomy and digitalisation (Regional council of Kymenlaakso 2019). Creative industry competences can boost growth in these sectors by enhancing innovation and networking capabilities as well as through creation of added value to products and services. For this article we develop new collaboration solutions vis-a-vis each of the four creative economy sub-fields defined above. Proposed solutions can be contrasted with the existing RDI funding programmes and projects related to RIS3 sectors in order to tackle their current challenges of renewal as well as to identify opportunities for new creative initiatives.

The strong position of universities of applied science in facilitating regional knowledge base, has been identified as a strength of Finnish creative industry. International benchmarks suggest that education and research organisations can promote collaboration within and among creative industries and other sectors. Cross-sectoral collaboration strengthens the impact of creative industries in the economy and society. (Oksanen et al. 2018, 31,90-91.) Xamk is the biggest RDI university of applied science in Finland, and it hosts country's second largest CCI education unit. Xamk is thus well-positioned to make advances in the intersection of creative economy and traditional industries, and to help increase region's low RDI intensity with a creative edge. *(See https://www.youtube.com/watch?v=_G2XWgTIs54)*

4. Methods

The paper adopts a qualitative methodological approach. It utilizes an exploratory research design to maintain adaptability to changes in the course of research. This approach allows to tap into new possibilities of data collection within the relevant regional creative economy ecosystem within the short timespan (5 months) of the research. The approach also helps to identify directions for future research in a participatory manner and thus to mobilize relevant stakeholders to develop this under-examined field of research in the regional ecosystem. (Singh 2007)

Data collection methods included focus groups (2 x 6 participants) and individual interviews (7) which were conducted during the launch of the Creative Arena (Luova Areena in Finnish) communication campaign. Data was obtained from three perspectives: a) cultural creatives which includes traditional cultural actors and institutions (artists, theatres, museums, etc.), b) business creatives which includes firms in the creative industries (advertising agencies, media companies, marketing communications firms etc.), and c) traditional industrial and services companies typical for the region.

Data collection and the campaign were integrated into the strategy work of the South-East Finland region's Creative Industry Development Network (CIDN) orchestrated by the region's Centre for Economic Development, Transport, and the Environment. Focus groups were conducted in the CIDN meeting in February. Interviews were conducted in April-May 2020. Interviews were structured into four parts according to the creative economy sub-fields, and they considered challenges and opportunities related to each of them. Each interview lasted 25-45 minutes. Interviewees included (i) three managers or entrepreneurs, from marketing, game development, and design companies, (ii) two middle managers from service industries, logistics and healthcare, (iii) a business manager from an ICT company, and (iv) a manager from a logistics industry association.

The results of the focus groups and individual interviews were first summarized separately, and then combined to produce the Tables 1 and 2 below. The middle column in Table 1 presents key challenges and in Table 2 key opportunities in exploiting creative economy competences in companies in Kymenlaakso. The results are presented according to the four categories of creative economy. The results are further categorized into those that are internal to the particular creative economy sub-field (marked with I) and those which pertain to people and firms in other sectors of the economy (marked with O).

The right hand column both in Table 1 and Table 2 presents CCI education and RDI collaboration solutions which help to overcome the challenges and exploit the opportunities, respectively. Solutions are derived by brainstorming possibilities of CCI education and university-business RDI collaboration (initiatives, arrangements, themes) targeted to particular challenges and opportunities.

Table 1: Key challenges in exploiting creative economy competences in companies in Kymenlaakso and CCI education and RDI collaboration solutions to mitigate the challenges.

Creative economy sub-fields	Challenges (I=for people/firms inside the field, O=for people/ firms outside the field)	CCI education and RDI collaboration solutions
a) Creative and cultural products • Heritage and arts • Antique and art dealers • (Visual) Arts and Galleries • Crafts • Music • Dance • Theatre and circus	**I** Poor business skills Cultural institutions' civil servant-likeness Quantification of value added of human experience	CCI talent manager/broker training Launch a regional Change Implementer programme in public-private partnership Research on price elasticity in experience economy
	O Firms' focus on core activities Logistics sector's conservative attitudes Difficulty of imaging the challenges due to lack of contacts with CCI sector	Creating new cultural value products as part of CSR Virtual and live regional platform for meeting CCI and traditional industry people (expansion of Creative Arena, for instance)
b) Creative content • Media • Animation • Film • Literature • Television • Publishing	**I** Personification of creative industry SMEs No public figure or spokesman	Create spaces and events in which creative leadership can emerge Support for management of growth of CCI firms
	O Lack of communications jobs SMEs' conservative attitudes and competence gaps regarding digital marketing Difficulty of imagining benefits from outside the CCI sector	Easy-access open university courses for entrepreneurs and SME managers Showcase best SME digital marketing case Fill in skills shortages with local and international student apprentices Virtual and live regional platform for meeting CCI and traditional industry people (expansion of Creative Arena, for instance)

c) **Creative services** • Functional creations • Architecture • Marketing communications • Design	**I** Poor in selling solutions Ability to tailor creative planning to local and regional characteristics (adaptations of corporate concept) Interdisciplinary determination of value added	Consultative project selling RDI collaboration with national corporations for testing local implementations Include more content on value-based pricing into culture and business curricula
	O Focus on quantity and results at the expense of coaching for excellent performance SMEs' limited financial resources SMEs lack experience of using creative services Lack of foresight Service orientation of industry challenges traditional industries	Creative collaborations with top sports teams and individuals as well as top artists Invite SMEs to bid for RDI funding Bridging local creative industry firms with local SMEs (joint RDI projects etc.) Encourage SMEs to commission theses from the future perspective Initiate service design theses and RDI projects with metal, bio, and logistics sectors
d) **Creative environments and platforms** • Software / Digital games	**I** Lack of deep technical and commercial know-how Lack of bold business acumen	Launch a regional high-tech culture project for kids and teens in collaboration with cities, universities, and corporations Develop regionally relevant deep tech open university and continuing education courses
	O Understanding software development in traditional industries Understanding of gamification Conservative attitude in logistics Closed knowledge and innovation systems within logistics Small units No experiences of cooperation -> no challenges	Launch an international conference on gamification in logistics Help regional games industry to meet industry best-practices Organise industry-specific design sprints for games people

Table 2. Key opportunities in exploiting creative economy competences in companies in Kymenlaakso and CCI education and RDI collaboration solutions to tap into the opportunities.

Creative economy sub-fields	Exploitation of opportunities	CCI education and RDI collaboration solutions
a) Creative and cultural products • Heritage and arts • Antique and art dealers • (Visual) Arts and Galleries • Crafts • Music • Dance • Theatre and circus	I New leadership in cultural institutions Collaboration between small and large firms	Establish a creative leadership programme Experimental marketing campaign for local businesses with local top artists
	O Art exhibitions and participatory performances in reception areas Exploitation of regional specificities and use of local CCI professionals Enhancing branding through art's universal language and top talent Exploiting industrial heritage Integrating design and other creative industry competences into product development from the start	Develop a service concept which manages changing art exhibitions in public and private spaces in the regional Industry-based project work in interdisciplinary pairs already at the university
b) Creative content • Media • Animation • Film • Literature • Television • Publishing	I Collaboration Enhancing experience industry by technology	Test, develop, and showcase technology enhanced performance, space, and event solutions Organise storytelling camps for businesses and locales
	O Visualising firm's own operations Storytelling of customer experience as well as induction and training materials Exploiting creative competence in branding Creative skills imposed by the new normal of post COVID-19 New TV formats based on sector-specific and regional thematic (ie. logistics)	Creative industry and business students' pair work to acquaint firm's operations by visualising them Introduce brand clinic to leverage brand analyses Invite TV production houses to shoot in authentic locations in the region and support engagement with students and local businesses

c) **Creative services** • Functional creations • Architecture • Marketing communications • Design	**I** Improving and commercialising design services	Business Sprints (intensive coaching & training) Twinning local CCI forms and research units with similar ecosystems from abroad (co-training, benchmarking, study visits)
	O Interior design Envision the future together Reaching for new customer segments with service design of industrial and logistics services Rethinking logistics marketing Investing in excellence in any creative industry field and utilizing it in branding	Service providers and buyers' joint scenario planning Responsible interior spaces initiative Design Sprints for logistics companies Gamifield simulations of logistics
d) **Creative environments and platforms** • Software / Digital games	**I** Serious games and gamified solutions for problem-solving through interdisciplinary collaboration Rehabilitative games and simulations Value-based pricing	Close-up study of industry problems and resources of gamification Gamification challenges/ competitions by industry
	O New inexpensive web-based platforms supporting visualisation and marketing Games and gamified solutions into traditional industries Exploiting times of crisis (COVID-19) to mold deep-seated conservative attitudes Using creativity to build resilience Integrating gamication and health tech Join problem-solving events between programmers, game designers, and industry professionals Bringing creativity to software development	New creative digital tools workshops with platform providers and lead users Gamification challenges/ competitions by industry Studying and advocating effectivity gains of remote and digital work Develop creative approaches to software development in business-university collaboration

5.   Results

Solutions presented in the right hand column in Table 1 and Table 2 show that there are many possibilities to integrate creative economy sub-fields into other industry sectors through education and RDI initiatives and activities. Indeed, the results show that creative economy and the so called RIS3 industries' integration and competitiveness in Kymenlaakso should be boosted by a variety of interventions. Solutions range from development of creative spaces, new collaboration partnerships, campaigns, conferences, training camps, and programmes to curriculum development and longer term educational initiatives and even basic research projects. Prominent topics of the solutions are leadership, branding, gamification, digitalisation, visualisation, and forms of storytelling and dialogue. Regarding both overcoming challenges and exploiting opportunities, the key is to embark in novel partnerships across traditional boundaries.

Figure 2. Prominent topics of the solutions.

One of the main results is that there are challenges, opportunities, and solutions both inside the respective creative economy sub-fields and outside them in other industry sectors, and even between the sub-fields. The ecosystem perspective works here, as the key lies in interconnections, inbetweens. New creative solutions for processes, products and services that win in the creative economy require input by different parties although there is also a need to develop deep knowledge. Another result is that there are challenges and opportunities, and solutions, pertaining to all creative economy sub-fields. Especially in a traditional industry dominated region like Kymenlaakso exploitation possibilities are multitude, and perhaps the hardest challenge is to prioritize and orchestrate their strategic development in the regional ecosystem. An interesting result was that there are difficulties in imagining challenges and opportunities of collaboration with some creative fields as people are unaware of what those field are and what they can contribute to business growth.

Detailed results can be studied further from Tables 1 and 2. Tables are left rich in information in order to allow insights to be presented without filtering them at this exploratory phase of investigation. This should provide a useful basis for more perspectival approaches in future studies on the topic. From the managerial point of view, a key to Tables 1 and 2 is to identify a box that is most relevant to a particular actor to start from.

6. Discussion

The paper contributes to the future model of collaboration between creative industry actors and traditional industrial and services companies as well as educational institutions in Kymenlaakso region. It provides practical advice to these stakeholders and Kymenlaakso Regional Council about what kind of initiatives and projects would enhance the utilization of different capacities of creative economy to improve the competitiveness of RIS3 focus areas, companies and organisations in the Kymenlaakso region. Theoretically, the study contributes to discussions on regional creative economy ecosystems and their development. It offers also methodological insights into integrating focus groups and individual interviews into the strategy work of regional Creative Industry Development Networks in Finland as well as to the national creative economy roadmap process.

The paper suggests that future research should be conducted in the area of public-private partnerships between traditional public and private cultural actors and both creative industry companies and traditional industrial and services firms as well as how to increase the value of the traditional industrial and services firms' outputs by the use of creative industry competencies. The paper provides also practical guidance for educational institutions on how to renew the delivery of creative industry education from the point of view of boosting regional creative economy ecosystem.

The study has some limitations which suggest further development and research. The study focused on analysing exploitation opportunities of creative industry competences in other industries. Creative industries as such as well as in relation to RDI and education involve important development needs and opportunities which are not covered in this study. Still, the study provides useful insights and direction for creative industry firms, professionals, and educators, too.

The study does not compare or contrast developed solutions to existing initiatives or projects. For example, there are in the region projects related to ambulance simulator training, virtual port logistics safety training systems, railway operators' virtual learning environment, and combining service design and circular economy. All these examples pertain to region's

RIS3 focus areas and aim at utilizing creative economy sub-fields to boost competitiveness. However, these initiatives are maximum 2-3 years from the start and some still in their planning phase. Later, it would be fruitful to study experiences and results from these projects from the perspective of challenges and opportunities identified in this study. For instance, it would be interesting to see which creative economy sub-fields or competences remain underexploited.

All proposed solutions may not appear novel. They were produced by brainstorming with a digital communications/CCI expert and entrepreneur, sustainability focused engineer, and business management and regional development expert with 20 years of education development experience and supported by interview insights. The trio covers a wide spectrum of RDI, education, industry, creative economy, and regional understanding to produce meaningful interpretations and relevant suggestions. And if solutions are not new to the world they can be new to the region. It is recognized that the validity of the solutions would be enhanced by reflective feedback by the respondents and relevant stakeholders. The Creative Arena process launched alongside this study gives an opportunity for further research with and feedback from the stakeholders.

During the data collection phase, especially with logistics industry respondents, it was noticed that focus group and structured interview methods did not allow to discover all what was left unsaid. It may also be difficult to articulate challenges and opportunities in the other (unknown) sector. Respondents may also be (unconsciously) unwilling to admit and express challenges rooted in one's own industry culture. Therefore, it would be interesting to follow hints and clues of this study in more ethnographically informed studies and employing a critical perspective, for instance.

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A MATURITY MODEL FOR SERVICE DEVELOPMENT FOR SMES

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ABSTRACT

For many small and medium-sized enterprises (SMEs), turning their organisation-centric thinking into customer-centric thinking is a difficult journey. In this paper, we present and discuss maturity models found in the service and design literature useful for evaluating and supporting the development of service businesses in SMEs towards customer-centricity. After the literature review, we present our preliminary model and analyse the first impressions of its applicability in SMEs. In the future, we will continue to co-develop the maturity model with SMEs.

Keywords: service business, service design, customer-centricity, stage model, small and medium-sized enterprises, service development, maturity model

1.   Introduction

For many small and medium-sized enterprises (SMEs), it is challenging to increase their customer understanding and customer-centricity. In this paper, we discuss various maturity models presented in the literature, and consider whether they could be modified to evaluate and support the development of service businesses in SMEs towards customer-centricity.

Previously, maturity models have become popular in several management fields. They can be seen as stepwise roadmaps for capability assessment and development, useful for defining a company's improvement targets and steps (Rapaccini et al., 2013). Despite the notable number of applications in other management fields, there is not yet much discussion on maturity models in the service business development and service design literature. (Rapac-

cini et al., 2013; Blommerde & Lynch, 2016.) In particular, there are almost no models suitable for SMEs in the development work of their service businesses. If a company is not aware of its current maturity level in its service business, it cannot properly define which development actions it should take. (Corsten, 2019.)

This paper aims to fill some of the gaps mentioned above. After going through some of the maturity models presented in the extant literature, we present our preliminary model, combining service business development and service design views, for evaluating service business maturity and development. Our model is still in its early development stages, and it will be further developed in an ongoing project with SMEs.

Our research questions are: 1) What kind of maturity models exist that are useful for evaluating and supporting the development of SMEs' service businesses towards customer-centricity? and 2) How can SMEs evaluate and develop their customer orientation and their development stage in service business development?

The rest of the paper is organised as follows. First, we discuss our research methods. Thereafter, we present a short literature review of maturity models which could be modified for evaluating the development stages of SMEs' service businesses. Next, we turn to the findings of our empirical study by presenting our own model and analysing the first impressions of its applicability in SMEs. Finally, a discussion and conclusions are presented.

2.   Methods

For the background, we conducted a literature review of maturity models found in the literature useful for evaluating and supporting the development of SMEs' service businesses. The empirical part of the research is still in its early stages. Our empirical data is and will be gathered from SMEs participating in service development and design training and coaching programmes in South Savo, Finland. For the purpose of the development work of the maturity model, the first brief web-based questionnaire was sent to the participants in 2019. Background information about the participating organisations' sizes and industries is gathered in Table 1. The organisations are from different service sectors, and they are typically very small, as only two of them have more than 50 employees. For privacy reasons, the names of the organisations are withheld.

Table 1. Participating organisations' service sectors and sizes.

Industry / Size	Trade and/or restaurant	Health and well-being	Consulting	Other service	Other (manufacturing, etc.)	Total
Fewer than 10 persons			1	1	2	4
10–50 persons	3	1		1		5
50–100 persons		1		1		2
Total	3	2	1	3	2	11

Next, we discuss maturity models presented in the earlier literature.

3.   Literature review

Maturity models can be used as means for continuous development. They can be used for self-assessment or evaluations done by third parties (Mettler, 2011.) Generally, the objectives of maturity models are to evaluate the present situation of an organisation, enable benchmarking and offer recommendations for improvement (Wendler, 2012; Blommerde & Lynch, 2016). Furthermore, there is an underlying assumption behind maturity models that typically organisations progress following a certain path, which can be anticipated and divided into successive stages, which in turn can be assessed against certain criteria. Usually, maturity models have three to six levels describing increases in maturity. (Blommerde & Lynch, 2016.) If an organisation is at a higher level of maturity than its counterparts, it has better capabilities for managing the specific issues defined in the model. In other words, high maturity builds on a highly skilled workforce, use of best practices and dedicated tools, a deep understanding of causal relationships, and a systematic, innovative and proactive culture. (Rapaccini et al., 2013.) Optimally, each level of a maturity model builds on the previous level, and the model includes guidance about how a company can go through a development process to get to the following level. However, it is not always realistic for a company to try to reach the highest level, but to find the best fit for that company and its needs. (Hesselmann et al., 2012.)

Maturity models have been presented in the research literature in several management fields. Information systems and software engineering were among the first fields where maturity models became popular, followed by applications in several other fields, among

others, business process management, supply chain management and project management. Maturity models also have close links and common historical roots with quality assurance. (Mettler, 2011; Rapaccini et al., 2013; Blommerde & Lynch, 2016.)

Next, we will go through some of the maturity models presented in the research literature for design, and service development and design.

3.1   Maturity models for design

Quite a few models have been developed for assessing the design maturity of companies. These models normally consider both the areas and degree of design efforts. In addition, these models usually implicate an evolution from the borders of an organisation to its core as the organisation advances to higher levels. (Björklund et al., 2018.) Some of them are in the format of self-assessment questionnaires (Topaloğlu & Er, 2017).

Maybe the most famous and widely adopted model is the Design Ladder, developed by the Danish Design Centre in 2001, to illustrate the differences in companies' design usage (Gomes & Branco, 2011; Foglieni et al., 2018; Design Ladder, 2019). In this model, the level of a company is defined by only one question: *"Which of the following describes the use of design in your business the best?"* The four steps in the model are: 1) Non-design, where design is not used systematically; 2) Design as form-giving, where design is used for styling products or services; 3) Design as process, where design is included in the company's development work; and finally 4) Design as strategy, where design is central in the company's business model. In practice, an extra step has been added to the model, namely 0) Design is not used in the company. Modified in this way, the model has been used as a basis for one of the largest design maturity rankings in the world, conducted by the Bureau of European Design Associations (BEDA), consisting of self-ratings from over 13 000 European companies (BEDA, 2017). According to the BEDA survey, 17% of European companies had reached the first level of the ladder, 14% the second ladder, 18% the third ladder, and 12% the highest ladder. However, 37% of companies did not use design at all. (Björklund et al., 2018; Design Ladder, 2019.) Design Ladder is an easy tool for companies to use to map themselves. However, the model has been criticised for targeting only design usage and not design management capabilities (Hesselmann, 2015; Topaloğlu & Er, 2017), or for not advising how businesses can proceed to the next level (Hesselmann et al., 2012; Hesselmann, 2015).
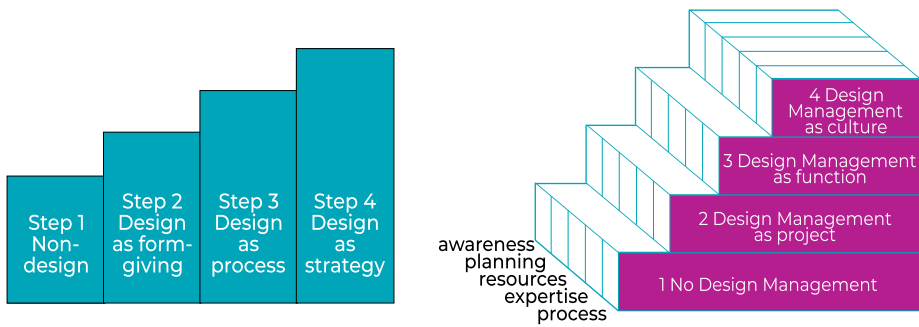
Fig. 1. Examples of Design maturity models. Danish Design Ladder (modified from Design Ladder, 2019) and Design Management Staircase (modified from Kootstra, 2009).

The Design Management Staircase was developed in a European project and as part of the DME Award, and tested in the Design Management Europe (DME) survey of 605 European companies (Kootstra, 2009; Hesselmann et al., 2012; Hesselmann, 2015). There are four maturity levels of design management in the model: 1) No design management, 2) Design management as a Project, 3) Design management as a Function, and 4) Design management as a Culture.

Artefact's Design Maturity Matrix has five maturity levels (Initial, Adopted, Managed, Integrated and Driven). These levels are evaluated related to five areas: 1) Empathy (understanding of customers), 2) Mastery (quality of execution), 3) Character (support for design, design thinking and design professionals), 4) Performance (market response) and 5) Impact (actions). (Björklund et al., 2018.) Design Maturity Survey (DMS), a self-assessment tool created by Artefact is available online at http://dms.artefactgroup.com/.

Gomes and Branco (2011) in their study on tools for measuring the contribution of design to the competitiveness of companies compare five tools, whose total number of questions varies from a minimum of 11 to a maximum of 43. Based on their analysis, Gomes and Branco (2011) introduce a generic design survey model with a questionnaire containing two generic and four key analysis sets: Company qualifications (generic), Results (generic), Planning, Resources, Process and Expertise.

3.2   Maturity models for service development and design

The development of physical products has a long tradition. In contrast, service development does not, and consequently it has been claimed that services are today under-designed and inefficiently developed, and that service development often lacks an understanding of customer requirements or a clear focus. (Rapaccini et al., 2013.) It has been proposed that many service companies are unfamiliar with the concept of developing new services in a systematic manner or do not understand that they could use design in their service development (Rocco & Hodak, 2013).

Rapaccini and colleagues (2013) introduce a model for assessing the maturity of new service development (NSD) practices in manufacturing businesses offering product-related services. The model incorporates five stages, and the key elements are assessed in proportion to four areas: Processes and projects; Resources, skills and tools; Customer, supplier and stakeholder involvement; and Usage of performance management systems. In their empirical case studies, Rapaccini and colleagues (2013) detect that the Resources, skills and tools dimension seems to be the weakest link, i.e. to have the lowest stage of maturity compared to the other dimensions.

Corsten (2019) presents a new maturity model, which is highly relevant for this study. The model has been developed under the wings of the Service Design Network (SDN), which is a global non-profit organisation raising awareness of service design. The model is called the Service Design Maturity Model. The five stages of the model are Explore, Prove, Scale, Integrate and Thrive. There are four pillars which help define the current stage of maturity: People and resources, Tools and capabilities, Organisational structure, and Metrics and deliverables. For example, related to the Metrics and deliverables pillar, a company in the Explore stage has no customer-related metrics, whereas for a company in the Thrive stage, customer satisfaction is not just a metric or a goal, but is part of the corporate culture.

		1. Initial	2. Repeatable	3. Defined	4. Managed	5. Optimized
Organisational approach	Relevance of NSD					
	Roles					
	Management practices					
Resources	Budget					
	Tools and methods					
Stakeholders	Customers					
	Other stakeholders					
Performance management	Feedbacks					
	KPIs					

	People and Resources	Tools and Capabilities	Organisational structure	Metrics and Deliverables
Explore				
Prove				
Scale				
Integrate				
Thrive				

Fig. 2. Examples of maturity models for services. Model for assessing maturity of new service development (NSD) practises (modified from Rapaccini et al., 2013) and Service Design Maturity Model (modified from Corsten, 2019).

Next, we will present the empirical findings.

4.   Empirical findings

After discussing previous maturity models of service development, we now present our own model and analyse the first impressions of its applicability in SMEs. The model is based on the views of service business development, service design and design thinking, and it will be co-developed with SMEs.

Our preliminary model has been compiled into the questionnaire sent to the participants of the training programme. The questionnaire has several questions based on our unit's earlier projects, which focused on SMEs' service development, but also questions from the Design Ladder, Artefact's Design Maturity Matrix and SDN's Service Design Maturity Model. In the questionnaire, the participants were asked to evaluate, using a Likert scale, their current situation in service development or their perceptions of their customers' views of their organisation associated with 15 statements related to strategy and culture, customer understanding, resources, service processes and networking, as well as development work and tools used in the company.

The model is described in Figure 3. It aims to evaluate the state and development of SMEs' capabilities related to customer understanding and customer-centricity through five lenses: Strategy, Culture, Resources, Competencies and Processes, practices and tools. Our own but still preliminary model has five maturity levels, as with many of the maturity models discussed in the literature. We name these levels Embryonic, Opening, Managed, Incorporated and Innovative.
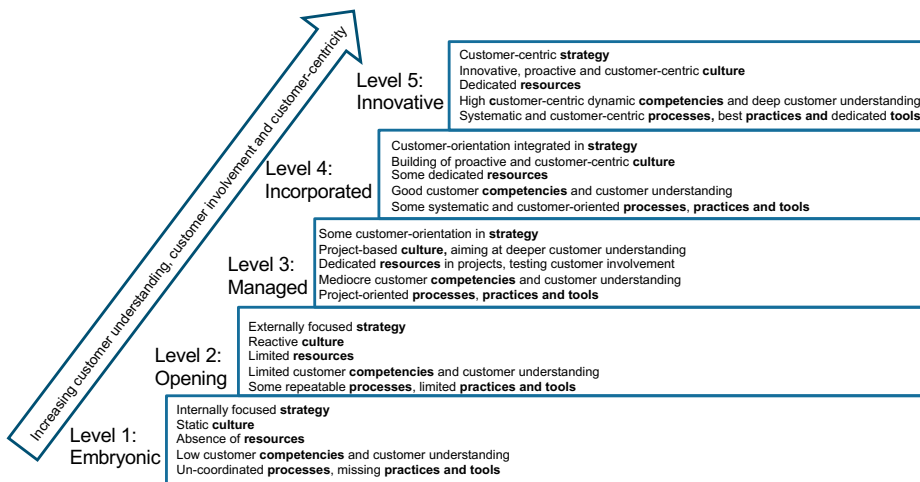
Fig. 3. The first attempt to build a maturity model for service development for SMEs.

Most of the respondents agreed with the following statements: "Service development is an important part of the strategy of our organisation, organisational culture and mind-set", "Our management is committed to customer focus", and "We collect customer feedback systematically". Disagreement was most common related to the following statements: "We make prototypes for testing new service ideas", "We develop our services as separate projects within our organisation", "We develop our services systematically", and "We have dedicated human resources and budget funds for the development of our services".

We may argue that our results are at least moderately in line with the observations of Rapaccini and colleagues (2013), as they detect that the Resources, skills and tools dimension seems to be lowest in maturity compared to the other dimensions, whereas understanding the relevance of development work is easier to accomplish. Furthermore, we can agree with Corsten (2019) that there is a challenge to develop new organisational structures that are designed for multidisciplinary work.

5.   Discussion

In the research, we have studied the previous literature to find maturity models which would be most useful for evaluating the development stage of SMEs' service businesses. We have presented our own model concentrating especially on customer orientation and analysed the first impressions of its applicability in SMEs. Our research contributes to the theories and practice of service business development, especially design thinking and service design methods and their applicability in SMEs. To the best of our knowledge, there are

only a few models combining service business development, service design and maturity approaches in the literature. The empirical part of the research is still in its early stages. We will co-develop the model gradually further with the SMEs participating in the service design training and coaching programme.

The managerial contribution of the paper is that by discussing the maturity models presented in the literature and by developing a stage model for service businesses, the aim is to help SMEs understand their current positions, and the steps they will need to take to progress forward to the next level and beyond in their service business development.

In the next phases of our research, we will further develop, operationalise and test both the theoretical foundations and the practical applicability of the model. We plan to use selected service design methods to formulate the maturity model as well as possible for users. Our aim is to develop an easy-to-use survey tool for SMEs for their service business development efforts. Further, more research on the success factors and challenges of service business development is needed.

While developing our own model, we need to be aware of the critics of maturity models. The existing design or design management maturity models have been criticised for not being adequately academically tested for their validity or usability. Furthermore, it has been argued that many of them fail to explain why the chosen factors are considered as important criteria, as there is no or only scarce empirical research to validate the tools. (Hesselmann, 2015.) Moreover, the models do not always consider metrics for different levels of maturity or different application areas (Björklund et al., 2018).

However, we claim that maturity models for service business development are needed and should be further discussed, developed and tested. It is apparent that SMEs have to build their competencies gradually to be able to apply new thinking and tools. In other words, absorption of new service development knowledge constitutes an organisational learning process. (Acklin, 2011.)

Foglieni et al. (2018) remind us, related to service design, that although measuring its impact continues to grow in importance, a structured theoretical discussion on evaluation frameworks is scarce, constituting a promising area for future research. It can be argued that the link between service development or service design, and business success is still to be verified. Therefore, future research on these issues is needed.

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CUSTOMER-ORIENTED TIMETABLE PLANNING – THE CASE OF PASSENGER RAIL CONNECTION IN SOUTH-EASTERN FINLAND

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ABSTRACT

A customer-oriented timetable planning approach is presented in this research. The geographical focus is on a South-Eastern rail connection between two medium-sized cities (Kotka and Kouvola) with seven railway stops along the route. The research was conducted with two online survey studies and an interview study between the surveys. There were in total 1675 respondents (874 in the first and 801 in the second survey), and nine interviewees.

The main research question of this study is: How should the current timetable be improved to get more passengers using the rail connection? The first survey study and the interviews were utilized to get suggestions for an enhanced timetable. The second survey was utilized to validate the suggestions further. The result was an updated timetable, which was taken into account in the national planning of the actual passenger rail connection described in this study.

Keywords: timetable, rail transport, passenger, customer-oriented, survey, interview study

1.   Introduction

This research describes a customer-oriented timetable planning process of an actual passenger rail line located in South-Eastern Finland. The main research question of the study is "How the current timetable should be improved to get more passengers using the rail connection?" The case is part of "Kotka-Kouvola train connection development" project carried out by South-Eastern Finland University of Applied Sciences during 09/2018-04/2019. In the project there were numeral customer-oriented tools utilized e.g. passenger profile creation, service path description and visualization of infrastructure development suggestions. Although, the time table creation was the pushing force and the core of the project being the most expected outcome, thereby also being the focus of this article.

Transportation in the research was seen as a service people use, so thereby research method followed service design principles. The most core principle in service design is that the human as a user is in the main role, while other principles are iteration, multidisciplinary, integrity, fact-based development and interlinked operations (Curedale, 2013; Miettinen, 2016; Stickdorn & Schneider, 2012; Tuulaniemi, 2011). Service design principles suit well to user centered development due to users' rising expectations for services and emerging competition of services in all sectors. Transportation also includes numeral social aspects that can only be taken into consideration, if decisions on transportation policies are made on strictly user centered data. (Ko et al., 2018; Reason et al., 2015)

The research was conducted in three main phases: The first was an online survey study. After that, an interview study was accomplished. The results of the first online survey study were taken into account, when conducting the interviews. After the interviews, a second online survey took place. Both the first survey and the interview study were the base for the second survey. The interviews were a suitable approach to improve the conception concerning the subject, and to understand the results of the first survey better. Based on these results, a new passenger rail timetable was accomplished. Furthermore, an updated service level was described. The new potential schedule and the service level was tested with the second survey. Hence, research plan implements all four process levels of iterative service design: research, ideation, prototyping and implementation throughout the research and in its different phases (Stickdorn & Schneider, 2018). Due the chosen research method, the research includes both qualitative and quantitative aspects.

The main aim of the customer-oriented timetable planning in this research is to get the potential customers involved in the process. Furthermore, the objective is to increase the amount of rail line users. The aim is to develop the improved timetable mainly according to the customer input. The customers include current but also potential users of the passenger

rail connection. The customer-oriented approach has been widely used in many different types of decision-making schemes such as marketing management (Clow and Baack, 2009), determining market structures (Srivastava et al. 1984), employee retention (Cardy and Lengnick-Hall, 2011) and executives' perception of the business value (Tallon et al. 2000). However, a customer-oriented approach towards timetable planning is a surprisingly seldom researched topic. In this research article, first the methods are explained. After that, the results and discussion are represented.

2. Methods

Geographical focus of the study is one of the major passenger rail transports lines located in the South-Eastern Finland. There are medium-sized cities in the both ends of the line. In addition, there are in total seven railway stops along the line. The line is in North-South direction. The population of the northern city is around 83,000, and the population of the southern city is approximately 53,000. The distance of the rail connection between the northern and the southern city is circa 50 km. (Statistics Finland, 2019)

The study was accomplished with two surveys and one interview study. The first survey was accomplished during December of 2018. The interview study took place during February 2019. The second survey study was executed on March of 2019. Thus, the research methods were online surveys and a semi-structured interview study. The number of respondents in both surveys and the amount of interviewees is summarized in Table 1.

Table 1. The amount of respondents and interviewees.

The amount of respondents/interviewees	
First survey	874
Interview study	9
Second survey	801

The first survey included 874 respondents in total. The main target group were the potential users of the public passenger railway transportation. The potential users are assumed to be located mainly near the train stations along the railway corridor. A sufficient amount of answers is estimated to be circa 10 % of the potential users. Based on Southeast Finland Centre for Economic Development, Transport and the Environment (2017), there are around 5,000 potential users, i.e. the aim of 500 answers was exceeded by almost 400 answers. The first survey consisted of the following topics: first and last mile distances, used transport modes

along the corridor, and what sort of timetables are popular and suitable for the potential train passengers. In addition, the survey tried to clarify, what are the reasons for not using the train, and how the service could be improved. The answers of the survey were analyzed, and based on the results, a sketch of a new potential timetable was developed. Furthermore, a description of the current service level was formed. The results of the survey were analyzed with the tools of Webropol service (more information of the service at Webropol, 2019).

Table 2. Summary of interviewed organisations and estimations of employee and customer amounts annually.

Interviewed organizations	Number	Employees	Customers (annual)
Public administration	4	14,500	-
Companies	3	2,000	-
Sports or culture	2	-	140,000

The analysed results of the first survey were the base of the semi-structured interview study as well as the second survey. The interview study was utilized to understand the results of the first survey deeper. The target group of the interview study included the main employers of the area. The main employers are assumed to be e.g. educational organizations and health care sector. Furthermore, the sport and culture sectors were included in the interview study, because they could also have a major impact in transportation demand. Table 2 presents summary of interviewed organisations and the amount of employees and annual customers. The aim was to focus the timetable sketch by clarifying the working hours and shifts of the main employers of the geographical area. The additional customer potential was investigated by interviewing the fore-mentioned main sport and culture event producers. The main questions for the producers were: Is there a suitable constant time, when both the culture and sport based customers could use the same train? Is there knowledge about the potential customers from other cities? Could the improved timetable increase the amount of passenger train users? Results of the first survey and the interview study were compiled together, to improve the timetable further.

Third part of the research was the second survey study. Main aim of the second survey study was to validate and verify the suitability of the improved timetable, which is the main result of the first survey and the interview study. The aim was again to gain answers from at least 10 % of the potential users, which accounts for 500 answers. In total, 801 answers realized in the second survey. User groups (age, sex, educational background and residency) of the first and second survey study were similar. Furthermore, majority of the respondents

were women (71 % in the first and 66 % in the second survey). Approximately 90 % of the respondents in both surveys were 21-60 years old. Main residencies were cities of Kotka and Kouvola with close to equal shares. Other residencies accounted for around 10 %.

3.   Results

The respondents were asked whether the current timetable (the one, which was operated during the December 2018) is suitable for them by Likert scale from 1 to 11 (1 = not suitable at all, whereas 11 = totally suitable). The mean was 5.35 (n=801), whereas the median was 5. This suggests that the respondents are not at all satisfied with the current timetable.

Furthermore, the respondents were asked to define, what would be the best and second best time of departure for the passenger train. There were 822 primary suggestions from northern to the southern city, and 820 primary suggestions from the southern to the northern city. Secondary suggestions amounted for 560 and 557 respectively. There were multiple demand spikes on different suggestions. The most favorable departure times are early morning departures (at around 6:00-8:00), and evening departures (at around 16:10 and 19:30). Surprisingly, many respondents suggested also nightly departures. There are currently no night trains, which could be one of the reasons for this demand. Figures 1 and 2 illustrate the primary and secondary departure times based on the first online survey.
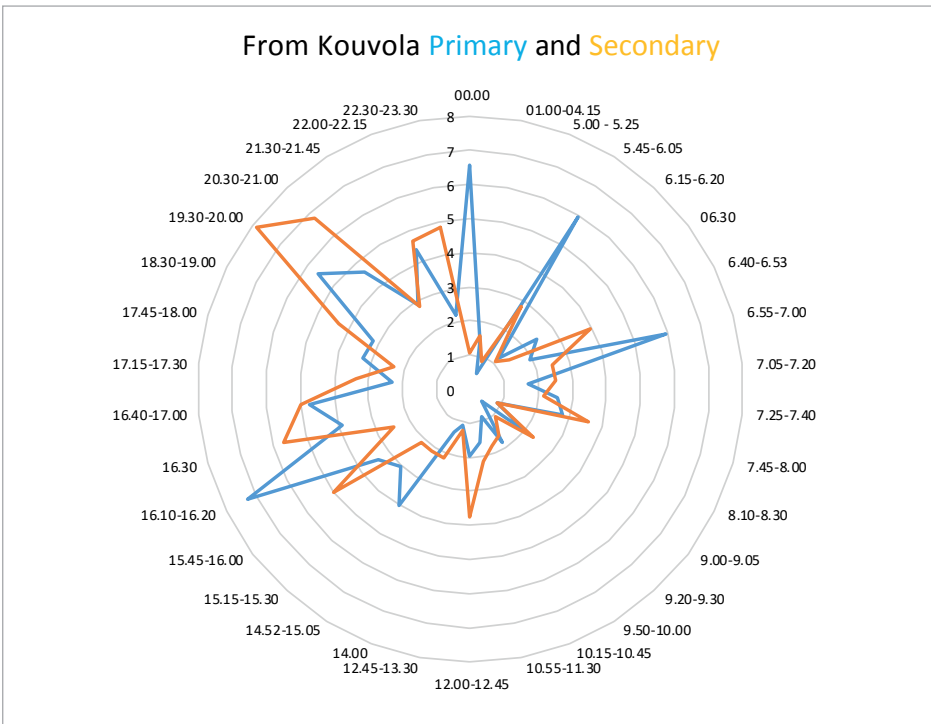
Figure 1. Primary and secondary train departure time suggestions from the first survey leaving from Kouvola.

The first survey answers for the most suitable departure times from Kouvola are presented in the Figure 1. The primary and the secondary departure times are shown together in one figure. It is possible to clear spikes pointing for the best departure times. Primary demand for departures from Kouvola to Kotka shows distinct spikes for early morning, after office hours and late night. Secondary demand is not supporting early morning departures as it does support late night train departures. Simplified, this might mean that the primary demand for train is work commuting and secondary need is for leisure travelling.
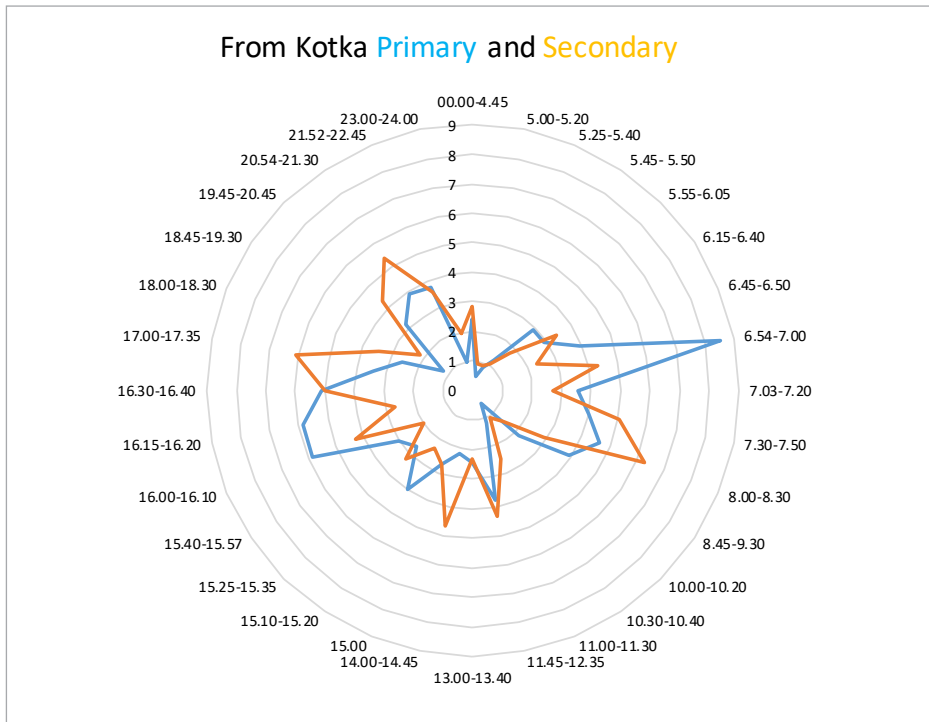
Figure 2. Primary and secondary train departure time suggestions from the first survey leaving from Kotka.

The most suitable train departure times from Kotka to Kouvola are presented in Figure 2. The dispersion of demand from Kotka differentiates with the demand from Kouvola. There is only distinct spike in demand for early primary departures and after office hours demand is more spread. Secondary demand is showing strong need for morning and late night departures. Generally the desired departure times from Kotka are more versatile than from Kouvola.

From these desired train departure times the first time table suggestion was created. The following Table 3 summarizes the suggestions based on the first survey. First suggestion for time table included ten departures from both cities.

Table 3. The first version of the timetable suggestion.

Towards south	Towards north
6.00	6.00
7.00	7.00
8.00	7.55
9.00	9.00
12.00	12.00
15.20	15.15
16.20	16.20
17.10	17.20
20.00	21.00
22.00	22.00

The first version of the improved timetable was first tested and validated with the interview study. The suggested timetable was validated as a good improvement, if compared to the existing timetable. With the new timetable, both the sport and other culture (such as theater) events are more accessible by passenger trains. Few connections (e.g. departure towards south at 9:00 or departure towards north at 21:00) were eliminated from the list, since they were not important according to the interviews.

After the interview study, the updated timetable suggestion was tested in the second survey, which was the main aim of the second survey. The respondents were asked, if the updated timetable included suitable train departures for them. In addition, they were asked to define one or multiple best departure times from the updated timetable suggestion. Based on the results of the second survey, the improved timetable suggestion was seen as a major improvement. Further, same connections from the first survey were again defined as the most suitable ones (the early morning, evening and late evening departures). Table 4 summarizes the updated timetable based on the interviews and the second survey. The table also clarifies the suitability of different departures. The percent defines the proportion of the respondents, which answered that the departure is suitable for their needs.

Table 4. The enhanced timetable suggestion based on the interviews and the second survey.

Towards south	Suitability for the potential user	Towards north	Suitability for the potential user
6.00	19 %	6.00	16 %
7.00	27 %	7.00	29 %
7.55	23 %	7.55	22 %
12.00	20 %	9.00	17 %
15.20	25 %	12.00	20 %
16.20	34 %	15.15	34 %
17.10	30 %	16.20	38 %
20.00	30 %	17.20	27 %
22.00	34 %	22.00	32 %

As can be seen from Table 4, the best departures were suitable for around 30-38 % of all the respondents. The least suitable were still suitable for 16-19 % of the respondents, which suggests that the proposed timetable would be an improvement, if compared to the old timetable, which was in use during the first and second surveys.

4. Discussion

The customer feedback about the results and way they were created was mainly positive. The potential customers were happy to be involved in the decision-making of the new timetable. Due to this, they were also motivated, and that's one reason, why the amount of respondents was so significant in the first but also in the second survey. The timetable was also partly taken into account, when the new official timetable was released during spring of 2019. The volume of potential users was around 5,000 according to Southeast Finland Centre for Economic Development, Transport and the Environment (2017). Based on preliminary calculations, the improved timetable could double the amount of potential users to more than 10,000. This is due to customer-oriented case methodology that ended up matching better with potential travellers' working schedules and added new, previously non-existing late evening departures for sports and culture consumers. Timetable also includes two more departures per city compared to the old timetable. New timetable creates better requirements for increased train usage, but to reach the full potential also other aspects of travel chain have to be considered.

Possible future avenues should include a continuous monitoring of the current timetable. With this approach, the timetable can be updated more frequently and proactively. Furthermore, a survey study of the customer satisfaction based on the improved timetable should have been carried out made during the year 2020, when the customers are more familiar with it. Unfortunately, the world wide Covid-19 pandemic affected public transportation passenger amounts highly negative which makes measuring of the results development irrelevant.

This method could also be adapted to other geographical locations and rail lines as well. Different locations have different characteristics, but these could be taken into account by focusing the survey to be suitable. In addition, what are the other aspects of travel chain ((such as punctuality, travel time and reliability)) to reach higher volume for public transportation?

Acknowledgements

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ONLINE MARKETING CHALLENGES OF MICRO AND SMALL COMPANIES

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ABSTRACT

Different online marketing tools are effective in attracting and retaining customers and increasing companies' competitiveness in today's global market. The main problem of the online marketing tools for micro and small enterprises lies in their complexity, which exceeds the capacities of one employee. In addition, the employee is expected to be able to manage all these tools together with following the newest trends and managing other activities of his scope of work. The aim of the article is to identify the educational needs

of small and medium enterprises (SMEs) in the field of online marketing. The paper is written on a basis of a study focused on micro-enterprise via international research (Czech, Bulgaria, Finland, Hungary, Italy) and small and medium enterprise areas. The research was conducted as part of international INSOM (Innovative support network for students in the field of online marketing) project, in which Xamk is one partner.

Keywords: online marketing, digital marketing, small company, micro company, SME

1. Introduction

Small and medium-sized enterprises (SMEs) are globally acknowledged as crucial for economic development (Savlovschi & Robu 2011, 280). They commonly employ the most significant amount of workforce and play a significant role in income generation. However, global competition also sets the major challenges for them as they typically operate locally or regionally (Singh & Gang 2010, 54-55.) Given the increasing use of technology, SMEs should be able to grasp the opportunities provided by online marketing tools find new customers and retain the existing ones, hence, survive in the global competition (Alford & Page 2015, 655). Online marketing can offer many benefits for SMEs. With the help of online marketing SMEs can grow sales, add value to customers by interacting with them frequently, increase and deepen the relationships with customers, save costs and extend the brand online (Chaffey & Ellis-Chadwick, 2019, 15.) In fact, flexible marketing capabilities have an essential and positive impact on the business performance (Maryanti et al. 2020, 165), but the complexity and the rapid changes characterizing online marketing are highly difficult to be managed by SMEs. The aim of this paper is to report on a study, which focused on identifying the use of online marketing tools and improvement areas, especially for SMEs of 5 countries: Bulgaria, Czech, Finland, Hungary, Italy.

The primary data was gathered using an electronic questionnaire (n = 376) focused on the enterprises and semi-structured interviews (n = 18) conducted with online marketing agencies. By comparing questionnaire survey results and semi-structured interviews, were identified. Research findings identify the main challenges in the effective use of the online marketing tools (complexity of the proper tools; lack of human resources, time and finance, lousy past experiences; lack of knowledge and competencies). Furthermore, this article suggests some recommendations for micro and small companies, such as educating staff's general knowledge of online marketing tools and activities with the help of online courses. As a result, educated individuals are then able to communicate more fluently with online marketing agencies when purchasing online marketing services externally.

2. Methods

For data collection, an electronic questionnaire was distributed to the employees and the CEOs of firms of different sizes (i.e., <10 employees; <50 employees; <250 employees). For all five countries (Bulgaria, Czech, Finland, Hungary, and Italy), in total 376 responses were received from the companies. For a more detailed country-specific split, see Table 1. The data was collected during December 2019 and February 2020. The questionnaire aimed to investigate two essential topics. Firstly, what online marketing activities are performed internally and/or externally. Secondly, in which areas the companies recognize the greatest opportunities for improvement. In Finland, 34 micro-sized companies (<10 employees) responded to the questionnaire, 28 small companies (<50 employees), 16 medium-sized companies (<250 employees) and 3 online marketing agencies responded to the questionnaire.

Table 1. Questionnaire survey responses in all 5 countries

	Czech	Bulgaria	Finland	Hungary	Italy	Total
Micro companies <10	70	14	34	25	44	187
Small companies <50	46	10	28	4	18	106
Medium companies <250	56	4	16	1	6	83
Online marketing agencies	9	3	3	3	3	21

The questionnaire contained 3 different question categories. The first category focused on sector, company size, and location. The next 6 questions focused on the use of individual online marketing tools in the company (see Table 2). Finally, the last 6 questions focused on the need for improvement in individual online marketing tools (see Table 3). Both of the latter categories were answered through a 5-degree Likert scale. The Kruskal-Wallis test was used to confirm the difference based on the size of the enterprise.

In addition to questionnaire, primary data were also collected through semi-structured interviews (n = 18) with randomly selected online marketing agencies. In Finland, 6 interviews were conducted by phone during December 7-18, 2020. The aim of the interviews was to identify possible challenges in working with SMEs companies in the implementation of online marketing activities.

3.   Results

Firstly, it was analyzed what online marketing activities are mainly performed internally, externally, partly internally or not being performed at all by enterprises. In the questionnaire survey, micro-companies (<10 employees) prevailed in all countries.

3.1   Micro and small companies rarely outsource online marketing activities

The results revealed that micro-companies mostly deal internally with following online marketing tools - websites, social media, e-mail marketing and analytics. On the other hand, they don´t implement all the online marketing tools such as SEO and PPC (see Table 2). Small companies (< 50 employees) implement internally most of the online marketing areas (website, SEO, social media, e-mail marketing and analytics) except PPC, which is not commonly implemented at all. At the same time, most of the medium-sized companies (< 250 employees) outsource SEO and execute internally websites, PPC, social media, e-mail marketing and analytics. On the contrary, 33% of medium-sized companies deal with PPC activities internally and 33% of them do not implement PPC at all.

Table 2: The use of online marketing tools within the companies

Category	Areas					
< 10 employees	Website	SEO	PPC	Social Media	E-mail	Analytics
Internally implemented	**55,61%**	33,16%	26,20%	**75,94%**	**52,41%**	**55,61%**
We use outsourcing	14,97%	18,18%	17,11%	3,74%	6,42%	14,97%
Partly internal and partly outsourced	14,97%	5,35%	6,42%	6,95%	3,21%	14,97%
Not being used	14,44%	**43,32%**	**50,27%**	13,37%	37,97%	14,44%
< 50 employees	Website	SEO	PPC	Social Media	E-mail	Analytics
Internally implemented	**68,87%**	**43,40%**	25,47%	**71,70%**	**65,09%**	**68,87%**
We use outsourcing	16,04%	23,58%	15,09%	5,66%	7,55%	16,04%
Partly internal and partly outsourced	12,26%	8,49%	5,66%	7,55%	2,83%	12,26%
Not being used	2,83%	24,53%	**53,77%**	15,09%	24,53%	2,83%
< 250 employees	Website	SEO	PPC	Social Media	E-mail	Analytics
Internally implemented	**59,04%**	31,33%	**33,73%**	**65,06%**	**68,67%**	**59,04%**
We use outsourcing	4,82%	**33,73%**	10,84%	2,41%	1,20%	4,82%
Partly internal and partly outsourced	36,14%	25,30%	22,89%	4,82%	26,51%	36,14%
Not being used	0,00%	9,64%	32,53%	27,71%	3,61%	0,00%

3.2 Micro and small companies are hailing for major improvements for all areas of online marketing

The results presented above need to be put in the context of the second part of the questionnaire, which focused on companies identifying their improvement needs in online marketing (see Table 3). For this part, results show that, based on self-assessment, micro and medium-sized companies need major improvements in all online marketing areas. Medium-sized companies identified major improvement needs in website and SEO activities. At the same time, they also identified needing some improvements in the area of PPC, social media, email marketing, and analytics.

Table 3. Self-assessment in the area of online marketing activities improvement

Category	Areas					
< 10 employees	Web	SEO	PPC	SM	E-mail	Analytics
We need major improvements	**29,95%**	**43,32%**	**36,90%**	**39,57%**	**35,83%**	**38,50%**
We need improvements	29,41%	25,67%	22,46%	26,74%	26,20%	33,16%
We need some improvements	23,53%	11,76%	13,37%	20,32%	16,04%	11,23%
We are fine	17,11%	19,25%	27,27%	13,37%	21,93%	17,11%
< 50 employees	Web	SEO	PPC	SM	E-mail	Analytics
We need major improvements	**59,43%**	**64,15%**	**63,21%**	**48,11%**	**54,72%**	**70,75%**
We need improvements	18,87%	14,15%	10,38%	21,70%	16,98%	10,38%
We need some improvements	11,32%	11,32%	10,38%	20,75%	14,15%	9,43%
We are fine	10,38%	10,38%	16,04%	9,43%	14,15%	9,43%
< 250 employees	Web	SEO	PPC	SM	E-mail	Analytics
We need major improvements	**54,22%**	**53,01%**	25,30%	28,92%	38,55%	36,14%
We need improvements	32,53%	7,23%	27,71%	30,12%	14,46%	16,87%
We need some improvements	10,84%	37,35%	**42,17%**	**34,94%**	**43,37%**	**40,96%**
We are fine	2,41%	2,41%	4,82%	6,02%	3,61%	6,02%

3.3 Lack of online marketing competencies, adequate time capacity and financial resources are the main challenges for SMEs

The third part of the questionnaire survey focused on identifying the main challenges in the effective use of online marketing in the companies. Based on this question, the following obstacles could be identified across all 5 countries:

- ✓ Staff competence is missing
- ✓ Lack of human resources
- ✓ Lack of financial resources
- ✓ Distrust in a quality service provider
- ✓ Poor past experiences
- ✓ Poor management willingness to invest in new communication channels
- ✓ Distrust in the effectiveness of online marketing
- ✓ High initial investment
- ✓ Lack of creativity

From the perspective of the companies, the biggest identified challenge is based on the combination of several different factors. These factors include the lack of in-depth online marketing competencies for the employees, the lack of adequate time capacity of the current employees, and the financial restraints to recruit new employees or employees solely focusing on online marketing. The companies also identified a lack of trust in online marketing agencies due to poor past experiences.

3.4 Outsourcing online marketing requires knowledge and skills

In addition to the questionnaire results, an expanded analysis of the challenges identified through the semi-structured interviews conducted with online marketing experts was created. The agency representatives were asked to explain what they see as the biggest obstacles in cooperating and working with SMEs. According to their perspective, crucial issues can be related to:

- ✓ **Lack of human resources and time** – In the micro and small companies, online marketing activities are often managed by one person who does not have proper competencies. In addition, this person is most commonly also responsible for other activities. Therefore, they lack the time to properly focus on online marketing, which can be seen.
- ✓ **High cost pressure** – The client company does not fully understand the complexity of individual options and tools of online marketing.

- ✓ **U**nrealistic demands – There is great difficulty in finding a match between budget and client expectations.
- ✓ **Lack of ability to articulate fundamental business** – Companies' challenges often translate into problems in setting up suitable business vision and strategy, given their inability to define target groups, people, and related marketing strategies.
- ✓ **Lack of knowledge** – In most cases, companies do not understand their potential in terms of advantages, disadvantages, possibilities of targeting, and measuring online marketing.
- ✓ **Poor experiences** – The client tries individual tools of online marketing without the necessary knowledge.
- ✓ **Wrong or insufficient problem definition** – The client seldom has any idea of the need to define the objectives of individual activities.
- ✓ **Unwillingness to try new things** – The client is seldom aware of the wealth of online marketing options or is reluctant to trust them.
- ✓ **Unwillingness to invest money in analyses** – The client does not want to invest money into conducting analyses.
- ✓ **Selling services to companies when you speak a "different" language** – The client does not know the online marketing terms and what they mean.

When comparing the questionnaire results and the semi-structured interviews, the main challenges that can be identified are the lack of human resources, time, and financing as well as poor previous experiences. Both micro and small companies identified a need for major improvements in the use of all online marketing tools. However, at the same time, they do not possess the necessary human resources or the time. One solution to solve the lack of human resources could be outsourcing, which is often used by medium-sized companies. However, outsourcing increases costs. The decision not to outsource to an online marketing agency and keeping advertising expenses as low as possible seems to be the most satisfactory solution to generate profit return for small companies. Therefore, one option would be to offer an online course for the personnel of SMEs and other individuals to improve their online marketing skills and knowledge.

4. Discussion

Online marketing tools provide an effective way to attract and retain customers as well as increase competitiveness in the marketplace for companies of all sizes. Online marketing landscape has evolved and rapidly changed over years. The landscape is full of service providers – online marketing agencies and platforms - enabling a large scale of online marketing services such as marketing research and customer profiling, websites, mobile marketing, search engine marketing, affiliate marketing, influencer marketing, online display marketing, social media and email marketing.

Based on the results in the 5 countries, it is possible to identify that websites are handled by SMEs' internal resources. Micro-sized companies do not utilize SEO, small-sized companies implement SEO both internally and externally, and medium-sized companies implement SEO mainly through outsourcing. The least used online marketing tool is PPC, both for micro and small companies. For medium-sized enterprises, the amount of those who implement PPC internally and those who do not use it at all is about equal. For social media, e-mail marketing, and analytics, the situation for micro, small, and medium-sized businesses is relatively similar, with mostly internal resources being used for these online marketing activities.

For micro and small companies, the challenge in utilizing online marketing often comes down to not being able to invest more time and resources to online marketing activities. One employee, who also has other duties, is not enough. At the same time, online marketing tools and activities develop at a rapid pace, and thus following trends and the fast development and utilizing competitive, operational online marketing activities on a daily basis is too much to handle for one person. Therefore, the main recommendation based on the research results is that micro and small companies should use the services of professional marketing agencies and additionally providing their employees, who are responsible for managing online marketing, the necessary training in the field of general orientation in online marketing tools, campaign goals, and their measurements.

For the SMEs, having an online marketing agency as a close business partner should be as natural as having an accountant partner. Since the online marketing service portfolio is so wide, the partner would be an inherent partner to provide the right service assortment to the company whether the agency is able to provide that themselves or if providing it would require networking with other online marketing agencies.

Having the online marketing agency right partner, who knows the SMEs needs, wants, desires and challenges, enables the SMEs to focus on brand management and continuous development of brand, increase the competitiveness and better success in the market.

Terminology

Analytics (web or digital)

Techniques used to assess and improve the contribution of digital marketing to a business, including reviewing traffic volume, referrals, clickstreams, online reach data, customer satisfaction surveys, leads and sales.

Pay Per Click (PPC)

The abbreviation PPC means Pay-per-click. Put in a very simplified manner, we can say that this concerns advertising on the internet when you only pay if the user clicks on the advert.

Search Engine Marketing (SEM)

Search Engine Marketing (SEM) is a set of activities which increase the visibility of websites in search engines via optimisation of content. The primary tool used in SEM is paid advertising – PPC (Pay Per Click). SEO (Search Engine Optimisation) is frequently included in SEM from the point of view of improvement of the quality of content to achieve a better-quality score in PPC systems. PPC and SEO are described in the following subchapters including the term quality score.

Search Engine Optimisation (SEO)

Search Engine Optimisation (SEO) is an abbreviation for "Search Engine Optimisation". SEO is a set of techniques used to optimise websites for search engines (Google and Yahoo, etc.).

Social Media Marketing

Social media marketing can be defined as a process in which we achieve marketing objectives via activities on social networks by establishing a brand, increasing sales, or guiding people to our other content (website, podcasts or videos, etc.).

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CAN ROBOTS HANDLE THE LOGISTICS OF SMALL WASTE TRANSPORTS IN A HOSPITAL ENVIRONMENT?

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ABSTRACT

This paper assesses the potential of an automated logistics system for small waste components produced in a hospital environment. Hospitals are very multifaceted transport systems, in which the complexity derives from the different sources of material flow, varied waste components, regulations, operations in public and restricted environments, work routines of the personnel, and transportation equipment being used.

The benefits of such a system would be manifold. In addition to improving the efficiency

of the hospital's internal logistics, it could enable safe transport, storage, and recycling of hospital waste. This paper discusses whether autonomous mobile robots can help to improve small waste logistics in hospitals and eliminate the bottlenecks.

Keywords: mobile robot, healthcare, robotics, automation, logistics

1. Introduction

Digitalization, automation, IoT as well as robotics and artificial intelligence are changing the world more than an industrial revolution. Automation, robots, and AI are quickly changing every aspect of how we live our lives and do our jobs. They have the potential to change the way we make and use things and services. This transformation affects the whole production chain and all industries, changing the way we will live and work in the future (Knell 2018). In every field, tasks will change in the next few years.

Robotic innovations have a long history, from early automation in the eighteenth century through the industrial machinery of factory automation to artificial intelligence robots (Thrun 2004; Barrett et al. 2011). In manufacturing, robots are already an important factor in increasing productivity and efficiency and improving competitiveness and safety. Automation, AI and robots will also become more common in companies that do not conceive themselves as technology companies. Nevertheless, the actual upheaval and exponential growth in the service industry will probably take place later on, for example, as service robots become more common. Automation and the use of robots enhance the company's operations and the added value that the customer receives, as the robots perform tasks much faster, more accurately, and more safely. With digitalization, companies can to both improve their own processes and to create completely new types of digital services and a completely new kind of business.

There are several studies about logistic efficiency and healthcare performance indicators, as hospitals themselves have made several private studies on how logistics is executed and what are the most crucial bottlenecks in hospitals. According to these studies, waste transport and other transportation of goods in the hospital environment is largely based on manual transfers. Waste is sorted here the waste is generated, and waste transportation uses the same passages as staff, customers, and other cargo. Hospitals and health care sector need to increase the efficiency of logistics with inventory management and simultaneously maintain a good service level. (Moons et al. 2019)

A robot is a device that performs tasks semi-autonomously or fully autonomously. The term robot covers a variety of different types of robots, including industrial robots, service robots, field robots, and autonomous vehicles or platforms, to name a few (Calderon et al. 2015). In the production industry, the use of automation and robotics is extensively implemented in many fields of activities. Mobile robots move from one place to another autonomously without support from external human operators. The majority of industrial robots operate in specifically designated workspaces. However, mobile robots have the ability to move around freely within a predefined workspace to achieve their desired routes and tasks. This smart mobility capability makes them suitable for a remarkable scale of applications in structured and unstructured environments (Tzafestas 2014).

This paper is based on the results of the project Small waste component logistics in the hospital environment. The goal of the project was to find out the capabilities of a robot to navigate in dynamic and constantly changing hospital environments, discover the potential for different use cases, risk assessment, needs and demand for user operation, and transport unit design for small waste components. The pictures below (Picture 2) present some examples of designs that were developed during the project. The research methodology includes a literature review on the use of robots in hospital environments, mobile robot technology, and the potential for robot utilization. The structure of the paper is as follows: Chapter 2 establishes the results of the literature review, chapter 3 presents the issues in small waste component logistics in the hospital environment, and chapter 4 describes the pilot study conducted during the project.

2. Literature review

2.1 Robots in a hospital environment

Robotics will bring entirely new opportunities related to, for example, health care, nursing staff's work, as well as various other functions in a hospital environment, including small waste logistics. Previous research has shown that 20–30 percent of the nursing staff's working time is used for other activities than the actual patient care and health care (Eskelinen 2006). Part of these other activities are functions related to small waste component logistics.

Hospitals and the health care sector need to increase the efficiency of logistics with inventory management and simultaneously maintain a good service level. In order to increase the performance in distribution, mobile robots can be seen as an effective alternative. (Moons et al. 2019). When using mobile robots in the hospital environment, the infrastructural level must be updated for requirements of the mobile robots. Mobile robots require the use of electrical doors and elevators, and involve a lot of vertical traffic. Mobile robots often need

needs their own internet network. Despite the increasing infrastructural cost of robots, at same time, robots can decrease personnel costs. According Rossetti et al. (1998), only six mobile robots can reduce the annual cost by approximately 56 percent and improve the turn-around time performance by 33 percent.

The first mobile robot capable of operating in a hospital environment was introduced in 1995. The first versions had issues with achieving commercial success. Now, after decades, this technology seems to have reached a breakthrough in a shared working environment with humans, which is the key to the availability of low-priced sensors and software development. This kind of technology is also essential in the context of autonomous cars (Bodenhagen et al. 2019). It has been forecasted that a large number of logistics robots will automate the whole hospital transportation. For example, a US-based Aethon TUG robot goes by call or can be scheduled to move independently from one department to another, and it can plan its route, dodge obstacles along the way, open the electric doors and use the elevator, and get to the charging station. The hospital's base map is scanned into the robot system, and there are few changes changes to the physical environment if any. The robot is connected to the electric doors and the elevator system through the wireless network and requires some preparatory work. The advantage of the TUG system is that it can work 24/7 flexibly according to the needs of the hospital departments (Ventä et al. 2018). In Finland, the system was introduced in the Seinäjoki Central Hospital in autumn 2016. At present, there are ten robots in use.


Picture 1. Aethon TUG T3 Autonomous Mobile Robot (Aethon.com)

2.2   Mobile Robot Technology

Human strengths are related to work that is more creative, where things are considered in a very new way, or when the ability to solve problems or complex conversations are needed (Andersson. et al. 2016). In the era of robots, valuable skills are those that the machine does not know well. In tasks that require creativity, intuition and handling of emotions, labor is particularly difficult to automate (Dahlin 2019). Thus, it can be assumed that, also in the future, robots will work alongside humans. Some of the old activities are replaced by robots, but at the same time, completely new kinds of jobs are created.

One major growth area for robotics is transport and logistics: the mobility of people and goods. Research shows that the global robotics market is currently €14–25 billion, depending on the segments incorporated. Regardless of the market size, the impact of robotics on production efficiency is indisputable. McKinsey Global Institute estimates that profits from advanced robotics will rise to 1.6–4.2 trillion euros. Robots are estimated to have an effect on GDP that is similar to the increase of production efficiency in last century (Pöyskö et al. 2016). The general sale of logistic robots is forecasted to be more than $10 billion by 2020, supposing an 11.5 percent yearly growth rate (Bodenhagen et al. 2019).

In general, mobile robots have a wide set of applications and markets. Implementing mobile robots in new fields of operations requires expertise in various fields. Resolving logistic tasks requires understanding of mechanism and kinematics, dynamics, and control theory, as described in Figure 1 (Siegwart 2011). The sensors designed for robots are like the sensors of the human sensory structure (e.g., vision, hearing, kinesthetic) that provide input signals to the brain for processing, utilization, and action (Tzafestas 2014). The technical components for autonomous robots have been available for years. Powerful microprocessors, laser-based sensors (2D and 3D lidar), ethernet radio communications, video processors, and a host of other subsystems are now priced at levels that permit practical autonomous machines to be built for an exciting range of commercially viable applications (Holland 2004).
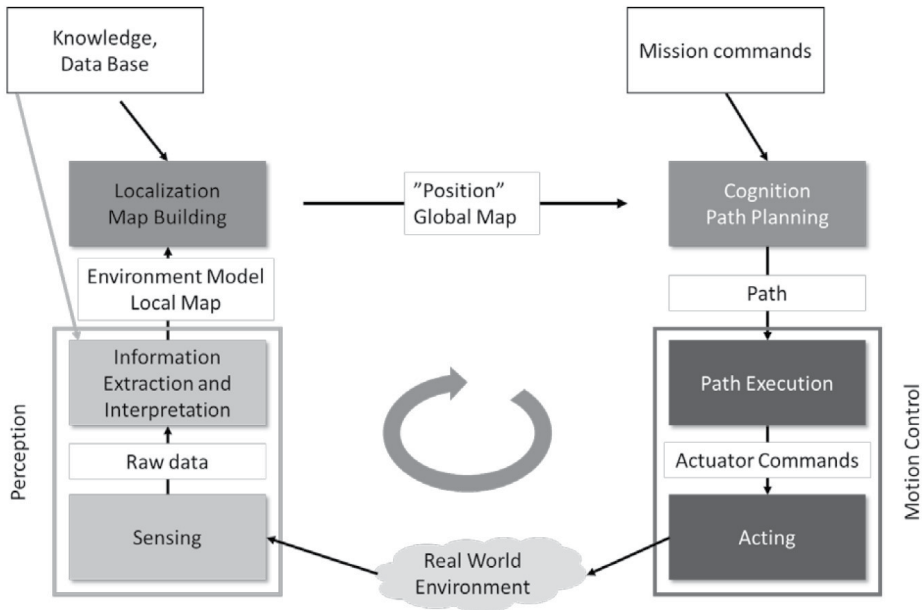
Figure 1. Reference control scheme for mobile robot systems (Siegwart et al. 2011)
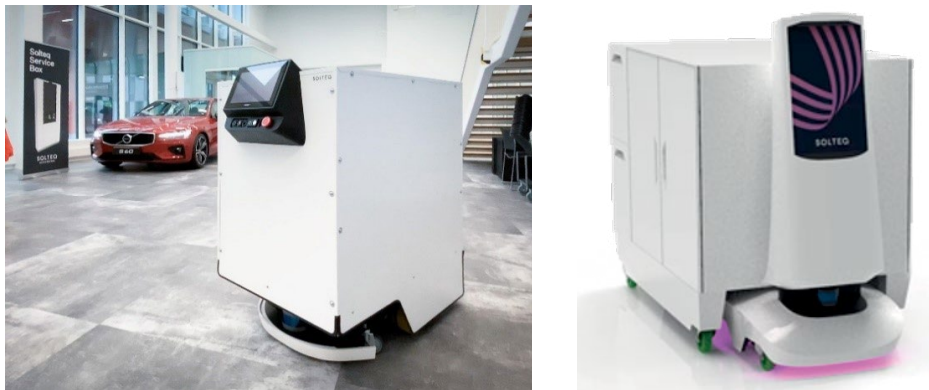
Picture 2. Solteq Indoor Logistics Robot added with different waste wagons (Solteq Oyj)

2.3 Evaluating the potential for robot utilization

Estimation of the performance of a robotic system and its utilization consists of analytical estimation of the maximum-order throughput and the average order cycle time. These models can be used to quickly evaluate different layouts, or robot zoning strategies (Lamballis et.al., 2017). There are several issues yet to study in order to ensure the safety of people when the mobile robot platform navigates in a human co-operated environment. The platform also needs to be able to deal with unexpected events. Autonomous hospital logistic systems should include user interfaces, planners, stations, charging stations and specially designed carts (Calderon et.al.,

2015). AMR (Autonomous Mobile Robot) type robots, instead, do not require heavy infra-structural changes or investments on such ecosystems. Autonomous Mobile Robots uses data from built-in sensors, cameras and lidar scanners as well as sophisticated software that enables it to detect its surroundings and even choose the most efficient route to the target or re-route itself when it hits an obstacle. The system operates completely autonomously. This optimizes productivity by ensuring that the material flow stays on schedule (Alatise M. et. al., 2020).

In general, all necessary conditions that robot utilization requires are a functioning network and an applicable working environment, although restrictions and special characteristics have to be taken into account. Design of such a system is a complex entity, which needs multifaceted examination (Lamballis et.al., 2017).

2.4   Regulation and safety

The legislation affects the routines and delays the transformation from human-controlled procedures to automation. Placing new technology in hospitals also introduces risks to safety and security. Different stakeholders are liable for different elements of safety and security in a hospital environment. These stakeholders include the manufacturer, the integrator, and the users of the robots. The parties liable vary according to the robot model. In a typical setting within the EU legislative system, the manufacturer, and to a certain degree, the integrator, are to ensure that the robot meets the relevant standards and complies with the product safety legislation. The integrator and the user are responsible for assessing and addressing the process safety, and the user of the robot is responsible for work safety while receiving support from the integrator and the manufacturer of the robot (Jacobs 2017). This requires individual and collaborative risk management between the liable parties. At the time of writing, there is no international standard for AMR type of mobile logistic robots. Autonomous Mobile Robots (AMRs) navigate via maps that its software constructs on-site or via pre-loaded facility drawings (Alatise et. al. 2020). Certain directives are applied, and standards being developed (e.g. 2006/42/EC, ISO/DIS 3691-4), but the requirements vary depending on the technology the robot utilizes.

Introducing logistics robots to a hospital environment requires a certain amount of risk management regardless of the transported material. Requirements include, for example, ensuring safety of the staff and visitors during emergencies and evacuation situations. The hospitals also need to consider what actions to take to ensure that the robot setup is in compliance with their cybersecurity practices. In addition to generic safety demands and requirements on technology, there are domain- and activity-specific requirements. To elabo-rate, biohazardous material such as medical waste, sharps, and biological waste transported in a hospital environment face strict regulation (e.g. Jätelaki act 646/2011, Terveydenhuol-

tolaki act 763/1994, Ympäristönsuojelulaki act 527/2014) due to the risks associated with the nature of the transported goods. The waste is transported in separate units, which also need to comply with these requirements. Thus, managing the risks related to transporting hospital waste requires both technological and domain-specific expertise.

3.   Small waste component logistics in hospital environment

There is no previous research conducted in Finland that would that would analyze/study the consequences of the adoption of automated waste management with the help of mobile robots. For example, refuse chutes or tube conveyors are not suitable for transporting small waste bins, which is why it is desirable to find alternative solutions for their automated transportation. Small verses are created in several places and the waste components are of varying sizes and shapes, e.g. glass bottles. The smallest fractions are generated in varying amounts, but they are regularly transported in the course of the trash.

Automation reduces the need for manual migration and can optimize waste shipments when there is less traffic or more demand-based, ad hoc, low response type of activity. The structural changes imply new opportunities for logistic robots. Because mobile robots safely maneuver in an environment shared with humans, mobile robots for waste logistics can be utilized to reduce the need for storage rooms in hospital units as they can operate in more frequent cycles and handle less waste at a time. In some cases, they could also be utilized in other operations, such as courier services, laundry, or instrument transportation. This use would add more modularity and productivity of the complex Ozkil et al. (2009) found that the need for mobile robots in hospital transportation tasks is obvious, but their designs should be made according to a thorough analysis, and their deployment needs to be based on a thorough analysis of the whole logistics system.

The volume of waste varies between different hospitals. As a case example, a mid-size Central Hospital in Finland produces over 500 tons of waste annually. Table 1 presents the amount of different waste materials and their distribution in a hospital environment. It can be seen from the table that one third of the produced waste is municipal waste and the second largest waste component is cardboards. It is evident that there can be a lot of potential for mobile robots in waste transportation. Nevertheless, it should be noted that issues such as hygiene, presence of hazardous objects, safety, and suitability of the transport unit must be taken into consideration in waste transportation operations in a hospital environment.

Table 1. Waste categories and amounts collected in 2013 at Kymenlaakso Central Hospital

Category	Weight (tonnes)
Municipal waste	166.31
Risk waste	21.59
Construction waste	27.38
Waste-to-energy (WtE)	141.63
Construction waste-to-energy	5.5
Biowaste	28.25
Low density polyethylene, LDPE	0.78
Cardboard / chipboard (recycled)	44.12
Paper (recycled)	18.58
Data protection paper	12.53
Data protection plastic	2.13
Recyclable cartridges	0.24
Electrical and electronic	2.3
Glass	5.2
Metal	24.5
Hazardous waste	13.04
Total	514.08

4.   Pilot studies in real environments

The design of the pilot project consists of two pilot placements in two separate existing hospital environments. The pilot study will evaluate the capability of the mobile robot and the functionality of the technical solutions developed in the project. After the use case pilots, a broader evaluation of the applicability of the study will be made. It is timely for these two pilot studies to be successful, taking into account that other similar hospitals are planning small-scale logistics solutions. The project simulates transport processes, which include the number of reliable logistic points, functions and data flows.

Project planning and schedule formation started with the modeling of possible variables, building the stakeholder network and choosing the robot development company through invite of tenders. The project coordinated the collection of initial data, pilot schema and establish collaboration platform between project stakeholders. The pilot schema was elaborated in the incremental solution development form. As described in Figure 2, before each pilot, three preliminaries are placed and prepared. The goal subjects, acceptance criteria and prerequisites are set up before each pilot, and the related tasks divided into parts for each stakeholder. After the pilot run follows an iteration and an evaluation cycle, in which experiences, conclusions and notes are taken into consideration for further development of the robot solution.
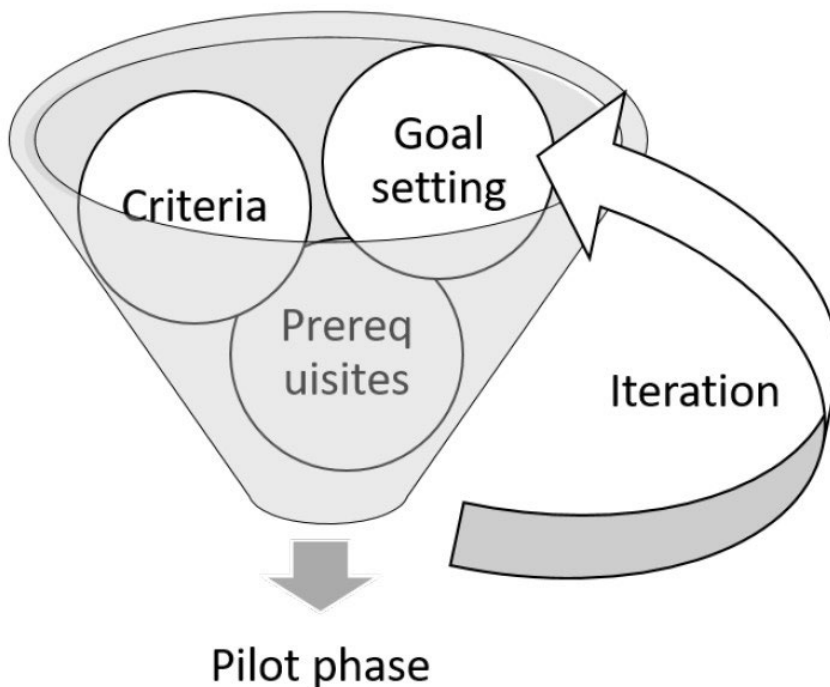
Figure 2. Pilot planning.

The robot solution for the pilots was created from ground up, meaning that the robot frame, the utilities, and user interfaces are built during the actual project, making changes to all these elements possible if required. The hospital staff, including the nurses, doctors, maintenance, and logistics, were given an opportunity to influence the design of the robot and utilities used, as well as the usability of the software and the process of small waste logistics. This kind of approach is called co-design. Co-design refers to an approach where the people involved are given the possibility to influence the design (Mattelmäki & Visser 2011, 2-3). In this case, the users were involved in the process early on through various workshops and queries. The workshops participants included representatives of the hospitals, the robot manufacturer, and research organizations.

During the workshops, the use cases for the robot were first defined. This process included defining the tasks the robot would be fulfilling, implementation of interaction and usability, and how the use cases are scheduled. The workshops provided input for the robot manufacturer about the design requirements for both hardware and software of the robot. The workshops also served the purpose of keeping the hospital up to date on robot development and the progress of the actual project. Furthermore, the workshops served as a platform to identify risks related to the pilots and to plan how internal and external communication should be implemented to keep relevant stakeholders informed. As a result of the workshops, the initial implementations were created. The use case consisted of clinical chemistry waste, used surgical equipment, and common waste transportations. Other optional use cases defined were cytostatic medicine deliveries, laundry transport, hazardous equipment transportation to the maintenance, and collection of medical waste to the pharmacy. As a whole, the aim was to create a versatile solution, which will adapt to all the use cases mentioned above with small modifications or any at all.

5.   Discussion and conclusions

5.1   Conclusion

This paper is based on a project Small waste component logistics in the hospital environment. During the project, two pilot projects will be executed in a hospital environment, which will span across the healthcare districts: Kymenlaakso Central Hospital in Kotka and the Helsinki metropolitan area, Pohjola Hospital. Hospitals aim to find sustainable and modern solutions, which will enable a resource-efficient and safe storage and handling of hospital waste. The pilot projects will be executed consecutively so that the user experience and knowledge of the robotics and application of IoT gained in the operation models and modes of operation of the first pilot can then be used and transferred into the second pilot.

The results gained from these two pilot projects can then be utilized by other healthcare providers who plan and execute similar small waste component logistics solutions in hospitals.

The project is funded by the European Regional Development Fund (ERDF), which aims to enhance the competitiveness of SMEs, produce and use new information and knowledge, and promote low-carbon economy. This project produces components of an intelligent and secure small waste logistics system. These include design tools, physical infrastructure for small waste supply streams, processes, safety systems, and operating models. Finally, the project productizes a model that could be applied in other similar hospital environments and operations. As in this case, the main contribution for the future is the experience and knowledge from the tangible pilots in authentic ecosystems, risks study, and safety specification, conditions for robotics, operational efficiency and investment calculations.

To conclude, hospitals are great platforms to implement robots, which are now a cutting-edge technology that will potentially help increase automation, reduce costs, and be convenient as a part of common hospital logistics. The evolution has come to the point where the operation of a robot does not need comprehensive master or programming knowledge because robots can be operated, routed, and programmed in-house. That gives a great advantage in the adoption of robots, and determines supplier or technical support dependency.

This article will give the reader enriched awareness of what mobile robotics is and how it has evolved over the years. It presents various ways how robots can be utilized in a hospital environment and small waste transportation, and the ideas and discussion about the entire topic area. Together with the findings, the literature review further expounds the challenges and risks associated with the robotics in the hospital supply chain, pilot planning, and putting robotics into practice.

As we have witnessed, the world can change fast, and the need for robot technology can suddenly change. Global economic and social life has been severely challenged since the World Health Organization (WHO) declared the COVID-19 disease a pandemic. Robotics, artificial intelligence, and human-robot interactions have gained an increased presence to help manage the spread of COVID-19 in hospitals, airports, transportation systems, recreation and scenic areas, hotels, restaurants, and communities in general.

5.2   Discussion and further studies

When the COVID19 started to spread and transformed to pandemic, it was a whole new situation to the world and health care systems. Earlier early in the 20th century, in 1918, Spanish flu was an international pandemic. After that world has not faced similar large epidemics (Keesara et al. 2020). Pandemic spread relatively quickly form China to the rest of the world. Could robots be in key role fight against pandemic? Previous robots have been tested in Ebola cases, and it was concluded that robots could be used that robots could be used in clinical care, logistics, and in monitoring (Yang et al. 2020). China has implemented and even tested these techniques against coronavirus. Results so far have shown that robots can be used in disease prevention. Robots can sterilize surfaces and areas in hospital cost-effectively and remote-controlled. In this case, their contamination risks decrease because cleaning personnel is not exposed to surfaces and areas.

When the pandemic started, people's temperature was measured in many places. Robots have already been doing this kind of measurements but could do it even more widely in large areas. Collection of more data layers such as facial recognition would improve the measurement, but privacy regulations must be followed. (Yang et al. 2020) In many countries, different kind of mobile corona applications have been taken into use. The main purpose of this software is to follow the chains of infection. Like in the sterilizing process or monitoring, robots would even help in the diagnosis process. Robots would do the whole swabbing process or at least transport the samples, which leaves the hospital personnel more time for other tasks and reduces the risk of infection. There are many possibilities to use robots in different kinds of tasks to assist healthcare personnel.

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LOGISTICS AND MARITIME NEED TO FOCUS TO CYBERSECURITY IN THE INTERNET OF THINGS (IOT) TECHNOLOGY

Getting Ready for the Cross-Border Challenges: Capacity Building in Sustainable Shore Use (GET READY project)

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ABSTRACT

Digitalization is a megatrend. Shipping and logistics will be transferring more to the digital world and digitalization is growing soon, taking advantage of digitalization with end-to-end solutions from customers to customers. The Internet of Things (IoT), machine learning, and robotics are being integrated into various layers of the logistics chain.

The research question focuses on cybersecurity with the Internet of Things (IoT) devices. There will be a huge amount of devices installed in the near future and there could be security challenges with those. The methodology of the research was studying new relevant information from the papers and articles written by the experts of IoT. This work is a basic desk study of IoT and aims to broaden more specifically for cybersecurity issues of logistics and maritime later on.

The estimation is that there shall be 31 billion installations of IoT devices until the end of 2020. By the year 2025, the estimation is more than 75 billion devices on the web worldwide. Huge amounts of devices are already online. The investments and growth of IoT devices interest in different groups operating on the internet. Machines and their IoT sensors will be integrated into the industrial processes to send

accurate information to the system. This enhances cost-savings and security improving resources for the process owners by the production of data and statistics. The fact is that as IoT becomes more widespread, criminals find new opportunities for making money. Cybersecurity, piracy, and terrorism are the top three risks for ports.

There is a huge potential for cybersecurity companies to maintain logistics and maritime security on growing business, giving benefits for the ports, shipping companies, and stakeholders.

Keywords: The Internet of Things, Cybersecurity, Maritime, Logistics, Ports

1.   Introduction

"Digitalization – An Unstoppable Mega Trend", says Hans Gillior in his web article of The Institute for Digital Transformation (2018). Digitalization is a megatrend that dominates the direction of the future even more than the industrial revolution. It has been forecasted that the entire shipping and logistics industry will be revolutionized. The development of digital and electronic solutions is constantly growing and their use in ports will only increase. Nearly half of all new port projects in the next five years will become partially or fully automated. (Gurumurthy et al. 2019; Hannula 2020; Saarikoski et al. 2019). The Digital era of logistics and maritime is supposed to grow in the near future, taking advantage of digitalization with end-to-end solutions from customers to customers.

Logistics and maritime sector are connected by global megatrends and terms like Artificial Intelligence (AI), Industrial Internet of Things (IIoT), Machine learning (ML), Augmented Reality (AR), Virtual Reality (VR), 5G connection, Automated Guided Vehicles (AGVs), automated and remote-controlled cranes, autonomous systems and automated yard planning, autonomous vessels, and open data, devices, sensors, robotics, automation, digital twins and blockchain technology. (A Menon 2019, p. 10, 30; WPSP 2020). Digital solutions based on the Internet of Things (IoT), machine learning, and robotics are being integrated into various layers of the logistics chain. Smart ports are fully AI-powered autonomous ports with IoT, big data, and 5G, facilitating advanced analytics and decision making for autonomous workflow management. Fully automated port terminals are already a reality and research to make unmanned ships a viable option is steadily gaining momentum. (Gurumurthy et al. 2019).

The winds of change are blowing to increase more automation and robotics in both logistics and maritime sectors, instead of human work. There are many different ways to enlarge business sectors changing how we have worked and communicated earlier, with the help of new technological possibilities. Change is now a reality and happening with a high speed. Political, economic, social, technological, legal, and environmental structures need to be adjusted at the same time with digitalization and globalization megatrends.

2.   IoT devices and technology

Every industry uses its own jargon and has its own acronyms. The acronyms of IoT terms are explained in this research, as well as the estimated increase of devices and what the consequences of the growth in the business are.

The internet of Everything (IoE) describes a possible future machine-to-machine (M2M) communications for people, structures, vehicles, systems, and processes. Internet of Things (IoT) means new applications for smart sensors, information, and communications technology to connect the billions of devices around the world. IoT includes wearables and smart consumer products. Industrial Internet of Things (IIoT) is for the manufacturing industry, improving the industry's connectivity, efficiency, scalability, timesaving, and cost-savings. IIoT refers specifically to increasing efficiency and improving health and safety. (Trillliant 2020). IoT means the connectivity of physical objects such as vehicles, devices, buildings, and electronics, and the networks that allow them to interact, collect, and exchange data (Link Labs 2020). IoT is an umbrella term for five types of technology; consumer IoT for light fixtures, home appliances, and voice assistance for the elderly, commercial IoT as applications of IoT in the healthcare and transport industries, such as smart pacemakers, monitoring systems, and vehicle to vehicle communication (V2V). IIoT includes digital control systems, statistical evaluation, smart agriculture, and industrial big data and Infrastructure IoT, which enables the connectivity of smart cities with infrastructure sensors, management systems, and user-friendly user apps. Military Things (IoMT) is an application for technologies in the military field, such as robots for surveillance and human-wearable biometrics for combat. (Maayan 2020). The term IoMT is also used in wireless healthcare medical devices and software applications combining people, data, and processes (Cook, E. 2020). IoT is used to track the location and conditions of shipments in the supply chain and ensuring that transported goods make it to their destination safely and on time (Rane, A. 2019). The same acronym IoMT is used for the Internet of Medical Things and the Internet of Military Things, which is a little bit confusing.

3. The regulation on logistics and maritime sector

International Maritime Organization (IMO) regulates port safety and security with the ISPS code (International Ship and Port Facility Security). ISPS includes procedures for physical security on ports, and protecting underway, berthed, and docked vessels. ISPS also states how to develop a cybersecurity assessment (CSA) and a cybersecurity plan (CSP). (Institution… 2017). IMO also regulates international shipping and global standards for safety and security. IMO has issued guidelines on maritime cyber risk management in the document MSC-FAL.1/Circ.3. The document enforces that cyber risks are appropriately addressed in existing safety management systems of the company's Document of Compliance after 1st January 2021. (IMO 2020).

IMO stated for maritime cyber management to cyber risk threats and vulnerabilities in the resolution Annex 10 in MSC.428 (98) in June 2017. The annex is for member states administrations, classification societies, ship-owners and ship operators, ship agents, equipment manufacturers, service providers, ports and port facilities, and all other maritime industry stakeholders. This annex affirms the need for cyber risk management, encourages taking care of that, acknowledges the necessary precautions, and requests to inform this resolution to all stakeholders. (IMO 2017).

4. The research question

This research shall be implemented as a desk study for the coming digitalization challenges. The research question is formed as follows:

"Is cybersecurity a crucial part for advanced sensor technology and Internet of Things (IoT) devices at the ports and vessels in the logistics and maritime safety in the future?"

The research question shall be investigated required data from the logistics and maritime studies, papers, and articles. Research shall be qualitative and executed by the FINER method with the relevancy of the study. The FINER criteria mean that research needs to be feasible, written as an interesting novel, and confirming, refusing, or extending previous findings. Feasibility means that there need to be enough subjects, technical expertise, and manageable in the scope. Research shall also be ethical and relevant. Relevancy shall focus on scientific knowledge and researching the future.

5. Hypothesis of this research

Digitalization is referenced as a phenomenon in almost every study and article. A huge amount of new sensors and IoT devices could be interesting targets for cybercriminals to attack. A hypothesis as a conceptual framework is the level of security of sensor, and IoT devices are poor and bring security challenges. There is a need to secure these challenges if devices shall be connected to the internet. Corporations using advanced sensor technology, automation, and IoT need to focus on cybersecurity throughout the production chain.

6. Methods, theory of the research

The research method was chosen pragmatically; the internet is full of studies made by universities, researchers, companies, and intellectual people. Those have a desire to examine new ways to change the future. Corporates located in the land area do not have any regulations for cybersecurity yet – it is just voluntarily to protect own ICT systems. The most important regulations for ports and shipping industry are agreed by member states of IMO. All regulations are easy to find with correct keywords from the internet search engines.

This work is a basic desk study of IoT and aims to broaden more specifically for cybersecurity issues of logistics and maritime later on.

7. Results of the research

7.1 Huge estimated growth of IoT devices

In 2015, Forbes estimated that there would be around 26 billion IoT devices in the year 2020. (Port Technology 2015). IoT technology has had continuous penetration worldwide according to the statistics; there were 7 billion devices in the year 2018 and active IoT devices reached nearly 27 billion devices in 2019. Estimation is 31 billion installations of devices during 2020. There will be 35 billion device installations by 2021 and more than 75 billion devices will be on the web worldwide by 2025. (Maayan 2020). Some 4.8 billion non-consumer IoT installations were operating by the end of 2019 and reach 5.8 billion devices by the end of the year 2020. IoT ecosystem will generate up to $1.1 trillion within the next five years. (Smith, K. 2020). This means that huge amounts of devices are ready online. By the estimations, IIoT devices are expanding rapidly also in the industrial sector. The investments and growth of IoT devices interest in groups operating on the internet.

IoT technology allows connecting physical objects to the digital world. The IoT device, system, and vehicle users can connect a wide range of different networks. Machines and their sensors will be integrated into the industrial processes to send accurate information to the system. This enhances cost-savings and security improving resources for the process owners by the production of data and statistics.

As an example, the Rotterdam Port authority has an IoT platform that defines docking time for ships, loading and unloading times, enabling more ships to be moored in the docks, and finally predicts arrival and offloading times. The platform makes decisions to reduce waiting times with the help of analyzed data. (Gurumurthy et al. 2019).

7.2   The problems with IoT devices

Open Web Application Security Project listed ten topic security issues and most pressing vulnerabilities for IoT devices (OWASP 2018):

1. PASSWORDS are weak, guessable, too short, simple, and publicly available, including backdoors in firmware or client software which give access to systems

2. INSECURE OR UNNEEDED NETWORK SERVICES are compromising confidentiality, integrity, and authenticity, or availability of information. Insecure or unneeded services allow also an unauthorized remote control for devices

3. INSECURE ECOSYSTEM INTERFACES. Common issues are insecure network, Application Programming Interface (API), mobile interface, lack of authentication and filtering or weak encryption

4. LACK OF SECURE UPDATE MECHANISM, firmware validation, secure delivery and lack of resetting and poor security monitoring

5. USE OF INSECURE OR OUTDATED COMPONENTS and customization of operating system platforms, and insecure third-party components

6. INSUFFICIENT PRIVACY PROTECTION. A failure to protect privately stored information on the device and ecosystems

7. INSECURE DATA TRANSFER AND STORAGE, lack of encryption and access control during processing data

8. LACK OF DEVICE MANAGEMENT results in poor security support, update management, systems monitoring and response capabilities

9. INSECURE DEFAULT SETTINGS, lack of security, and restricting modifying configurations

10. LACK OF PHYSICAL HARDENING, allowing remote attacks and taking local control of the device

Finnish National Cyber Security Centre states in the annual report of 2019, that devices connected to the internet remain vulnerable and no improvement in the security of firmware was achieved, IoT products keep repeating the same mistakes in their products year after year, and no improvement has taken place in more than a decade. Devices with information security deficiencies can be harnessed to bot networks to amplify denial-of-service attacks. The unfortunate fact is that as the Internet of Things becomes more widespread, criminals find new opportunities for making money. The information security level of IoT devices has been poor so far. (Traficom 2020).

There are many ways to fail with vulnerabilities of IoT devices by the list by OWASP. Many problems are self-made due to human configuration errors, lack of professional installations and device investigation, and without making proper device inventory and risk assessment. Traficom also stated that the IoT security level is poor. The carelessness and ignorance of IoT problems may escalate operating losses for business and resources. This generates many new business opportunities for ICT consultancy companies.

7.3   Increase of cyber criminality

Cybercriminals are aware of weaknesses with personal devices (called Bring Your Own Devices, BYOD) and smart technology systems. Kaspersky, an antivirus company reported 105 million attacks taking place between January and June 2019. Comparing the previous first half-year of 2018, the total number of attacks on IoT devices was 12 million. (Smith. K. 2020). Cybercriminals are increasing attacks to the maritime sector, on shipping systems and vessels. Maritime organizations modernize and embrace digitalization and they must take steps to prevent and defend against cyber threats. Safety at Sea and BIMCO noticed in their Maritime Cybersecurity Survey a 9 % increase of cyberattacks influencing 31 % of organizations from February 2019 to February 2020. By the report of Naval Dome, the maritime industry's operational technology (OT) attacks increased 900% in three years,

respectively 50 in 2017, to 120 in 2018 and 310 in 2019. (Macola 2020). As earlier stated, the huge growth of the IoT business attracts also cybercriminals and cyberattacks have increased exponentially.

Threats to the IoT devices are coming currently from network hacking, Distributed Denial of Service (DDoS) attacks, and radio frequency (RF) jamming. IoT devices can be hacked via the network. Hackers may gain control of the device, operate it, for example by taking control of an autonomous car, and control the temperature of the industrial thermostat. DDoS attack means the devices are sending so many messages that it is overwhelming and shuts down. The necessary information is blocked from getting through to its destination. Illegal RF jammer devices block wireless communications. IoT devices lose connectivity and limit the ability to communicate with the network. (Rane, A. 2019).

7.4   How to protect the IoT network

Smart devices require regular security updates, encrypted data, and sophisticated software, which are necessary to guard against cybercriminals (Smith, K. 2020). Endpoint Detection and Response (EDR) cybersecurity tools monitor from endpoints of IoT devices and proactively look for threats and send alerts during security events. IoT devices and systems need to scan continuously for vulnerabilities and before enabling the network connection. Dedicated and segregated wireless network for IoT devices with access to the Internet and without access to corporate network keeps security. (Maayan 2020). DDoS attacks and network hacking can be avoided by connecting IoT devices to a 0G network. 0G network is a dedicated, low-power wireless network. It sends data as small and critical messages asynchronously from IoT devices to the internet. Due to the sleep-mode of the IoT device, there is an extremely small window for hackers to break into the network and take control of it. The risk of DDoS attacks is low due to the support of device-initiated downlink. Hereby IoT devices cannot be taken over and control remotely to launch DDoS attacks. (Rane, A. 2019).

According to DNV GL, shipping organizations should use Plan-Do-Check-Act cycle to ensure and manage cybersecurity. An organization needs in the planning phase to identify cybersecurity objectives and make an inventory of systems and software. The organization executes cyber risk assessment and identify prioritization of improvement needs. The second phase is for doing things; the organization needs to integrate cybersecurity policies and procedures into the systems, define and update people's roles and responsibilities for cybersecurity. After that, the organization executes cybersecurity training for general awareness. Systems need to harden and roll out network segregation. In the third phase, checking and evaluating objectives need to be done. Analyzing cyber incidents and event reports, and data

monitoring are important. Internal audits need to execute and managing cybersecurity on the agenda. Acting and executing corrective and preventive actions, and ensuring ongoing compliance, and strive for continuous improvement is a necessity. (DNVGL 2020).
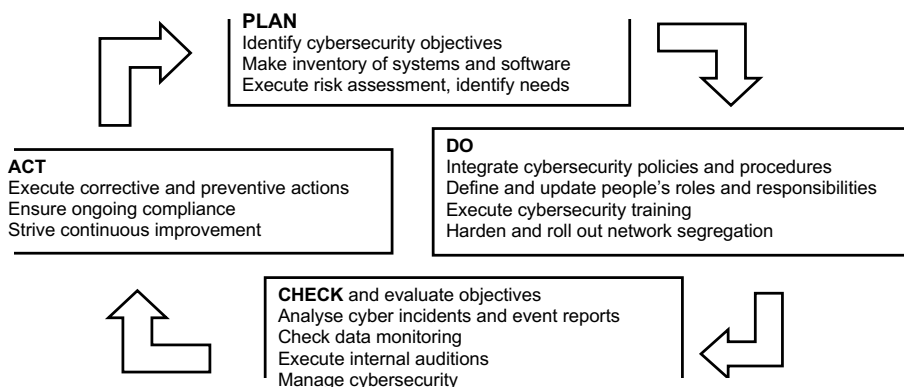
Picture: Plan-Do-Check-Act cycle for maritime cybersecurity, modified from DNVGL, 2020

The circle of monitoring of cyber threats and enhancing the continuous improvement of the organization lower the possibility of criminal attacks. The reason for this Plan-Do-Check-Act cycle here is to understand the process and importance of protecting IoT devices and networks from cybercriminals.

8. Conclusion of the research

The research main question asks, "Is cybersecurity a crucial part for advanced sensor technology and Internet of Things (IoT) devices at the ports and vessels in the logistics and maritime safety in the future?"

Ports and terminals are critical infrastructures. As such, they are potential objectives for criminal attacks and terrorism. Cybersecurity is one of the three top risks at ports. However, many ports are not yet fully prepared for this occurrence. Cyberattacks in ports are not hypothetical or theoretical risks. They are a reality. The more agents, devices, and systems are interconnected in smart ports, the higher the cyber risks will be. Policymakers should pay close attention to cybersecurity in ports working together with the industry. (De la Peña Zarzuelo, 2020). These highlights are describing the cybersecurity in the smart ports by Associate Professor Ignacio de la Peña Zarzuelo. He declares cybersecurity, piracy, and terrorism are the top three risks for ports. He stated that everything connected to the internet

is vulnerable and can be hacked, and the new era of IoT together with the management of an enormous amount of data requires further research and development.

The logistics industry implements increasingly IoT devices. The automation of processing orders and the efficiency of order deliveries can be interrupted by cyberattacks from the internet (Kam-Fung et al 2019).

There has been a huge growth of installed devices in the last three years period. Estimation is that a large number of devices shall be installed and the total revenue of the business sector increases up to $1.1 trillion U.S. dollars in a five years period.

IoT technology enables future digital transformation and change of information between human and machines, and between machines and machines, collecting massive data about us to the systems. These IoT devices become a part of our normal life and help us at home and in healthcare, logistics and transport technologies, and industrial networks. As more industries take part in digitalization, the more IoT devices will be installed and connected to the networks.

Security needs to be taken seriously. Cybercriminals and hackers are waiting for the possibility to make harm to your business. As a result, cyber criminality is increasing more and more, and the attacks are increasing at an alarming rate.

The common sense of personnel needs to be at an extraordinary level. One of the most important tasks is cybersecurity training for personnel. Users need to be more sceptical and awake for abnormal situations than ever. Nobody should give their passwords and personal information to anyone who is asking strange questions. Nobody should either click strange links from suspicious emails. Using public WIFI connections should be careful when accessing sensitive websites. Updated antivirus software and firewalls must be used with a possible Virtual Private Network (VPN) option.

IoT brings advantages and security challenges. These challenges need to be handled before an IoT device is connected to the internet. Devices need to connect to reliable networks to avoid hacking.

Problems will come with old and outdated IoT devices without using security updates. Some devices do not have strong passwords or those have reused, and network passwords can be leaked. Networks and insecure interfaces may cause more problems as well as insecure settings. Some of the devices could be stolen if there is not an appropriate physical covering.

The main three hacking ways to injure IoT devices are DDoS attacks, radio frequency jamming, and the administration of the device is overtaken by cyber criminals. Generally speaking, the cybersecurity has been poor on the IoT technology.

Cyberattacks to the maritime sector have increased in a few year period, as well as to operational technology systems. IoT technology can use advanced sensor data for maintenance and service. Ports, vehicles, cranes, and transportation systems can be more accessible to hackers through mobile networks and Wi-Fi connections, even with using malware contaminated USB memory sticks. There is always a possibility that hackers may get access to the vehicles' operational system through that connection. The concern of the digitalization is the possibility of growing cyber criminality. Is there also a possibility to hijack autonomous vessels? This is a very difficult question to answer, there are not any autonomous ships sailing today. If there is a possibility to hijack an autonomous car, the researcher believes there is a possibility to hijack an autonomous vessel.

In shipping and commerce, IoT brings lots of new information to understand more harbour workflows and processes, better resource management, and operational performance. After collecting all data, it needs to be analysed and better decisions should be made.

IoT technology creates value for the business when innovations for business needs are understood. As for the research question, the researcher has become convinced that cybersecurity is crucial for the importance of logistics and maritime.

9. Discussion

The researcher has spent a lot of time searching for knowledge about IoT devices. These studies have given an understanding of the possibilities of IoT, the vulnerability of technology, and the importance of cybersecurity for the logistics and maritime sector.

The next perspective for the future cybersecurity research would be to use PESTLE analytical tools to examine cybersecurity for the logistics and maritime industry in Finland. PESTLE analyses how much IoT devices and cybersecurity affects the political situation (P) of Finland, what are economic factors (E), how important and which are the IoT determinants in the local markets (S), what are the most relevant technological innovations (T), how the legislations are changing (L) and how IoT and cybersecurity concern environmentally (E) in the logistics and maritime industry.

SWOT-analyze (Strengths, Weaknesses, Opportunities, and Threats) for the cybersecurity of IoT technology for some cybersecurity consulting companies on how to develop a successful strategy for the logistics and maritime sector could be done. SWOT tool is used for assessing the organization's current position of deciding a new strategy; what is working well and what needs to be improved, where the organization wants to head, and what things are on the way.

There is a huge potential for cybersecurity companies to maintain logistics and maritime security on growing business, giving benefits for the ports, shipping companies, and stakeholders. The need for more academic research on IoT devices and cybersecurity is obvious.

Acknowledgements

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REMOTE MEETINGS BRINGING US ONE STEP CLOSER TO CARBON NEUTRALITY

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ABSTRACT

The Circular Economy UAS –project started in April 2018 when the Ministry of Education and Culture granted funding for a consortium of 19 Universities of Applied Science for improving their circular economy competence. In order to minimize harmful environmental impacts of unnecessary travel, the majority of project meetings were arranged using collaboration tools. Due to the COVID19-pandemic restrictions set by the Finnish Government, the spring and summer 2020 seminars were also organized online.

Comparisons between online and in-person meetings and seminars presented in this article reveal the potential to reduce emissions of work-related travel while enabling efficient cooperation.

Keywords: Circular Economy, sustainability, emissions, carbon neutrality, online meetings, work related travel

1.   Introduction

Finland seeks to be carbon neutral by the year 2035 (Finnish Government, 2019) and according to Sitra (2019), 29% of the carbon footprint of an average Finn is due to transport. The need to reduce travel in order to reduce emissions was discussed by Banister already in 1997 and replacing face-to-face meetings with online ones has been offered as one of the tools available for reducing work-related travel even before that. Collaboration tools are now more advanced than those available in 1997, yet the degree of their use has been somewhat moderate.

The Circular Economy UAS –project (later Circular UAS) funded by the Ministry of Education and Culture aims at helping circular economy specialists and educators join forces in improving circular economy education in the UAS field in a sustainable manner (CircularUAS, 2018). From the very beginning, it was clear that any harmful environmental impacts of the project would be minimized, so the majority of meetings were arranged using collaboration tools to avoid unnecessary travel. The benefit of networking and interaction was seen attainable by the three annual project seminars including informal get-togethers. Due to the COVID19-pandemic restrictions set by the Finnish government the spring and summer 2020 seminars, originally planned in Kuopio and Kokkola, were also organized online.

2.   Methods of Comparisons

The work in the Circular UAS project was organized into four working packets, each with a specific focus. The example used in this article is that of South-Eastern University of Applied Science (Xamk). Each UAS in the project has allocated work to the different work packets differently, so calculations or estimations presented here do not directly apply to any other UAS. The number of online meetings attended by one project participant at the South-Eastern Finland University of Applied Science during the year 2019 was used as a basis of calculations to provide an estimation on how much emissions could be reduced by each project participant avoiding unnecessary travel. Since only one participant attended, possible ride-sharing was not taken into account. It was assumed that had in-person meetings been held, they would have been held at the location of the organizer. Distances were obtained from Google Maps service. Costs were calculated using the Xamk compensation rate (0,2 €/km).

The estimated amount of emissions was compared to that of train travel, as longer distances are likely to be traveled by train. It should be noted, that the emission value of 0g/km/person is widely used when calculating railroad travel emissions in Finland. Emission information of Finnish railroad travel per distance traveled wasn't available, so a value published by BBC (2019) for an average passenger train (41g CO_2/km/person) was used.

The Kuopio and Kokkola seminar participants were asked to give information on their intended method of travel to reveal the amount of carbon dioxide emissions not emitted by participants as well as some possible prejudices to online events. Both surveys were conducted as Webropol-surveys during the seminars. Respondents were asked to estimate the distance not traveled to and from the seminar location as well as the means to travel they would have used.

3. Estimation of Emission Reduction by Remote Meetings

The number of online meetings attended by the Xamk representative and an amount of unnecessary travel is presented in Table 1.

TABLE 1. Cumulated amount of meetings and distance not traveled for one Xamk representative in the Circular UAS project during 2019

Assumed location	Meetings organized	Distance not traveled (km)*	TOTAL (km)	Cost** (€)
Helsinki	8	228	3648	729,6
Joensuu	6	210	2520	504
Turku	7	336	4704	940,8
Kokkola	4	347	2776	555,2
Rovaniemi	2	627	2508	501,6
Kajaani	2	332	1328	265,6
Hämeenlinna	3	199	1194	238,8
Seinäjoki	3	300	1800	360
Mikkeli	4	0	0	0
		TOTAL	**20478 km**	**4095,6 €**

*) distance one way from Mikkeli according to Google Maps
**) 0,2€/km (Xamk compensation rate)

By car (depending on the vehicle, this calculation is made using emissions 108 gCO_2/km, which is the emission value for this participant's car) this would mean over two million grams (2 211 624gCO_2) of CO_2 not emitted during the year 2019. The compensation for driving this total distance, at the rate or 0,2 €/km, would have been 4095,6€.

If all this distance was traveled by train, it would amount to total emissions of 839 598 gCO_2, which were now made unnecessary. The emissions of the distance between the participant's home and the railroad station were not taken into account. The price of a train ticket varies depending on the time of travel and when the ticket was purchased, so cost estimations were not done for this option.

The duration of an online meeting was typically one to two hours, yet with travel time meeting attendance e.g. in Helsinki would take a day's worth of working hours. Train travel would allow working while traveling, so the meeting would most likely not be the only productive activity that day. Online events allow attending several meetings during the same day, even in different locations, so it could be argued that they increase the efficient use of working time.

Another clear benefit of online meetings is risk reduction. Personal ergonomics aside, the risks exposed to while traveling are likely to be higher than those exposed to at the comfort of your office or home. This aspect would require further study.

4. Expanding Remote Meeting Practices to Seminars: Kuopio and Kokkola

The first two of the annual three Circular UAS- project seminars organized by Savonia UAS located in Kuopio in April 2020, and Centria UAS located in Kokkola in June 2020, were forced to online seminars due to the COVID19-pandemic related requirements for social distancing.

The Savonia seminar was transformed into an online version on a very tight schedule, rendering all seminar preparations already made redundant. The two-day seminar itself was organized as a Zoom meeting. During the seminar, the participants were asked to respond to a Webropol-survey about how they would have traveled to Kuopio, had the seminar been organized there as planned. Respondents were asked to estimate the distance not traveled to and from the seminar location as well as the means to travel they would have used. They were also given the opportunity to express their opinion on the utility of online seminars as opposed to in-person ones. The same survey was also used to gather data in the Kokkola seminar in June.

There were 40 participants in the Kuopio seminar and 30 in the Kokkola seminar. The number of participants in each seminar is an estimation of the average since some only participated in these events partly. It is impossible to say if participation online was full-scale participation or simply being present, but this is also the case in in-person meetings, where many participants browse their phones or email not entirely focusing on the seminar content all the time. The amounts of responses to the survey were 32 and 11 respectively giving response rates of 80% and 37%.

The median travel distance to and from Kuopio was 300 km and the total distance not traveled by all respondents was 17 212 km. Half (16/32) of the respondents chose "by train"

as their likely means of transport and 7/32 "by car". The rest (6/32) chose the option "sharing a car ride". These responses were left out of the calculations, since their travel emissions were included in the "by car" respondents' travel distance. In total, the distance traveled would have amounted to 9467 km traveled by train and 4130 km by car. Very similarly the median travel distance to Kokkola was 306 km and train was the preferred means of travel. Only one of the respondents would have driven to the Kokkola seminar. Based on the given responses a total of 6148 km of travel was made unnecessary by the remote seminar arrangements in the Kokkola seminar. The low response rate distorts the results, so the actual amount is likely to be closer to the Kuopio seminar data.

Using the average emission data given for cars (127,1 g CO_2/km) and 41 CO_2/km/person for trains, not traveling to Kuopio saved a total of about 900 kg CO_2. It can be assumed that the actual result for the Kokkola seminar would have been about the same had the response rate been higher. Compensating this amount of emissions is offered by several organizations at a negligible price of around a hundred euros. Emission compensation could quite easily be included in future project budgets, especially if the expense is not higher than these calculations suggest.

Avoiding the actual cost of travel seems to provide a more significant incentive for promoting meeting practices that require no travel. Train ticket prices vary, so the cost of traveling to these seminars can be estimated using the compensation rate of 0,2 €/km driven. Table 2 presents a summary of travel emissions and costs by the survey respondents to the seminars discussed.

TABLE 2. Distance not traveled, emissions not emitted and cost not caused by remote seminars

Seminar location	Distance not traveled (km)*	Emissions saved (kgCO$_2$)	Cost** (€)
Kuopio 32 responses/40 participants	17 212	about 900	3442,4
Kokkola 11 responses/30 participants	6148	about 126	1229,6
	*by the survey respondents		**0,2€/km

The calculations described only relate to emissions caused by travel. A more accurate result of the total saved emission level would be given if all the emissions caused by accommodation, catering, etc. were taken into account It should be noted that while an online seminar requires no travel, it does require a network connection, so electricity is used and even without a catered lunch, the participants still consume food while attending the

seminar. It is also likely that most seminar participants would have their laptop on even if they were physically present at the seminar, so it can be argued that the overall electricity consumption of these two options is likely to be quite similar in the end. Naturally, this would require further study.

Most of the Kuopio seminar respondents (26/32) felt the online version was as adequate (5/32), or nearly as adequate (21/32) in fulfilling the seminar purpose, as an in-person one. In the case of the Kokkola seminar, all 11 respondents felt the remote version was nearly as adequate as an in-person one. Convenience, time, and cost savings were mentioned as clear benefits of an online seminar. Some (Kuopio 7/32, Kokkola 3/11) respondents would not have attended at all if online participation wasn't possible. Comments given in the survey revealed some potential reasons for this to be time management issues and difficulty of travel to these locations. Lack of person to person interaction was -not surprisingly- seen as a negative aspect, although the use of small group discussion tools used facilitated some possibilities for interactive participation.

The exceptional circumstances caused some other challenges, such as child care arrangement difficulties, in seminar participation. The few technical difficulties experienced during these seminars were not seen as a major problem, in fact being forced to learn the use of digital and collaboration tools that the respondents hadn't used before was seen as a clear benefit. Several comments underlined the importance of meeting people in person to ensure true networking. This type of seminar was seen to be successful among people who already had met in person.

5.   Discussion

Remote meetings and online seminars have proven their usability and are likely to be used at an increasing rate. As shown by remote seminar participant's responses, they facilitate co-operation on a sufficient level. By becoming accustomed to these methods of cooperation we have opened a window of possibilities for more sustainable meeting practices. A more detailed study on the differences between online or in-person meeting entire ecological backbag is needed to establish the importance of adopting new sustainable meeting and event practices.

To promote meeting sustainability further, emission compensations should be included in all activities as one of the costs to consider. At current compensation rates; however, a more significant economic incentive towards remote meetings and seminars is the actual cost savings and more efficient use of working time made possible by not having to travel. The decreased risk level, participation convenience and lack of social interaction should be studied further to better understand the social aspect of replacing in-person meeting with online ones.

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