



Finnish winter road management – the evolving business ecosystem

BECSI WP2 project report

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Preface

This case study on Finnish Road Weather Ecosystem (FIRWE) is a part of Tekes-financed BECSI project, led by Professor Pekka Kess (D.Sc.) from the University of Oulu. The research team of this case study comprised Research Scientist Aki Aapaoja (D.Sc.) and Senior Researcher Raine Hautala (M.Sc.) from VTT Technical Research Centre of Finland Ltd, and Research Professor Pekka Leviäkangas (D.Sc.) and Researcher and BECSI project manager Tuomo Kinnunen from the University of Oulu. Dr. Leviäkangas also works as Principal Scientist at VTT.

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1. Introduction

Industries and industrial enterprises go through structural change in Finland and in EU in their quest for success. This development can be seen as a part of global creative destruction process that, in turn, calls for industries' renewal by innovations, new entrepreneurs, new thinking and new business ecosystems crossing industry borders. The creative destruction involves modern societies as well and its negative effects are especially experienced in Finnish structural change areas today. These areas must look for growth and job creation from future opportunities utilising their existing strengths and capabilities. Public actors may play a significant role in future ecosystems and innovation processes.

Systematic innovation consists of the purposeful and organized search for changes, and in the systematic analysis of the opportunities such changes might offer for economic or social benefit (Drucker 1985). These innovations necessitate cross-disciplinary networking. However, competition is moving from individual firms or industries towards business ecosystems. The logic in ecosystem thinking is that firms must proactively develop mutually beneficial relationships with customers, suppliers, and competitors (Iansiti & Levien 2004). The firms coevolve capabilities around a new innovation: they cooperate and compete to support new products, satisfy customer needs, and finally build succeeding innovations (Moore 1993). In addition to competitive forces, constraints are set by regulators, standard-setting bodies, laws, social norms, and business ethics; the rules in the ecosystem result from the coevolution and interactions between the stakeholders (Teece 2007).

Innovations take place at different levels and in different contexts. Macro-level innovation systems are demand driven, and typically use project funding and tax incentives to promote innovations. National (e.g., Tekes), international (e.g., EU), and regional (e.g., EU structural funds) innovation systems are examples of macro-level demand side innovation systems. Micro-level innovations are less formal and depend on individuals' and organizations' capabilities and commitment. The success of these systems is relatively straightforward to measure. Macro-level success is observed in national or regional GDP growth whereas micro-level success is (or at least should be) reflected in firms' value as these are able to create positive expectations on the demand for their new products, processes or services.

1.1 Scope

This case study focuses on one particular work package of a larger project, namely “Business ecosystems and platforms for innovations” (BECSI). BECSI analyses Finnish innovation system from three perspectives: local innovation platforms, Health and Life Science ecosystems and emerging small business ecosystems. The policy level analysis is based on empirical observations from aforementioned platforms and ecosystem cases. The primary research questions are related to the cases’ capability to generate economic growth and address challenges in scaling-up towards international markets. The grand idea of the project is to let the best learn from the best and to approach innovation challenges bottom-up, i.e. make true empirical investigation through observation and analysis.

The particular case study focuses on Finnish Road Weather Ecosystem (FIRWE) which is based on natural strength of a group of Finnish firms’ special expertise: ability and know-how related to winter road management. The value chain sections are covered each by different firms, starting from meteorological observation technologies, followed by winter maintenance equipment supply, meteorological services and service concepts. Key point for FIRWE is the access to new markets through a collaborative effort by providing turn-key solutions for prospective customers as a full-package delivery instead of individual efforts. Again, innovation policy tools could find some room in this process of accessing new markets through collaboration.

In order to ensure mutually beneficial collaboration within the whole ecosystem, Finnish Road Weather Ecosystem is seeking a working risk-revenue sharing model that enables the firms work in profitable collaboration and increases the shareholder value of all ecosystem partners. Based on the objectives, the participants of FIRWE ecosystems are seeking answers to the questions on how the risks and revenues are shared within the ecosystem, which forms a critical evaluation point from the innovation policy perspective: how can innovations of ecosystems be supported in a manner that allows ecosystem partners to build win-win collaboration? How can the end-customer value shared between partners and is public innovation support of some kind playing any role?

1.2 Aims and objectives

The overall aim of this study is to define and apply a model to describe an emerging micro-level business ecosystem of road weather in Finland, and its evolution over time. In order to achieve the aim, we have set three objectives:

- 1) to describe what is the Finnish Road Weather Ecosystem and who are involved.
- 2) to assess ecosystem’s operations and evolution (i.e., how it has been organized and how it may evolve)

- 3) to assess the role of Finnish public sector concerning the support for innovations (how should the ecosystem development and growth be supported)

The aforementioned objectives are related to certain issues identified by some of the participants of the ecosystem. First, FIRWE seeks council how it could access new markets as an ecosystem. Therefore it is essential to identify the offerings of each player as well as public sector's (including research) supportive actions which can pave the way towards successful contracts. This question is highly relevant for the business actors whose business is dependent on successful exports to a large extent.

Secondly, in order to outline the future scenarios, the current state must be known, i.e., how is end-customer value shared between partners? How it forms a working risk-revenue sharing model that enables the firms work in profitable collaboration and increases the shareholder value of all ecosystem partners?

Finally, the public sector plays a significant role in Finland and as a matter of fact, it can be regarded as "a gate keeper" that to some extent sets the rules and hence may facilitate or balks the development of the ecosystem. Third objective is to gain better understanding how the risks and revenues should (or could) be shared forms a critical evaluation point from the innovation policy perspective. How can innovations of ecosystems be supported in a manner that allows ecosystem partners to build win-win collaboration? How is end-customer value shared between partners and are public innovation support mechanisms playing any role here? How can innovation system support the up-scale of single innovation concept first to national level and then further to international market? Additionally, all the research objectives together are associated with innovative small- and micro-size firms as well: how can innovation system boost their growth and particularly their access to markets larger than the firm size usually allows?

1.3 Methods and flow of analysis

Literature review and semi-structured interviews were used as the main source of information in this study. The main purpose of the literature review was to gain in-depth understanding of the phenomena, theories and issues related to the topics under analysis (i.e., business ecosystems, business development, innovation scalability etc.). Naturally, the literature review also introduces the topic the reader as well.

The research data was collected through 14 interviews (see Appendix A); ten of those conducted in Finland and four in the United States of America. A total of 18 people from 11 different organizations participated in the interviews, and every interviewee was highly experienced with a long history of the winter road maintenance. The number of interviews was not limited in any way, but the purpose was to interview as many ecosystem participants as possible and by that get enough data so that saturation point was reached. Although this study focuses mostly on the Finnish winter road maintenance, the authors saw that it was essential to gain experience outside Finland (USA in this case) in order to improve the basis of

analysis and recommendations. Because natural discussion and flexibility were seen as very important for this research, the interview questions were broad and the interviews were quite loosely defined. For the purpose of credible and reliable analysis, most (those carried out in Finland) were recorded and transcribed.

Semi-structured interview is an efficient method to collect data, because they can be utilized as an interview guide, but also because they give interviewees the freedom to express their views and interviewers were allowed to ask additional questions when necessary. The interviews were kept as informal as possible. The empirical material gained by the interviews was collected in order to understand and have a comprehensive picture of the discussed issues and subjects in a real-life context but also to obtain new knowledge about the needs and trends in winter road maintenance. Because (winter) road maintenance ecosystems include multiple different levels and hence different kinds of actors, the interviews were conducted to both private organization (e.g., service and product providers) and public organization (e.g., public authorities). The interviews were arranged during 2014. The interview questions are included in Appendix B.

The interviews formed a basis for describing the existing ecosystem of winter road maintenance and the relationships between ecosystem participants. However, the ecosystem itself was defined and illustrated by using Customer Value Chain Analysis tool (CVCA) which "is an original methodological tool that enables design teams in the product definition phase to comprehensively identify pertinent stakeholders, their relationships with each other, and their role in the product's life cycle." (Donaldson et al. 2006.) In addition, CVCA was used to evaluate and analyse the current ecosystem and to isolate the service and product offerings of individual stakeholders. The main idea is to show how individual offerings can supplement each other in the process of value co-creation. The description of the first version of the ecosystem was done in Leviäkangas et al. (2014) and Pilli-Sihvola et al. (*accepted*), but the version presented in this study has been slightly upgraded.

This study and the description of the winter maintenance ecosystem also exploits widely the publicly available material (annual reports of companies, other reports and printed materials), but also largely on direct information from stakeholders. The process of creating and validating the ecosystem model comprised a series of meetings and workshops held as part of the research in 2012–2014. The drafting was done by the researchers based on publicly available material, and the validation was performed in two workshops (3–4 hours each).

In the report no explicit reference to any interviews is made despite the fact that they were carefully analysed. Hence all the conclusions, interpretations and observations are only those of the authors.

1.4 Report structure

The report consists of six chapters. The report starts with this introduction that described the background, objectives and methods of this study. Chapter 2 takes a look on the literature and thus discusses the scaling-up domestic ecosystems and innovations. Third chapter continues the literature review focusing on business ecosystems more in detail but the chapter also presents the general structure of Finnish Road Weather Ecosystem. The description is based on the empirical material. Chapter 4 focuses on the empirical material solely and analyses the findings based on the results of the research and information gathered. The analysis is made in accordance with the main objectives of this report. The same chapter draws conclusion of the research and discusses the findings and contribution to the Finnish innovation policies and strategies. Finally, Chapter 5 points out some key messages and ways forward.

2. Innovativeness in business ecosystems

2.1 What is innovation?

In brief, innovation is focused on the research and development system and high-tech activities. The perspective of broad approach innovation is seen as everyday activities (such as procurement, production or marketing) of firms, organisations and sectors. (Johnson 2008.)

Innovation is something “new”. This “new” can emerge because of individual flash of wit, because of identified urge or need or very slowly progressing towards solution of a problem. In many cases, all these elements are present, but their relative weight might differ. As goes without saying, definitions of what are in fact innovation takes multiple shapes and there is no generally accepted formulation; a few of these definitions, non-academic, are following: 1) the introduction of something new, 2) a new idea, method, or device (Merriam-Webster.com 2014).

Definitions of innovation:

“The process of translating an idea or invention into a good or service that creates value or for which customers will pay. To be called an innovation, an idea must be replicable at an economical cost and must satisfy a specific need.” (BusinessDictionary 2014).

“Innovation generally refers to changing or creating more effective processes, products and ideas, and can increase the likelihood of a business succeeding. Businesses that innovate create more efficient work processes and have better productivity and performance” (Government of Australia 2014).

“Innovation is a new idea, device or process. Innovation can be viewed as the application of better solutions that meet new requirements, inarticulated needs, or existing market needs. This is accomplished through more effective products, processes, services, technologies, or ideas that are readily available to markets, governments and society. The term innovation can be defined as something original and, as a consequence, new, that “breaks into” the market or society” (Maranville 1992).

The above examples show that satisfying a need in a novel manner is the key to the concept of innovation. However, one could equally well argue that the above definitions represent economic or utility-based definitions of innovation. Some innovations can might entirely lack the economic dimension, but still be valuable.

2.2 Business ecosystems

Innovation and new product and service development are vital for firms (Chesbrough 2003, Cooper 2011). In present highly competitive and global business world, firms cannot survive alone and hence they seek different kinds of ways to collaborate with other firms to provide and extent offerings. The potential benefits of collaboration contains better access to new markets, asset flexibility, complementary and new competencies, economies of scale, extended offerings, improved resource utilization, new technology and products, and risk and revenue sharing (Majava et al. 2013, Chesbrough 2003, Meade et al. 1997, Melohn 1994, Shamdasani & Sheth 1995).

Business to business collaboration varies a lot and may occur in many ways. The simplest form of collaboration is the exchange of products and services between firms. Collaboration lead to building of business networks, clusters, business ecosystems and innovation hubs (Majava et al. 2013). In this study, the focus is on business ecosystems. In business ecosystems the firms actively develop mutually beneficial relationships with customers, suppliers, and competitors (Iansiti & Levien 2004).

Business ecosystems can be considered as networks of suppliers, distributors, outsourcing firms, products and service providers, technology providers, and a host of other organizations that interact with each other through their practices and offerings in the value creation process (Iansiti & Levien 2004). Having a dynamic structure, business ecosystems include interconnected, competing and collaborating organizations – not just firms, but also e.g. research institutes and public-sector organizations (Peltoniemi & Vuori 2004). In an optimal situation, a business ecosystem is self-sustaining, adaptable and evolving in time (Iansiti & Levien 2004, Peltoniemi & Vuori 2004).

There is also a deeper dynamics between ecosystem stakeholders, regardless of their positioning or role within the ecosystem. The business models of individual companies partly depend on the ecosystem they are working in, but affect it at the same time (Weiller et al. 2013). Consequently, ecosystems are dynamic in terms of evolution phase (time) and content (composition, modus operandi and business models of the members). Early stage ecosystems are usually smaller and consisting of smaller companies the business models of which change as the key stakeholders change theirs. Exits or entries of stakeholders likewise change the logic, structure and operating and/or business models of remaining members – unless there is a perfect substitute to fill the empty position.

The fewer cornerstone members there are in the ecosystem, the more vulnerable it becomes in terms of entry and exit of these particular members, as substi-

tutes may be difficult to find or they simply might not exist. However, the internal dynamics of the ecosystem becomes simpler and more straightforward as the number of members is reduced. At the same time the dependency between the members increases. Simplicity may also be an advantage especially in the early life-cycle phase of the ecosystem, or if the market in which the eco-system is operating is limited. The topological structures of ecosystems are of wide variety, but state-of-the-art industrial analysis tools can be used, e.g. when measuring the concentration of the market (see e.g. Zulkarnain & Leviäkangas 2012).

The functions performed by the ecosystem participants increase the total value of the output, and the members of the ecosystem can create and achieve more value together rather than working independently. In other words, the ecosystems provide services, products and functions that have value to the end users by combining ecosystem actors' resources and functions. Resources must be understood not only as costs of providing a function but also as technologies, skills, tangible and intangible assets, market presence, and so forth. The list can include whatever the particular context may consider as a resource. Combining functions also enables sharing some of the resources, so that the efficiency of the ecosystem is enhanced without sacrificing value creation.

Another view to value co-creation is the dual division between supply and demand. Usually business ecosystems combine their offerings in order to better meet customers' needs. Likewise, bridging the gap between customers and suppliers enables closer collaboration between the demand and supply sides, where win-win situations may be realised: suppliers having better understanding of their customers' aspirations and in exchange, customers gaining better value for their money. On many occasions, where ecosystem is not truly collaborating or sharing the value creation processes are mainly concentrated on stakeholders' own products or services. Then, the synergistic benefits and values, which could be co-created by working together in an ecosystem, are not there. In this case, the ecosystem lacks obviously systematic ways of management.

3. Analysis of winter road maintenance ecosystem in Finland

3.1 Introduction

In winter, surface land transport infrastructures including roads and railways must be kept in usable condition. Snow must be removed and ice melted or treated, and road users, travellers and transport operators must be made aware of the condition and availability of their route and modal choices. Maintenance service providers carry out these operations at the request of infrastructure owners, which usually are national or local road authorities and railway firms or agencies.

Over the past two or three decades, public sector infrastructure managers have unbundled their functions, with a widening spectre of services related to maintenance and construction of transport infrastructures being outsourced to the private sector, while ownership of the infrastructure and ultimate responsibility for it has remained with the public sector (Leviäkangas et al. 2011). Hence a capable and resourceful service provider network has become an increasingly vital resource for communities and societies in ensuring that basic functions, such as mobility, perform seamlessly and efficiently.

The importance of such a service and technology provider network, which we regard as an ecosystem, in the ensuring of mobility in winter time is essential. In the following chapters, the focus is on winter maintenance of the road network and how this ecosystem is built in Finland to provide safety, reliability and accessibility of roads. The first tier beneficiaries are the infrastructure managers/owners and thereafter, ultimately and in particular, the road users. Such ecosystems that form a part of critical societal functions are one of the competitiveness factors of any community, society or country. Unless these ecosystems are put to work effectively, the functions of society will perform sub-optimally, efficiency losses will materialize, and global competitiveness is weakened.

When considering how winter maintenance services can be turned into societal benefits in a way that brings value both to the supply and demand sides of the ecosystem, we can start by illustrating a traditional value chain. The offerings of the supply side's technology, component, system, service and value-added service providers are integrated into services that have end users' demand. Not only does the supply side comprise a value chain, but so does the demand side. Road

authorities acting on behalf of road users may have certain functions that add to the value of end-user services. For instance, public information on road conditions, management and control functions in maintenance operations can add to the value of such services supplied to road users.

The divide between supply and demand may not be fixed. Policy changes in infrastructure management have increasingly shifted the responsibility, at least in operational terms, to the private sector so that the dividing line has been shifting from left to right (see Figure 1). This has reduced the role of the public sector. There are other prospective changes, such as those forced by technology development, and this is where information and communications technology (ICT) has played a great role in recent years. The ICT enabler has pressed the public sector to redefine its role in many functions – not only those concerning winter maintenance. It is obvious that the ecosystems may be highly unstable if technology and policy changes are affecting the environment they work in.

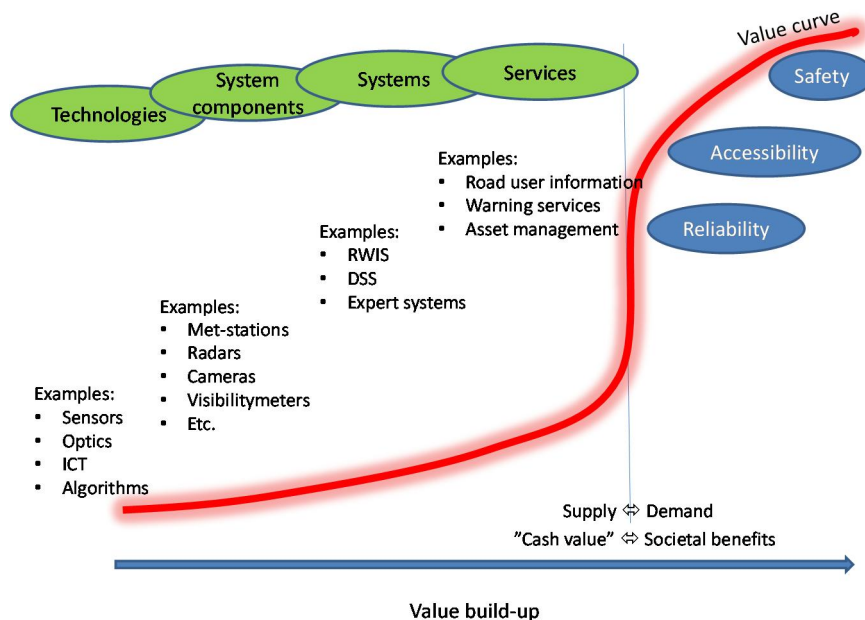


Figure 1. Value build-up of the road weather ecosystem.

3.2 Ecosystem architecture

The “technical” architecture of the Finnish road weather information systems, which can be regarded as a meta-system comprising several extensive stand-alone or integrated systems, infrastructure of the sensor and observation network and key data bases, is shown in Figure 2. This technical view does not underline the ecosystem nature but a descriptive model of ecosystem identifying different

roles of stakeholders and how they contributed to winter road management in particular was described in Pilli-Sihvola et al. (*accepted*). A modification of that is shown in Figure 3.

A slightly similar illustration is found in Leviäkangas et al. (2014) using Customer Value Chain Analysis (CVCA) description method, identifying some of the flows (economic) and offerings between stakeholders (Fig. 3). The model represents one view only and is without question a description of the current state which can and will change over time.

In Table 1 the stakeholders' roles are defined in more detail. The stakeholder list follows the definitions of Figure 3 and is identical to that. There is also a distinction made concerning the supply side (private sector) and demand side (public sector, road users and other societal stakeholders)

What comes obvious from the above tables and figures is the decisive role of the road authority that in the end finances the entire ecosystem.

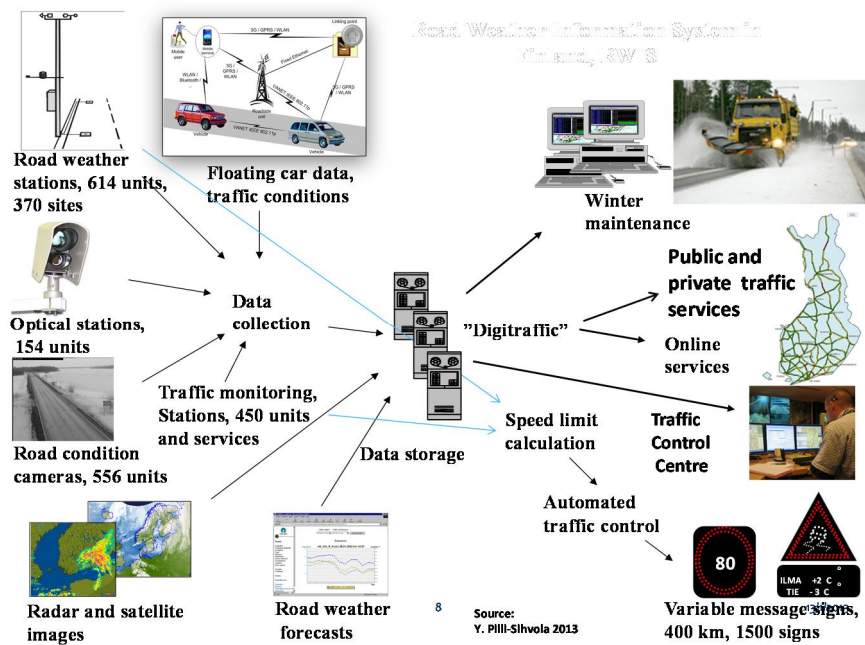


Figure 2. Technical view to the road weather information architecture.

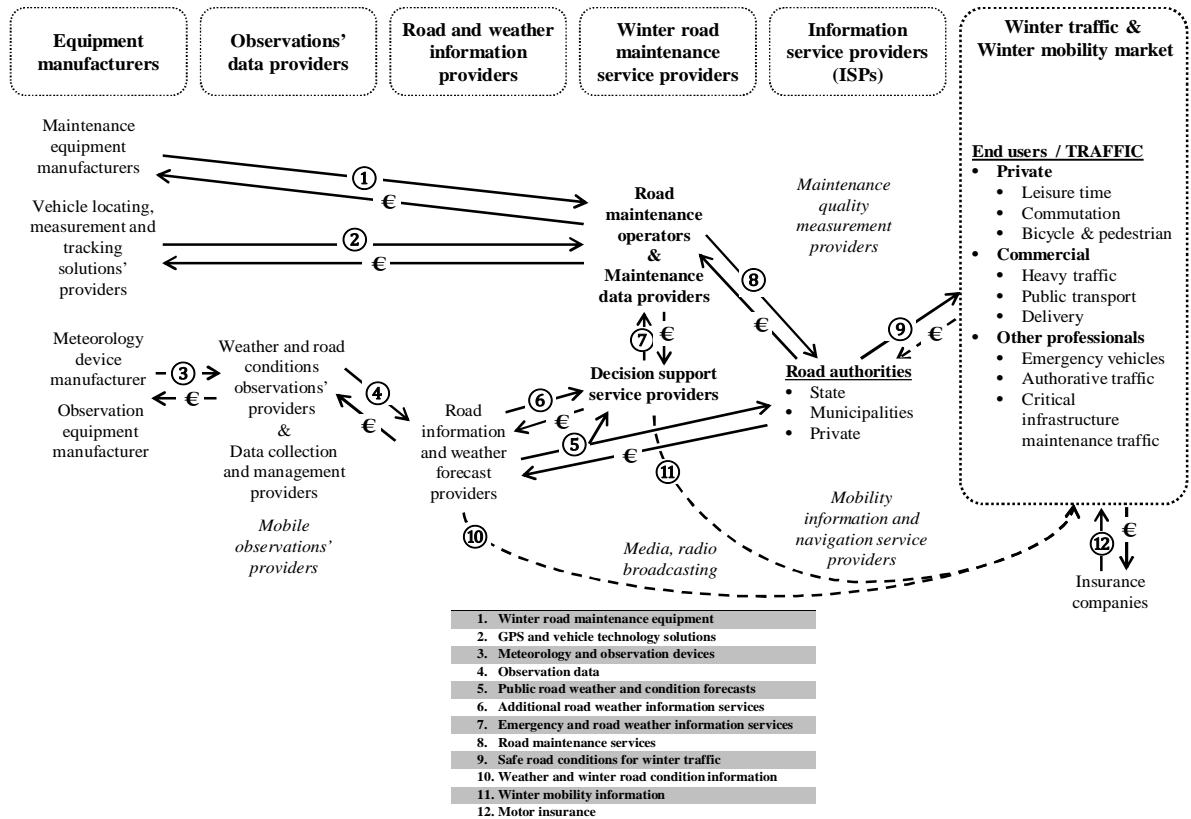


Figure 3. CVCA description of Finnish Road Weather Ecosystem (modified from Pilli-Sihvola et al. *accepted*).

Table 1. Roles and functions of stakeholders of the Finnish ecosystem (modified from Leviäkangas et al. 2014).

Stakeholder	Role and function in the ecosystem	Type
Maintenance equipment manufacturer	Manufacture of road maintenance equipment that can be installed in road maintenance vehicles, for snow removal, anti-skid treatment and data logging depending on the functions of the devices.	(S)
Vehicle location, measurement and tracking solutions provider	Provides systems and solutions for monitoring e.g. the location of the vehicle, route history, hours of operation.	(S)
Meteorology and observation device manufacturer	Provides a comprehensive range of observation and measurement products (e.g. road weather stations, RWS) and services for chosen weather-related markets.	(S)
Device maintenance service provider	Repair services include fault tracing and repair or replacement of failed RWS and components, and final testing to ensure that the equipment is functioning properly.	
Road and weather conditions observations provider & Data collection management	Road and weather condition observations are collected and produced with public funds and are thus freely provided by the Finnish Meteorological Institute and the Finnish Transport Agency. Data management is also handled by the organizations.	(S)
Road weather and conditions forecast provider	Offers a wide variety of weather services for commercial shipping, road maintenance and air traffic using different models, observations and meteorological expertise.	(S, D)
Decision support system provider	The system collects and uses current and historical road weather and pavement information. Allows decision-makers to use a system that provides guidance as to what to do based on current and predicted weather.	(S)

Decision support service provider (aka Road Weather/Management Center)	Monitors weather and road weather conditions. With the help of accurate and frequently updated weather forecasts, the right equipment can be sent off to clear the street of snow, ice and slush at the right time. Emergency requests can be transmitted directly to drivers or the customer's work supervisors as agreed. In addition, produces weather and road weather information that can be used over the Internet.	(S, D)
Road maintenance service operator & Maintenance tracking data provider	Undertakes maintenance operations according to agreements with road authorities/infrastructure owners. Keywords in winter maintenance are the anticipation of road weather conditions, selection of the right measures and their correct timing. Anticipation prevents worsening of road weather conditions and reduces the need for preventive actions. Correct timing of tasks also improves the economic efficiency of operations.	(S)
Road authority/owner	The main purpose is to keep roads usable every day and ensure that traffic can flow safely. The owners are responsible for maintaining roads plus adjoining structures, bus stops and road lighting. Nowadays the maintenance is usually outsourced.	(D)
User of road and infrastructure	End users (private people, commercial and other professional users) are those who use the infrastructure and for whom it is maintained.	(D)
Insurance company	Provides e.g. compulsory motor liability insurance for a vehicle used in traffic. Generally insurance premiums are directly related to safety statistics.	
Finnish Motor Insurers' Center	A cooperation body of Finnish motor insurers.	
Telecommunications service provider	Provides telecommunications services for consumers and businesses.	
Telecommunications equipment manufacturer	Offers network products that give the ability to connect (voice, data, images or video) and to share ideas and information anytime and anywhere.	

3.3 Social Benefits of Winter Maintenance

Road weather solutions that collect, refine, and/or distribute information to road users and to maintenance actors can provide significant societal benefits by mitigating these impacts as identified by e.g. Pilli-Sihvola et al. (2012). Bläsche et al. (2011) identify snowfall, low temperatures and blizzards as the most significant extreme weather phenomena related to winter road transport. The main impacts of these conditions are longer travel times, an increased risk of accidents and reduced accessibility of the road network. Strong et al. (2010) have found that adverse weather conditions reduce traffic speed and increase the frequency of crashes while decreasing the number of fatal crashes. Ye et al. (2013) assessed quantitatively the socio-economic savings of winter time maintenance on Minnesota Department of Transportation's roads. They found the aggregate benefits to be 227 million USD per winter season, yielding to a cost-benefit ratio of 6. The majority of the savings were safety benefits. Fu et al. (2012) studied the provincial roads in Ontario and developed impact models of winter time maintenance efforts that resulted in certain ratios of bare pavement conditions. Mobility benefits were assessed to be between 17–32 million CAD and safety benefits for more than 4 million CAD.

Fabre and Klose (1992) maintain that the estimation of costs and benefits of a road weather information system should take into account road maintenance activities, driving costs, and environmental, social and psychological effects. They see that the most important benefit of Road weather information system (RWIS) is the possibility of anticipating icy road surface conditions and eliminating accidents caused by slipperiness by responding to poor road conditions more quickly and effectively. Additional benefits can be gained from improved maintenance methods through more efficient distribution of work and personnel and reduced use of maintenance materials. Leviäkangas and Hietajärvi (2010) compiled a summary of road weather information services and RWIS benefits, which showed typically clear positive benefit-cost ratios.

However, aside from information benefits, the benefits of actual maintenance operations have been studied much less in Finland, which is surprising. A report by the Finnish Transport Agency (2013b) assessed that the average accident cost in Finland is about 2.5 billion euros per year and the accident risk in winter time is six times higher than in summer time. The Statistics Finland (2014) reported that in 2013 41 people died and 1414 injured in accidents caused by the icy, snowy or slushy conditions.

In sum, even this brief review of studies regarding winter maintenance benefits highlights the very likely positive marginal benefit impacts of winter road management operations.

3.4 Risks in the ecosystem

Each stakeholder is having a unique risk preference profile and each of them will price different risks according to these preferences. Hence a concept such as “risk”, be that of whatever nature, is not uniform across the ecosystem but takes different shapes, forms and criticality depending on stakeholder’s perception. To make the context even more complex, there are two major divisions that have possibly very deviating risk perceptions from each other, namely the public sector client side and the supply side of the ecosystem comprising private companies. Moreover, there are two different valuation logics involved, the cash flow emphasis of the private side and the socio-economic emphasis of the public side. These two are substantially different in sense of volume and accountability.

When considering the most crucial risks with regard to entire ecosystem, it is the ones that are associated with the road authority. This is simply due to the abovementioned fact that the road authority finances the entire ecosystem. Hence the ecosystem is dependent mainly on two major external drivers:

- 1) the budget the authority has available for road network maintenance, and
- 2) how much of the budget is used for road weather management specifically.

For the first risk the annual budgeting procedure in Finland largely hedges against this risk as the budgets are based on traffic volumes and road network length, although this does not mean that the aggregate maintenance budget would not be subject to cuts. However, in most cases where the cuts have been made on road budgets, the lion’s share is cut from capital projects. This leads to focusing on to the other risk that is following from possible shifts of emphasis in maintenance budgets.

3.5 Fostering the ecosystem through public procurement

It is not only the budget allocation that matters. It is also about the procurement strategy of the road authority that sets boundaries to the procurement of maintenance services. How these procurement packages are defined in scope, innovation and requirements for ecosystem collaboration will have most likely the gravest impact. Basically, the road authority has three main optional strategies:

- “divide and rule”, meaning that the road authority manages the ecosystem as separate companies lacking extensive collaboration among them, keeping the control to innovation to itself; in practice this means slicing of the contracts and functions piece by piece and deciding what combinations of scope and innovation bring out the best results
- “let the market work”, meaning that loosely defined tenders are called for while letting the market stakeholders freely to either find collaboration pro-

spects or work on their own; this means slightly open definitions of work but no intentional call for added value or innovation

- “innovation collaboration”, that could be described perhaps as active facilitation of tenders that provide not only desired socio-economic impacts (which are explicitly mentioned in road authority’s operational targets) but also novel added value beyond standard performance; the novelty can be also outside the usual “socio-economic impact” box, for example increased export business of that of the ecosystem market actors.

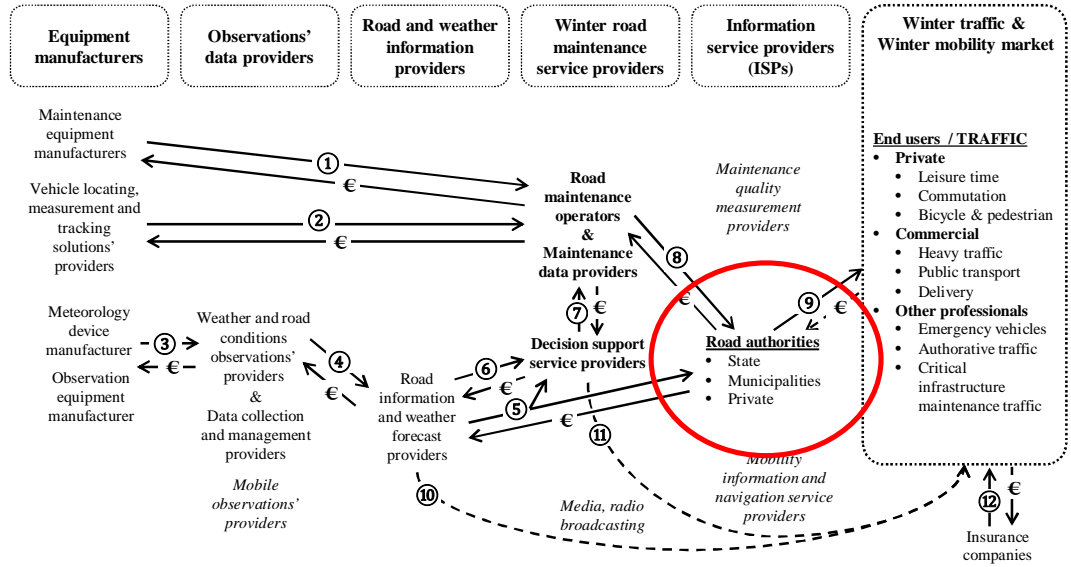
It is self-evident that the road authority should pursue the last-mentioned strategy if it desires to contribute to wider societal goals, not necessarily restricted to authority’s stated mission, long-term or annual performance targets. However, in its most recent performance management agreement for 2011–2014 (Ministry of Transport and Communications 2010) does not even contain the term “innovation” and speaks practically nothing about procurement strategies, although procurement is the authority’s main operational function through which the societal impacts are achieved (or not). In the medium-term management plan for 2015–2018 the same absence is observed. R&D activities are explicitly mentioned in relation with intelligent transport systems, but the impression on that plan is that the authority is more concerned with its own role and activities in the field rather than that of the market side (Finnish Transport Agency 2013a).

3.6 The evolution of the ecosystem

The current ecosystem is a result of restructuring of Finnish government sector since the early 1990s (see e.g., Mononen et al. 2014). However, the functions of the ecosystem have remained essentially the same, but unbundling of the government (public) functions have led to a need to increase the role of the private sector. Figure 4 shows the development for the winter road management ecosystem. The upper panel shows the current mandate and functions covered by the road authority. As the authority stands now, a minimal amount of operational activities remain with it. Only long-term planning and procurement represent the authority’s task in addition to infrastructure ownership and representation of the public. Ca. two decades earlier the functions were covering many services, now provided by private or semi-private actors.

This political development has been accompanied by the technological evolutions that have, as well known, been explosive. Technical capabilities, restricted but yet a decisive role as well as pressures to enhance public sector efficiency have created a whole new game environment for the road authority. What used to be publicly justified function is now increasingly relying on market players’ capabilities and skills. Managing the new game and market’s functioning then has changed the procurement as well and will keep changing it in the foreseeable future. The “public good” and “socio-economic” logic is more dependent on market’s logic.

The road authority in the current ecosystem...



The road authority before...

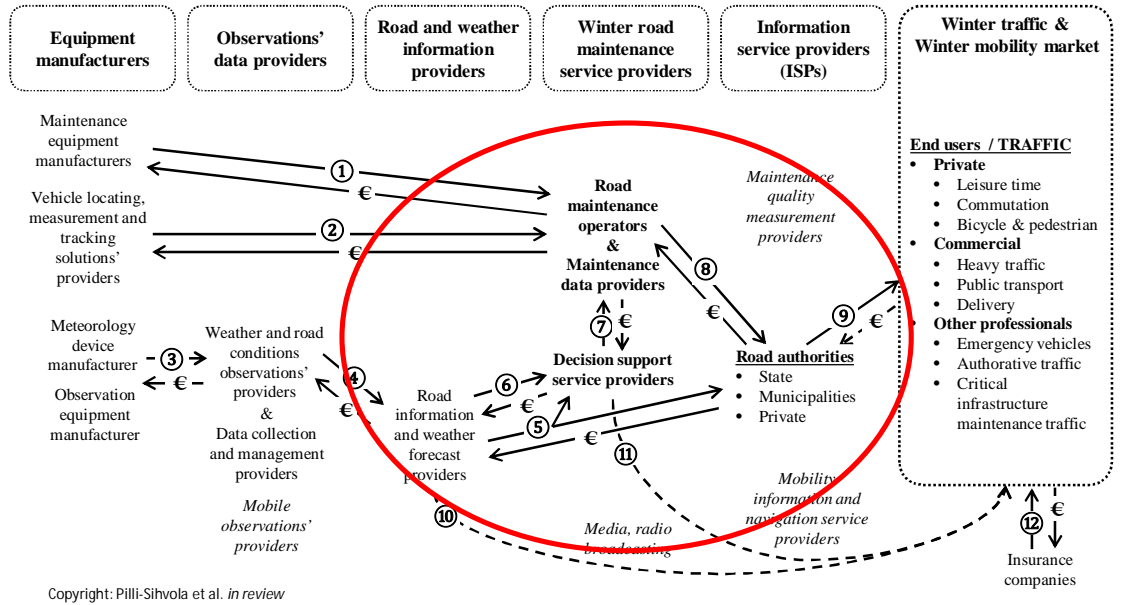


Figure 4. Road authority's functions now (upper panel) and about 20 years ago (lower panel) (modified from Pilli-Sihvola et al. *accepted*).

4. Conclusion and discussion

Innovations and innovativeness are always a sum of many things, and take place in dimensions of time, space and point-specific contexts – especially when considering innovation in complex service networks, or business ecosystems. What makes innovativeness even more interesting is the fact that it cannot be forced; from the management point of view, identification of the current challenges, seeking of solutions, and finally fostering fertile atmosphere and platforms will ultimately lead to results, at least with greater probability. The more complex the innovation system under scope is the harder innovative and holistic development becomes. One good example of such complex system is the Finnish winter road maintenance system.

Internationally well recognized, the Finnish road maintenance and road weather system has always been based on the needs of the mobility system and its users. Especially information management has been in the focus. The generated information is exploited, in addition to winter road maintenance, in traffic management operations and road user information. This should be kept in mind when developing winter road maintenance. It is crucial to recognise that the holistic development of the whole service package (i.e., service offering) is associated also with the compatibility of the sub-assemblies (e.g., products, hardware, services, maintenance). The following subchapters focus on finding the most severe obstacles balking innovativeness in the Finnish winter road maintenance system. These chapters are integrating interview findings and authors' own observations and conclusions.

4.1 Innovation challenges in the Finnish winter road maintenance

We recognized four interconnected themes that are believed to create the most of the problems related to the innovativeness in winter road maintenance ecosystems. The themes are as follows:

- Personification and vague roles
- Short-term view
- Public-private procurement

- Network governance

Even as stand-alone issues these themes could expect to bring challenges for innovativeness, but as combined they create more complicated and multi-dimensional challenges. In addition, over the years these themes and problems have become intertwined, covering all parts of the ecosystem.

One of the gravest challenges is associated with scarce resources of the road authority. This can be a more general problem or a problem of current internal resource misallocation. The fact is that winter road maintenance is controlled by the road authorities (i.e., public organizations) and especially by certain individuals in those organizations. As can easily be perceived, fostering innovations and calling for innovativeness is extremely difficult if organizations, as well as its individuals, have no strong desire or mutual strategy to do so. So both levels of commitment is required: personal and organisational.

In 2000 the procurement of winter road maintenance changed and it is based on the public-private procurement: road authorities (Finnish Transport Agency, and Centres for Economic Development, Transport and the Environment) answer for the procurement of maintenance and for the setting of requirements while the operative maintenance itself is outsourced and carried out by private companies. The Centres for Economic Development, Transport and the Environment have the main responsibility for the procurement (i.e., competitive tendering by using design-bid-build model) of the winter road maintenance, but funding, control and authorization comes from the Finnish Transport Agency. However, the roles between the two are considered more or less vague at the moment. This applies also to the development of the system.

At present, the road authorities seem to be suffering from the lack of monetary, human resources and lack of technical competence. Again, the perception could (and probably is) factual but also signals challenges with regard to resource allocation. Over the years the budgetary pressures along with strong personification have created an atmosphere where the focus has shifted on operational activities, leading to short-term orientation where the procurement of maintenance is based on almost the price alone, not on the capabilities of service providers. There is a foreseeable risk, also identified by the interviewees that excessive tendering and sub-optimization “kill” the innovativeness, as day-to-day handling of procurements and focus on operational issues draw the attention away from collaborative efforts and development.

However, the aforementioned perceptions should not be considered as an excuse but vice versa, they highlight the importance and central role of the road authorities. When it comes to the road maintenance, the road authorities are between the end-customer (i.e., “winter mobility markets”) and the service providers. After all, the money for the road maintenance comes from the state budget which further increases the salience of road authorities. One of the most typical interviewee comments was that in order to develop the winter road maintenance, road authorities should support the long-term development by enabling new innovative

ways of working (e.g., services or offering created by the ecosystem) and hence promote the business and export possibilities

On the other hand, the role between service providers and end-users points out the fact that the road authorities must provide requirements for the service providers so that they can create right kind of services and hence maximize the customer value.

As mentioned earlier, the winter road maintenance in Finland is controlled by the authorities (Finnish Transportation Agency, and Centres for Economic Development, Transport and the Environment, and Finnish Transport Safety Agency), the roles of which in the value stream have been somewhat ambiguous. Naturally, this has a negative impact on the development because ideas, requirements etc. may not be able to be forwarded to the right places or individual experts within the authorities. In addition, the current procurement model separates the quality level design (i.e., demand side) and implementation (i.e., supply side) and actual operations quite effectively. From a neutrality and integrity point of views this is understandable, but it brings along the same challenges as have been witnessed in construction projects where design and building processes are separated as independent processes procured by the client (Matthews & Howell 2005, Lahdenperä 2012, Baiden et al. 2006). Furthermore, the tradition is to go for the lowest bid price, although today quality aspects are having more and more weight in evaluation of bids (e.g. Aapaoja 2014, Moore & Dainty 2001, Lahdenperä 2012). Basically it means that all the development activities are made by the maintenance service providers at the moment. Naturally the low prices and small margins do not support to do so, because the current procurement model leads to sub-optimization, where the stakeholders just strive for optimizing their own performance.

The collaboration, not only between road authorities and private services providers, but between the service providers too (i.e., companies) appears to be problematic as well. Especially the governing of the ecosystem seems to cause headache for the companies. Companies have traditionally been used to work and do business independently, but ecosystem thinking changes the rules; now everyone is (or should be) in the same boat seeking win-win situation. This in turn creates a situation where the companies to some extent have to market each other's products and services. In the eyes of the business itself, sharing the risk and revenues among ecosystem stakeholders may be very challenging. Many interviewees mentioned that some larger company should act as a system integrator who integrates the offerings of stakeholders into their own services or platforms. The reason for the large company leadership is understandable: they have resources and capability to manage the service network, especially when considering international markets. The views reflected however, that the risk-revenue model should be designed such that the leader company cannot alone set the rules and every stakeholder gets their share.

The road authorities have a threefold role in the ecosystem. Firstly, they are an end-user (i.e., set the requirements) for the supply-side organizations who provide information and know-how about the weather, road conditions and possible treat-

ments. Secondly, the authorities are a customer for the maintenance service providers as well. Third, road authority represents the aspirations of the society and road users. Picturing a role for the road authority where it can successfully fulfil all these roles and manage the packaging of technologies, services and products in a manner that maximises benefit-cost ratio for winter maintenance is unrealistic. The road authority simply must seek collaboration with multiple stakeholders, not least with the prospective suppliers. Based on the findings, there is a clear call for new innovative procurement models. Winter road maintenance or maintenance in general can be considered as a complex product system where every stakeholder has their own role and function. The road authorities must understand that based on their central role, they are the drivers of the requirements, which should be in creating cost-effective state-of-the-art winter road maintenance and ultimately safe and reliable mobility system.

However, because the maintenance activities are outsourced, the road authorities are nowadays suffering from the lack of technical competence which then must be gained from the maintenance services providers. It even emphasizes the need of new procurement models, because traditional models do not encourage co-operating, co-developing or information sharing.

4.2 Innovation “pain-spots” in the ecosystem

Acting in business ecosystem, or in complex product system, requires that the roles and responsibilities of the stakeholders must be defined accurately, both internally and externally. By defining roles and responsibilities internally, organizations can make sure that everyone inside that certain organization has access to relevant information and who are the most capable of individuals and organisations to perform any specified efforts. If and when the ecosystem becomes a participatory and collaborative supplier network, the inter-organizational interfaces must be defined in detail as well (i.e., external definition).

Figure 5 summarizes the findings by illustrating the most credential spots were the innovation support should be targeted in order to foster the innovativeness in winter road maintenance. This prioritisation should not undermine the hard-core technological development. The technological push must always be one of the priorities, though not the only one if one pursues systemic innovation to supplement technological advances.

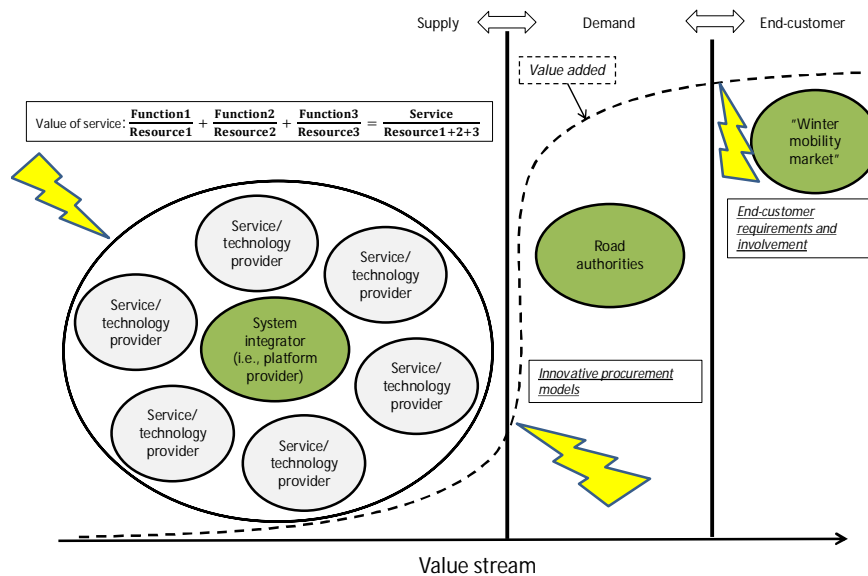


Figure 5. The pain spots of innovation support.

First of all, creation of co-developed service offerings should be supported, because the inter-organizational interfaces are one of the most important sources of innovations and hence synergic benefits can be significant. Especially small and medium size enterprises seem to have many innovative ideas, but not necessarily enough resources to further develop those. In this regard, service co-development and being part of the ecosystem could offer a fruitful environment for the emergence of new services.

The possible mechanism for developing service networks and collaborative offering may be some sort risk funding from different sources. In the beginning (e.g., conceptualization) the funding could be quite small, but if it seems that service may have market potential, the amount of funding can be increased later. At the moment, the collaboration between public authorities and funding agencies does not work well enough so that the long-term (co-)development activities could be possible. Moreover, the political control by the Ministry of Transport and Communications has increased in recent years, which limits Finnish Transportation Agency's "leeway" and possibilities of research and development activities. The ministry should stay on their role as a legislator, not play an expert of winter maintenance.

Design-bid-build has been (and still is) the most popular procurement model in most of the complex projects. However, customers have started to demand more value and better service level, because there has been lots of problems (e.g., budget and schedule overruns, and low quality) due to the low prices and sub-optimization. Because winter road maintenance ecosystem is a complex product system, we argue that combining supply and demand side cannot be done effectively through traditional procurement models. During the past few years, a new innovative procurement models such as *alliancing* has been adopted successfully

to some highly demanding large-scale and complex (mostly infrastructure and construction) projects. Alliancing is a project delivery and procurement model of major capital asset delivery where the customer and non-owner stakeholders work together as an integrated, collaborative team in good faith, acting with integrity and making unanimous, best-for-the-project decisions, managing all project delivery risks jointly, and sharing the outcome of the project (see e.g., Aapaoja 2014). Alliancing or at least the “business model” of it could be adapted to the winter road maintenance and hence create value for all the ecosystem stakeholders.

The support of funding agencies plays an essential role. The road authorities (related to winter road maintenance) are, anyway, suffering from lack and/or misalignment of human and monetary resources. Thus the funding agencies could provide various funding and support mechanisms directly to public-private collaborations, especially to those which cover business ecosystems and are connected to the “old fashioned” business sectors. Moreover, such support for the procurement does not distort the market and unwanted market conflicts can be avoided.

The services should always be based on the needs of the end-customers. That is why all the value stream stakeholders, including especially the end-customers, should be actively involved in the service development process in order to have the correct requirements set for the services. However, as seen in the figure 3, the role of the public authorities between supply and end-customer side insist that road authorities take an active role in the end-customer involvement and requirement management. This, of course, demands that the roles among the road authorities are defined more clearly than now. Involvement of the whole ecosystems will become even more important in the future, as technological enablers become more available, affordable and usable. For example, when mobile measurements become more available and data are collected by the end-customers (e.g., regular road users and maintenance services providers).

In sum, at national level, the holistic development (including competencies, methods, products, services, innovativeness and cost-effectiveness) of the winter road maintenance will probably be the most successful if it is based on the long-term collaboration between the service providers who share the objectives and are able to develop their competencies and business at the same time. Finland is a small country with small market but we have “optimal” conditions for developing, studying, piloting the new solutions of winter road maintenance. The winter road management ecosystem can succeed in international markets with much greater probability if the domestic “show case” is available and performing well. This will not take place without the striving of both public and private ecosystem actors.

4.3 On innovation policy and strategies

Considering innovation policy from the public procurement perspective, the risks of the procurer need to be acknowledged. Assuming a situation where a state agency or city authority deviates from the accustomed standard practice, the procurer clearly assumes certain risks that it is not perhaps able to manage at once. For

one, there is a lack of experience. Second, the responsible managers of the procuring organisation are accountable same as anybody. Failing in a risky, untried procuring process may endanger individual careers.

However, this obstacle is easily removed simply by encouragement, rewarding new ideas and try-outs, and most importantly, supporting innovative procurement models financially. It goes without saying that public innovation funding is the key in the Finnish context. Equally it must be recognised that if such procurements start to take place to a larger extent (as they probably should), this inevitably will mean also failures, not just success stories. The most relevant thing is to share the experiences and learn from them. And unfortunately, it is hard to see any easy way out from these downsides of conscious risk taking.

Procuring from ecosystems is actually one of the most efficient ways of turning the societal values into market values. Understanding the value of increased safety, environment, infrastructure availability and operational efficiency in winter maintenance and letting new services and concepts to be experimented through innovative contracts will facilitate the evolving of supply side ecosystem. When alliancing philosophy is combined to experimental procurement, both sides are bound to learn and build-up mutual understanding.

For the public side procurer, the aforementioned ideas may seem as giving up control to the market (supply) side, but in fact it is the opposite. By defining service levels in collaboration with the private sector, the public side must assume a role of a conductor rather than a client, but the actual power becomes more substantial. This in turn will pose entirely new types of requirements for public sector managers. They must become the voice of the end-user while at the same time being able to capture the value creation logic of the private side as well as the society side. Negotiation skills, high level of integrity, and wide perspective capturing abilities will be required.

The innovation boosting tools of the public sector, i.e. direct support (subsidies, grants), taxation (reliefs) and procurement are of course all available. However, it is difficult to see that direct support or taxation would be as straightforward as innovation through procurement, especially in areas where the services for the end user are in the public domain. Taxation tools are practically non-existing and require legislative efforts, direct support may distort markets. Furthermore, taxation may be inaccurate or non-targeted and direct support gives advantage to individual companies that in addition to market distortion might result in unwanted media reactions.

When procurement tool is adopted and handled transparently, it is also fair towards all market actors. Although it is likewise fair to acknowledge that if procurement is done from an ecosystem that faces not too much competition, a very careful process is needed. Just like individual firms, also ecosystems could stand in a monopolistic position.

For smaller companies, the ecosystem approach is a good alternative in addition to stand-alone strategies (which also might work in some situations). The ecosystem offers them peer network that can benefit them significantly. The larger companies usually manage larger markets, more customer segments and have a

wider repertoire of in-house expertise. Also these factors can benefit smaller firms, if the collaboration is open and trusted. Understanding how their technology, services or know-how can serve a larger customer base, immediately creates potential for growth in firm value too. Innovative Finnish companies are often subject to acquisition. The higher the value of the company, the better this is as a whole for the national economy, regardless who is the buyer.

5. Recommendations

The results revealed several ideas for enhancing innovativeness in winter road management. These key results enable the researchers to make the following recommendations:

- 1) The development of winter road maintenance system must base on the long-term collaboration. Collaboration includes at least the following things: 1) utilizing public and independent research institutions to spread the publicly beneficial information, 2) testing and piloting as a part of productization and operative activities (road authorities has to act as an enabler), 3) measurement and assessment of the impacts as a natural part of the systematic developments, and 4) pain and gains sharing.
- 2) Road and other public authorities should foster the use of innovative project delivery and procurement methods (e.g., project alliance). Otherwise, there is a risk that these methods and approaches will not be used, and hence, the 'old' culture and habits cannot be changed. The authorities must become conductors of bringing all views together and combining skills, services, and public interests in manner that delivers maximum benefit-cost ratio.
- 3) Personalising should take place, but in a right way. There should be a named contact person (with defined role) who has the responsibility as a key person to communicate with the stakeholders. The role should not be promoted by position, but rather because the individual can (i.e. knows how to) play a vital role in the project network. Decision making as it is right now lacks common strategic view.
- 4) The responsibilities and interfaces of the involved stakeholders should be defined. It helps stakeholders to have a clear vision and mission of what they have to do and how to do it.
- 5) The selection of ecosystem stakeholders (e.g., service and technology providers) should not be based on price alone (e.g., by choosing the lowest cost tender), but rather on competence, capability, and expertise that contributes to the whole. In addition, the projects and stakeholders should

utilize existing relationships, but also build long-term relationships with other stakeholders. Good relationships help to build trust and increase natural communication and interaction, which ultimately leads to smooth and successful collaboration.

- 6) Customer requirements are the link between the supply and demand sides. However, end-customers are not typically experts and they rarely know their ultimate needs and wants. This emphasizes the vital role of the road authorities as an expert of maintenance between the service providers and end-customers.
- 7) Public sector's active role as an authority and buyer/customer is a crucial in domestic market. Because all the money comes from the government, authorities have a central role as an enabler of winter road maintenance.
- 8) Due to the lack of resources in public organizations, funding agencies (e.g., Tekes – the Finnish Funding Agency for Innovation) should provide funding and support to foster the implementation of innovative procurement methods. This is already done, but as pilot procurement projects are more in numbers, the need to establish best-practice monitoring tools increases.
- 9) Ecosystem approach, i.e. bringing the buzz talk on value co-creation and collaborative networks one step closer to practice, can potentially increase the value of the smaller companies and business as a whole. Ecosystems could be favoured in innovation funding.

As for further research, the following are recommended:

- Frequent checks how different ecosystems perform and develop in order to set policies and strategies in synchronisation with supplier network capabilities. Winter road management is not the only highly relevant ecosystem that serves infrastructure authorities. Data management, other life-cycle maintenance aspects, and effective public management are examples of additional issues that could be reviewed.
- Further case studies on different business (including the public side) ecosystems in order to a) gain understanding on the logic under which they operate and can be made to operate b) to identify other relevant ecosystems that are essential for the competitiveness of the nation and companies themselves.
- Initiating and monitoring the performance of innovative procurements. This type of research would have enormous normative value, but it would have to be a patient and long-term activity.
- In-depth research on socio-economic benefits of winter road management. The current body of knowledge is thin and mostly based on repeti-

tive reviews of past studies. Also hard quantitative analysis based on empirical material is missing.

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Appendix A: Interviewees

Date	Organization	Interviewee	Duration
20.3.2014	Teconer	Taisto Haavasoja, CEO	121 min
25.3.2014	Destia	Seppo Kaarto, Manager of winter maintenance management center	144 min
25.3.2014	Vaisala	Kimmo Kynnös, Business Development Manager	105 min
2.4.2014	Foreca	Marko Moilanen, VP of business development	58 min
25.4.2014	Noptel	Jukka Pahkala, Electronics Designer/Customer Support Engineer Tuomo Karjalainen, Marketing Manager	102 min
25.8.2014	Arctic Machine	Juha Jääskelä, CEO Mervi Kuoppamäki, Product Manager	70 min
15.9.2014	Finnish Transport Safety Agency	Eetu Pilli-Sihvola, Special Advisor	83 min
8.10.2014	The Centre for Economic Development, Transport and the Environment (ELY Centre), Southeast Finland	Yrjö Pilli-Sihvola, Manager, Traffic services Jouko Kantonen, Engineer, Traffic services	112 min
20.10.2014	Vaisala Inc. (Boulder, CO, USA)	Paul Bridge, Manager, Road offering	-
22.10.2014	Vaisala Inc. (Boulder, CO, USA)	Kevin Petty, Chief Research Scientist	-
22.10.2014	Vaisala Inc. (Boulder, CO, USA)	Gary Peck, Manager, Engineering	-
22.10.2014	Vaisala Inc. (Boulder, CO, USA)	Antero Järvinen, Director, Roads and Rails	-
26.11.2014	ELY Centre, Uusimaa	Tuovi Päiviö, Manager, Maintenance	68 min
16.12.2014	Finnish Transport Agency	Pekka Rajala, Manager, Development Raimo Tapio, Vice director General	-

Appendix B: Interview questions

At the beginning of interview: Tell about your background and current role

1. How do you see the importance of ecosystems for companies in today's business?
2. Tell briefly about FIRWE ecosystem
 - a. Is it ecosystem?
 - b. How do you characterize the ecosystem?
 - i. Nationally?
 - ii. Internationally?
 - iii.

Within FIRWE ecosystem

3. What is your organization's role in FIRWE ecosystem?
 - a. What factors enhance your organization's growth in the ecosystem?
 - b. What factors prevent your organization's growth in the ecosystem?
 - c. How do you see the future of your organization in the ecosystem?
4. Tell about the other actors in FIRWE ecosystem
 - a. Describe their roles
 - b. Describe the relationships between actors
 - c. How long have the actors been involved in the ecosystem?
 - d. How have their roles changed over time?
5. How should the ecosystem actors support and make use of each other?
6. Tell about the offering of FIRWE ecosystem?
 - a. What is it currently
 - b. What could it be in the future?

7. With potential future offering, how should the ecosystem actors share
 - a. the efforts of collaborative offering development?
 - b. the costs of collaborative offering development?
 - c. the revenue from the ecosystem offering?
8. Who controls (sets the rules in) the ecosystem?
 - a. Is FIRWE ecosystem open for new entrants? – If yes, how one can join?
9. What is driving the ecosystem development?

About FIRWE ecosystem

10. How can FIRWE be utilized as a spring board to international markets?
11. How do you see the future of the ecosystem?
 - a. What will change during the next years?
 - b. How would you develop the ecosystem?
 - c. How will the ecosystem evolve?
 - d. What factors enhance the ecosystem growth?
 - e. What factors prevent the ecosystem growth?
12. Is the ecosystem facing competition?
 - a. Who are competing with the ecosystem?
 - b. How is FIRWE striving in competition?
 - i. Existing competitive advantage
 - ii. Future competitive advantage FIRWE should work for?

The role of Finnish public sector

13. How could following actors boost ecosystem development and growth?
 - a. The Finnish Transport Agency (LiVi)?
 - b. The Centres for Economic Development, Transport and the Environment (ELY Centres)?
 - c. Tekes?
 - d. Research institutes?

14. What could be specific means to boost FIRWE ecosystem development?
- a. Public procurement practices
 - b. Technology testing and piloting
 - c. Innovation support

Title	Finnish winter road management – the evolving business ecosystem BECSI WP2 project report
Author(s)	Pekka Leviäkangas, Aki Aapaoja, Raine Hautala & Tuomo Kinnunen
Abstract	<p>This case study describes the contents and results of BECSI project's work package 2. BECSI – Business Ecosystems and Platforms for innovations – is an innovation management research project carried jointly out by the University of Oulu, Lappeenranta University of Technology and VTT Technical Research Centre of Finland Ltd. This case study looks into one particular business ecosystem related to winter road management. The ecosystem comprises manufacturers of sensors, meteorological devices, winter maintenance equipment and meteorological information service providers. By definition, the public sector client, Finnish Transport Agency, is part of the ecosystem.</p> <p>The ecosystem has supplementary skills and know how on winter road management. This study investigated how the ecosystem's full potential could be utilised as an example of innovation boosting. The bottlenecks and obstacles stated by the companies as well as by the transport agency clearly show that there is plenty of potential to be realised in the future. Main challenges that are faced are rigid procurement traditions, lack of earnest collaboration and leadership, and finding the right persons to work together. Also uncertainty on the quantified benefits of novel practices and innovative approaches was mentioned.</p> <p>A list of recommendations how to tackle the obstacles and bottlenecks for new innovations includes several items, e.g. innovative procurement methods, long-term committed collaboration, institutional goal-setting that supports wider shared benefits, and piloting on a larger scale. Basically the same recommendations can be considered for more general innovation strategies.</p>
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Nimeke	Teiden talvikunnossapito – kehittyvä liiketoimintaekosysteemi BECSI työpaketti 2 -raportti
Tekijä(t)	Pekka Leviäkangas, Aki Aapaoja, Raine Hautala & Tuomo Kinnunen
Tiivistelmä	<p>Tämä raportti kuvaa BECSI-hankkeen työpaketin 2 tutkimusprosessin ja tulokset. BECSI (Business Ecosystems and Platforms for Innovations) on Tekes-rahoitteinen hanke, joka selvittää esimerkkitapausten valossa, miten innovaatiotoiminnan tukemisesta saadaan mahdollisimman suuri hyöty. Työpaketti 2 keskittyy talvitiehoitojen liiketoimintaekosysteemiin, johon luetaan kuuluvaksi myös pääasiakas Liikennevirasto. Ekosysteemi ja sen toiminta kuvataan ja sen muodostumisen lyhyt historia kerrataan.</p> <p>Ekosysteemi muodostuu lukuisista toimijoista, joilla on toisiaan täydentäviä teknologia- ja liiketoimintaosaamisia. Toimijoita ovat esimerkiksi laite- ja sensorivalmistajat, kunnossapitolaitteiden ja -kaluston valmistajat sekä liikennesää- ja keltiedon tuottajat. Innovaatiotoiminnan suurimmat haasteet ekosysteemin näkökulmasta liittyvät yhteistyöhön, hankintamalleihin sekä koko ekosysteemin verkostojohtamiseen. Traditiot, jäykät käytänteet ja esimerkiksi hankintaohjeiden liian tiukat tulkinnat ovat niin ikään uusien ideoiden ja innovaatioiden tiellä.</p> <p>Raportti listaa suosituksia innovaatioiden kiihdyttämiseksi ja kokeilemiseksi. Näihin suosituksiin kuuluvat esimerkiksi uusien hankintamallien rohkeampi käyttö ja kokeilu, avoin ja luottamusta rakentava yhteistyö sekä osaavampi ja osallistavampi verkostojohtaminen, joka mahdollistaa arvonluonnin yhdessä ja kaikkia hyödyttävällä tavalla. Samat päätelmät koskevat laajemminkin innovaatiostategisia suosituksia. Erityisesti innovatiivisten hankintojen roolia korostetaan reiluna ja läpinäkyvänä toimintana. Tällöin kaikki kilpailijat ovat lähtökohtaisesti samalla viivalla ja innovaatioille luodaan ennemminkin markkinaehtoinen kysyntä kuin annetaan suoraa innovaatiotukea yksittäisille toimijoille.</p>
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Finnish winter road management – the evolving business ecosystem

BECSI WP2 project report

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The ecosystem has supplementary skills and know how on winter road management. This study investigated how the ecosystem's full potential could be utilised as an example of innovation boosting. The bottlenecks and obstacles stated by the companies as well as by the transport agency clearly show that there is plenty of potential to be realised in the future. Main challenges that are faced are rigid procurement traditions, lack of earnest collaboration and leadership, and finding the right persons to work together. Also uncertainty on the quantified benefits of novel practices and innovative approaches was mentioned.

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