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Shaping urban mobility

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12. INNOVATION & HUMAN CAPITAL—FORGING THE FUTURE.

ABSTRACT

This paper is based on clinical research of the evolving Nordic mobility ecosystem NUME (Nordic Urban Mobility Ecosystem), which was initiated with the support of Business Finland during spring 2017. NUME is a sub-community of the World Alliance for Low Carbon Cities (WALCC), supporting innovations in the Finnish transport sector. During its first two years of operation, the ecosystem has gone through different stages in the establishing of the more stable network, which ultimately has become a platform for new projects supporting the goal of promoting lower-carbon urban transport solutions. Business models and capability maps have been used as tools when orchestrating the evolving ecosystem.

Keywords: business models; capabilities; ecosystems; orchestration

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1. Introduction

Digitalization has rapidly reconfigured a multitude of industries. The leading platform companies such as Amazon, Apple, Facebook, Google, and Uber are illustrating that new business models can radically alter the way services are provided.

Business models are traditionally defined as the way an organization creates value and captures as much as possible of this created value for itself (Osterwalder, 2004; Teece, 2018). The design and operation of business models are dependent on the firm's capabilities (Teece, 2018:41). Osterwalder (2004:79) used Wallin's (2000) definition of capabilities when highlighting that the firm can increasingly "unbundle" and outsource capabilities.

Dynamically capable organizations can rapidly implement, test, and refine new and revised business models, which requires orchestration and learning (Teece, 2018:45). For an organization to stay competitive it must, therefore, allocate resources for capability building in addition to its immediate value creating activities. Fujimoto (1999:122) argues that when an organization competes for long-term contracts, intense and dynamic competition based on capability is likely. Leading firms such as Toyota are successful because they have outperformed their competitors in the long-range competition of capability building (Fujimoto, 1999:276).

Subsequently, when considering how new mobility solutions are emerging, it is important to understand, design, and deploy new business models and ecosystems to satisfy the objectives of the stakeholders involved in the new emerging mobility regime. This paper attempts to shed some light on this by presenting findings from one such emerging process in Finland, the Nordic Urban Mobility Ecosystem (www.numo.org), which was established in 2017 by the World Alliance for Low Carbon Cities (www.walcc.org).

This paper proposes that shaping urban mobility calls for a new type of platform organization, which engages in capability-building through the formation of new ecosystems, which are not designed purely for value creation and value capturing, but also for collective capability-building. This provides the basis for a community of complementary actors, which can jointly take responsibility for longer-term initiatives aiming at lower-carbon mobility solutions. If ecosystems are designed for this purpose, their business model is different from the original assumption that a business model is "defining the manner by which the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit" (Teece, 2010:172).

If capability-building becomes a key objective for an ecosystem orchestrator (Wallin, 2006), then the process undertaken for the formation and maintenance of the ecosystem is different from the process of forming an ecosystem aiming at establishing a profit-maximizing business model. Understanding how such a capability-building ecosystem works is the objective of this paper, which analyses how the NUME ecosystem has evolved and how the capability building objectives interacted with the evolution of the ecosystem.

The paper proceeds as follows. The second section reviews relevant literature on business models, capability building and ecosystems. The third section introduces the methodology. The case is presented in the fourth section and analyzed in the fifth section. The sixth section discusses the results before conclusions are made.

2. Literature review

The main research question of this study is: **How can ecosystem orchestrators shape urban mobility?** This section will review the key concepts of the paper by discussing business models, capabilities, capability building, and orchestrated ecosystems.

2.1. . Business model

Business models can be depicted in different ways. The creator of the business model canvas framework, Alexander Osterwalder (2004:81) refers to the value-creation framework presented by Wallin (1997) as one input when developing his own business model framework. The notion of value co-production presented by Normann and Ramírez (1993) was the key underlying concept for the value-creation framework, and the subsequent definition of a business model by Ramírez and Wallin (2000):

The business model of a firm defines value creation priorities in respect to the utilization of both internal and external resources. It defines how the firm relates with stakeholders, such as actual and potential customers, employees, unions, suppliers, competitors, and other interest groups. It takes account of situations where its activities may (i) affect the business environment and its own business in ways that could create conflicting interests, or impose risks on the firm, or (ii) develop new, previously unpredicted ways of creating value. The business model is subject to continual review based on actual and possible changes in perceived business conditions. (Ramírez, Wallin, 2000:77)

Teece (2018:40) sees the business model as an architecture for how a firm creates and delivers value to customers and the mechanisms employed to capture a share of that value. However, Teece does not explicitly separate the potential learning elements, even if he underlines that unique capabilities are the building blocks of firm-level competitiveness as they enable business model design, which is deeply intertwined with strategy. Ramírez and Wallin (2000:77) highlight the interactions with stakeholders, referring to the role of continuous capability building, based on learning, as one feature of the business model.

Capabilities

Selznick (1957) noted that organizations must represent a fundamental congruence between external opportunity and internal capability. Based on the concept of capability presented by Selznick, Richard Normann introduced, in 1985, what he called strategic action capability. The ideas about capabilities presented by Normann are well aligned with the notion of dynamic capabilities (Teece et al., 1997). When companies compete on capabilities, they must mobilize complementary assets and nurture co-evolution (Teece, 2008). This requires dynamic capabilities. Wallin has identified four operational capabilities and three leadership capabilities, resulting in seven capability categories, which resulted in the Capability Map, which also in the version illustrated in Fig. 1, has adapted the terminology of Teece et al. (1997) and Honadle (1981).

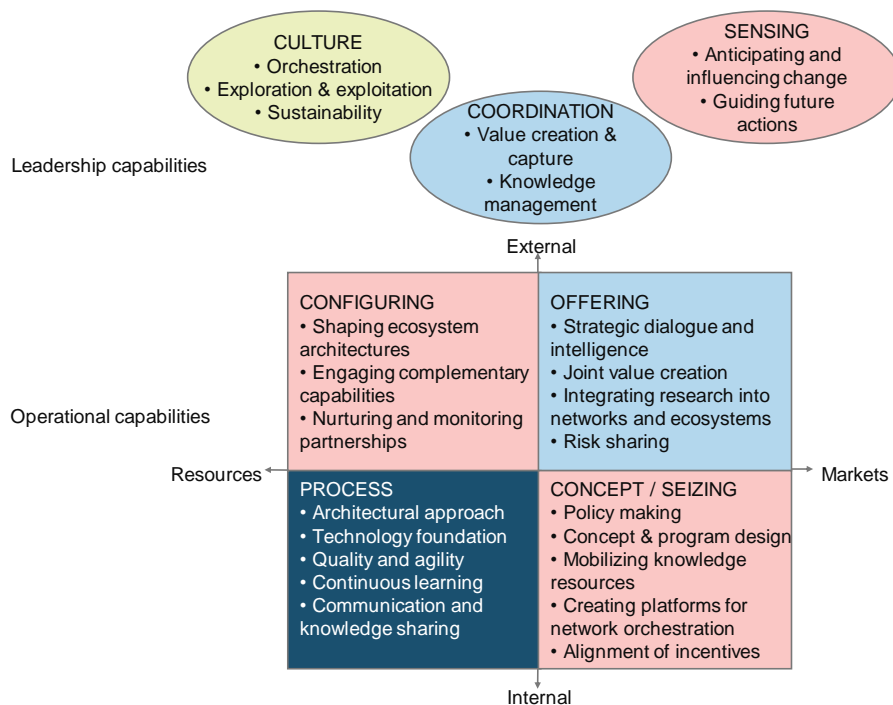


Fig. 1 The Capability Map (based on Honadle, 1981, Teece et al, 1997, and Wallin, 2000, 2005)

2.2. Capability building

In an ecosystem value is co-produced (Normann, Ramírez, 1993). This calls for skills to identify and exploit complementarities and manage co-specialization. Such skills are scarce (Teece, 2009:48). When companies compete based on capabilities, innovation support means supporting ecosystem formation and ecosystem orchestration (Teece, 2008). The capability-building efforts require learning, which must take place on the individual level, and interactions between the learning individuals, which is guided by organization-specific

policies regarding network engagement (Caniëls, Romijn, 2003). New offerings are expected to result from collaborative arrangements (Agarwal, Selen, 2009). How individual learning and organization-specific policies interact in a specific case is in turn dependent on the previous engagement between the key individuals involved in the process as well as the brokerage skills of the orchestrator. Obstfeld (2017) emphasizes the active pursuit of coordination and connection between members of the network in collaborative brokerage.

When seeking capability building with external partners, the starting point must be some form of shared mission, which attracts potential collaboration partners to engage in the joint capability building effort. Furr and Shiplov (2018:60) suggest that connecting with uncommon partners on the outer fringes of the industry may prove to be a key factor for successful joint capability building, as this encourages cross-fertilization.

Orchestrated ecosystems

Furr and Shiplov (2018:59-60) introduce the notion of adaptive ecosystems based on the ideas of Obstfeld (2005) regarding collaborative brokerage. Partners develop significant projects or innovations together in adaptive ecosystems. These ecosystems are different from centralized ecosystems as they are looking for new ways to drive innovation and are not purely supporting the predefined objectives of the nodal organization of the ecosystem. This in turn implies that it can be difficult to predict all the required expertise and capabilities (Furr and Shiplov, 2018:60).

When establishing a new ecosystem, the orchestrating entity must perform three functions: adjust the system's behavior to deal with external contingencies, direct the system towards more favorable environments to improve its chances of survival, and reorganize aspects of the system structure to make it more effective in these two tasks (Checkland, 1981). These functions drive the evolution of the business model during the ecosystem formation stage.

When aiming at capability building together with external parties, the orchestrating entity is not launching a pre-defined business model and looking for external stakeholders to join. Instead, the orchestrator is co-creating the business model together with the expanding group of external stakeholders joining the ecosystem. In this respect, the inclusion of the external stakeholders, to strengthen the capability building efforts, becomes a necessity for the business model to materialize. At the same time, however, including new stakeholders will impose new requirements on the further evolution of the business model, uniting the stakeholders. Williamsson (2014) has noted that it is unclear how stakeholder inclusion influences business model renewal.

The gradual formation of an ecosystem for joint capability-building can be seen to proceed through three phases: (i) inducing cooperation, which we here will call ecosystem design; (ii) mobilizing action or ecosystem development; and (iii) driving outcomes, resulting in market shaping.

Moore (1993:76) argued that mobilizing action is what creates the momentum in the chain of events noting that “a business ecosystem gradually moves from a random collection of elements to a more structured community”. To mobilize ecosystem partners, a common mission (Mazzucato, 2018) may offer one way to secure engagement. Powerful missions often originate in dissatisfaction and inefficiencies in the existing system (Normann, 2001:66). Such a mission can become an ‘attractor’ that mobilizes the attention and energy of many players and coordinates their actions in such a way that it makes the mission a self-fulfilling prophecy (Normann, 2001:279). The starting point for an evolving ecosystem seems, thus, to be a common mission.

3. Methodology

This study is based on interpretive research, and, more specifically, on a clinical research approach. I have proceeded through a dialogue between theory and the empirical phenomenon (Hatch and Yanow, 2003). Thus, the research has created reflexive narratives, not explanatory models or theoretical propositions (Mantere and Ketokivi, 2013:75) as I have tried to grasp the subjective meaning of social action (Bryman and Bell, 2014:29).

In line with the hermeneutic-phenomenological tradition Normann (1977:11) emphasized the importance of historical analyses to understand organizations as products of history. In this research I have been involved in the researched organizations as I was one of the original founders of World Alliance for Low Carbon Cities, established in 2012. As I have not just been an outside observer but a key actor in the analyzed case this study is an example of clinical research (Normann, 1977).

Normann (1977:187) suggested that research is a genuine learning process. A clinical theory must be concerned with the way the actor improves his or her ability to deal with the situation at hand. Clinical research is thus research about learning processes (Normann, 1977:188). Learning is a means to an end, as social research should develop new perspectives and theories, constructions and ‘inventions’, and ‘improve our picture of the world’. Normann (1977:192) calls this an innovative cognitive research interest. Clinical research is also action learning, through which experts and laymen hold learning in common trust as the basis for the ongoing resolution of the faced problem issue (Ramírez, 1983:726).

As one of the founders of WALCC in 2012, and a former colleague of Richard Normann and Rafael Ramírez, I entered the formation of the new ecosystem for transport innovation during spring 2017. This ecosystem should become a permanent innovation platform as part of the national Finnish innovation system supported by Business Finland (formerly Tekes), the Finnish innovation agency.

Throughout the research process, I have actively reflected upon how to validate the interpretations from the case reported in this study. In this respect, choosing what to attempt to validate calls for more effort than validation. Lindblom (1987:519) has stated that, when dealing with social problems, thinking in many forms is required and some degree of validation is required, but it need not be scientific. In my view, the outcome of the intervention is a form of validation. If the interventions result in some permanent impact, this would indicate a certain degree of validity as it suggests that the process is of some value. As the established new ecosystem, NUME, has been institutionalized, this indicates that it has, to some extent, made some contribution towards ‘improving the picture of our world’. Hopefully, these outcomes may also provide insights and inspiration for other practitioners and researchers.

4. Case study – the nordic urban mobility ecosystem (nume)

During spring 2017, Tekes, the Finnish funding agency for innovation, launched a call for proposals titled “Business spearheads and ecosystems in the platform economy”. The call was aimed at developing business spearheads with international market potential supported by open development platforms through which firms could develop and test their solutions in a real operating environment (Tekes, 2017). Financial support would be given to platform orchestrators helping companies to connect to other players in the network.

The call for applications resulted in the acceptance of a total of eleven proposals for the first stage, one of which will be analyzed in this paper: Mobility as a Service – Catalyzing Market Co-Creation Strategy (C-MaaS), orchestrated by the World Alliance for Low Carbon Cities (WALCC) and the professional services firm Synocus and myself being responsible for the orchestration of the C-MaaS ecosystem.

When the C-MaaS ecosystem was initiated, the design was strongly steered by the principles provided by Tekes in the opening words of the call for proposal:

The Government aims to create development platforms and growth environments for digital business, supporting the creation of innovations, services and new business models... The purpose of the call for applications is to create open development platforms through which companies will be able to develop and test their solutions in a real operating environment. We are looking for development platform orchestrators who help companies connect to various players in the value network. (Tekes, 2017)

Synocus actively engaged with the WALCC to develop an application that would match the expectations of Tekes. In line with the guidance of Tekes, the objectives of the C-MaaS initiative were defined as follows:

As the outcome of the project will be a multisided platform, the ambition is to engage organizations, which will identify shared value in the pursuit of a national innovation platform to further the development of mobility as a service (MaaS)... The first phase of this initiative will be to crystallize the joint growth vision and related road map of the key actors of the open ecosystem. (C-MaaS application, April 2017)

Once the financial support for developing the WALCC-led ecosystem was obtained from Tekes in June of 2017, the outline for the first stage of ecosystem design was completed. The design of the ecosystem was developed in

a co-creative mode, as Synocus conducted altogether 18 interviews with presumptive ecosystem members about their interest in joining the ecosystem and the direction they would like the ecosystem to take.

During the interview process, it became clear that the original name of the ecosystem to be formed, C-MaaS, did not correspond to the collective interest of the initial anchor organizations that were committed to join the emergent ecosystem. Subsequently, the name was changed to Autonomous Vehicles and Mobility Services (AVM). This anchoring in the underlying technologies enabling the disruption of transportation was described as follows in the project plan submitted to Tekes in October 2017:

The ongoing transformation in transportation is shaped by new technologies and new business models. For the transition in mobility to materialize in full, several technologies, such as 5G, electrification, and autonomous driving, must be in place. This will then result in new types of business models, often with a strong integration between public and private service providers. The technological challenges/opportunities are the same for both autonomous cars and for mobile machinery. Therefore, from a technology development point of view, it may be a quicker route to establish pilots and demonstrations in mobile machinery instead of trying to fulfill all the legal and political challenges relating to the testing of the new technologies in the field of human transport. This would also provide a broader base for technology companies if the introduction of autonomous cars were to be delayed.

The application for financial support from Tekes was submitted at the end of October 2017 and the decision was received at the beginning of December. The financial support was conditional on WALCC being able to prove that at least three cities and ten SMEs were contractually committed to the new ecosystem under formation. Based upon this requirement, the WALCC signed membership agreements with a total of 12 SMEs and two cities during the first quarter of 2018.

Once the financial support was secured the process shifted from Ecosystem Design to Ecosystem Development. During spring 2018, Focus Areas became the notion through which Synocus, as the orchestrator, organized the ecosystem development. Each Focus Area owner was supported in developing a Focus Area-specific project plan, and, in several cases, this project plan included the ambition to gain financial support for a development project from Business Finland. These projects also opened discussions with new potential members.

Through May 2019, the Ecosystem Development work resulted in the formation of a number of Focus Areas and the corresponding approved applications for separately funded development projects from four different companies: Kyyti, Ponsse, Roima Intelligence, and Valmet Automotive. In addition, the WALCC participated in a call for proposals issued by Nordic Innovation in November 2018, resulting in a pan-Nordic project called e-Mobility Systems Architecture. These efforts resulted in the following configuration of the ecosystem as of spring 2019:

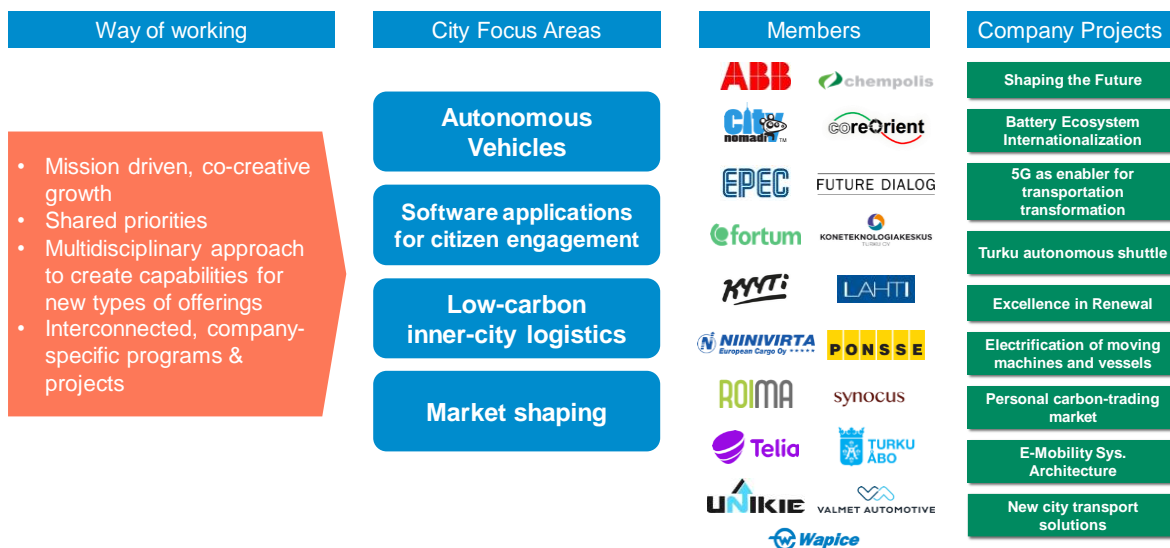


Fig. 2 The NUME ecosystem as of May 2019 (source: www.numo.org)

5. Analysis

The emergence of the WALCC ecosystem for urban mobility is analyzed based on the elements of the Capability Map. The Capability Map was the basis for a different form of categorizing capability development targets called the Excellence Framework. This is a tool used when discussing the direction of the ecosystem. The Excellence Framework (Wallin et al., 2017:22) is depicted in Figure 3.

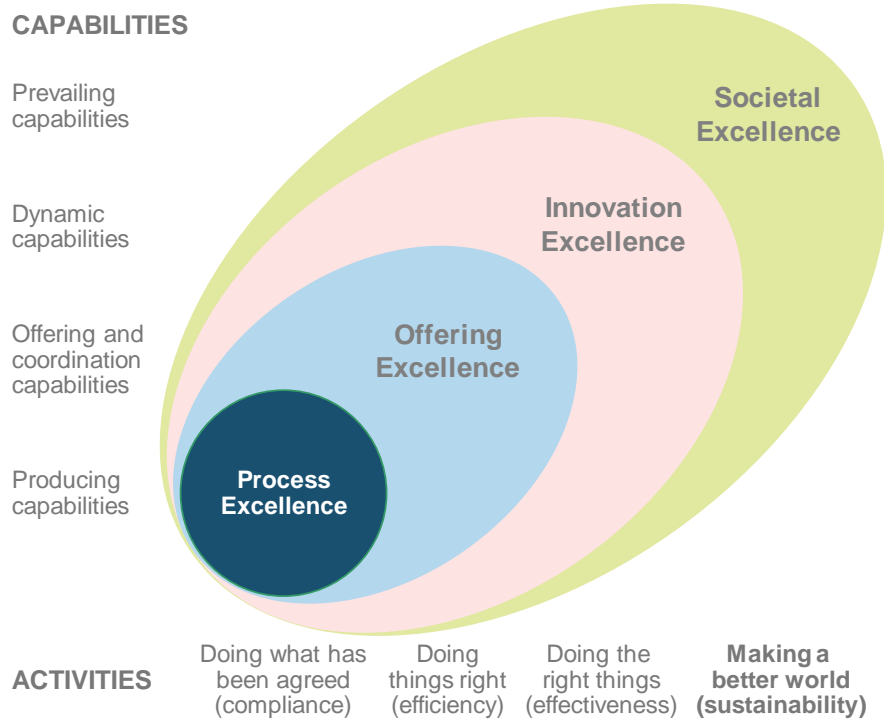


Fig. 3 The Excellence Framework (Wallin et al., 2017:22)

The Excellence Framework is another way to portray the seven capability categories and visualize how they provide a portfolio that must be managed in a systemic way. The color coding of the Capability Map and the Excellence Framework provides the connection between the two frameworks.

5.1. Phase 1 (initialization, February – October 2017)

When the C-MaaS application was first discussed in February 2017 the starting point was how to develop an ecosystem in line with the call for proposals by Tekes. This meant that the discussion was, from the outset, strongly anchored in the sustainability sphere of the Excellence Framework, as one of the main arguments for pursuing mobility as a service is its potential to reduce CO2 emissions in the transport sector. This aim was well suited to the mission of the WALCC, which saw this as an opportunity to contribute towards developing an ecosystem supporting low-carbon urban transport.

Following Tekes's announcement of its decision in June, the ambition of Synocus was to clarify which companies would be prepared to participate in the formation of the emergent ecosystem. When the application was submitted, binding commitment had only been received from two companies: Valmet Automotive and ABB. As the initial emphasis was strongly on Mobility as a Service, the idea was to use the positive support from Tekes as the basis to convince Nokia and HERE to join the ecosystem, based upon the initial positive attitude signaled during spring 2017. The discussions with both companies continued until September, when they had to make a final decision, with corresponding commitment of financial support for the first project phase through to the end of October 2017. At this stage it became apparent that neither of these companies was able to join the ecosystem. This outcome shifted the emphasis more towards the hardware technology aspects of the automotive transition, which was the main interest of ABB, Ponsse, and Valmet Automotive, who were all committed to join the ecosystem as anchor companies.

Based on the in-depth discussions with the anchor companies and potential ecosystem members during August 2017, it was possible to agree upon a common mission for the ecosystem: integrating public and private interests in co-creating new mobility services markets in a global context. This statement was accompanied by the clarification that the Autonomous Vehicles and Mobility services ecosystem (AVM) would benefit from new technologies such as 5G, electrification, and autonomous driving. These technologies would give birth to new types of business models with a strong integration between public and private service providers.

Once the mission was agreed upon, the next step was to configure the group of organizations that could form the core of the ecosystem. This was strongly guided by the instructions from Tekes, which stipulated that qualifying for continued financial support after October 2017 would call for a two-year plan for building the ecosystem, including a shared vision, roadmap, and action plan. This required a much more “granular” engagement of the anchor organizations, because the main activity of the ecosystem would be concrete development projects, expected to lead to some form of pilots or demonstrations. As the overall topic was to promote new mobility services, each anchor organization had to explicitly define its own interest in this area. For the projects to form a systemic entity, leading to an ecosystem and not just to a portfolio of independent projects, the orchestrator had to engage in in-depth one-on-one dialogues with each individual anchor candidate to be able to integrate the various viewpoints and objectives of the members of the ecosystem into a coherent development program. This required both assuming the responsibility of forming some type of higher-level concept that would unite the different viewpoints, and then developing new types of relationships between the different anchor organizations of the ecosystem,

The initiation of the ecosystem resulted in the October 2017 submission of the project plan for the second stage of public financing extending through July 2019. This project plan described the objectives in the following manner:

Finland has three strongholds in the transport sector: connectivity knowledge (as a heritage of the early Nokia initiatives in the transport sector), vehicle technologies (applied primarily in the field of mobile machinery), and an entrepreneurial service-developer start-up community (illustrated by companies like Rightware, MaaS Global, Kyyti, PayIQ, etc.). However, for the time being, these capabilities are cultivated in different silos within the Finnish innovation ecosystem. The ambition for the new AVM ecosystem, to be developed by the WALCC and its partners, is to integrate the above mentioned three strongholds into a common platform for the development of the Finnish transport-related ecosystem.

5.1. Phase 2 (operationalization, December 2017 – August 2018)

The project plan submitted in October 2018 stated the following expected outcomes for the AVM initiative:

- New offerings (and related roles for each actors) for different customer segments; e.g. equipment manufacturers, MaaS operators, AI providers, software providers, and users, addressing new customer transportation needs e.g. due to digitalization, robotization, electrification, and new business models.
- Enhanced brand recognition for participating organizations and resulting higher share of mind thanks to the image of Finland as world-leader in innovation for mobility services.
- New knowledge creation through broader understanding of the transition of transportation.

This also mirrored the outcome of the round of interviews carried out during phase 1, as “Promoting pilots and demonstrations” was the most important activity members expected from the ecosystem.

Tekes’s positive decision regarding the continued financial support of the ecosystem was announced in the beginning of December 2017. However, at this stage, a significant change in the process was forced upon the original ecosystem members, as the financing from Tekes was conditional upon the ecosystem orchestrator being able to sign engagement agreements with at least ten SMEs and three city organizations before the end of February 2018. Whereas the original action plan had focused on gradually expanding the network based upon the evolving needs of the anchor organizations when establishing their demonstration projects, there was now a need to radically change the marching orders and engage in an intense phase of recruitment of new members. This also implied that efforts to develop concrete projects aiming at pilots and demonstrations had to be put on the backburner until this new requirement from Tekes had been fulfilled.

Membership recruitment; January – March 2018

In the AVM ecosystem, the three categories of members were attracted due to different reasons. The initial anchor companies (ABB, Fortum, Ponsse, and Valmet Automotive) all had previous business relationships with Synocus. During spring 2017, the original Tekes application was discussed with all these four companies prior to submitting the application. These companies also financially sponsored the first phase of the ecosystem formation during the period June-October 2017, and they had committed to continued financial support in the case that additional funding was obtained from Tekes for 2018 and 2019. In this respect, the content of the second application was co-created by the WALCC, Synocus, and these companies. The application was also openly communicated to other potential members, but their involvement in the actual formulation of the development plan was more superficial compared to the anchor companies.

The SMEs engaged in the ecosystem were primarily attracted due to their commercial relationships with the anchor companies. Most of the twelve SMEs that signed up for membership had either already done business with one or several of the anchor companies, or they expected new projects to emerge as an outcome of the ecosystem formation. One such example was the role of Fortum, which launched its own sub-ecosystem initiative in February 2018 relating to offering development in renewable energy. Five of the engaged SMEs were directly involved in this new initiative.

Attracting cities proved to be the most difficult part of the conditions stipulated by Tekes. Despite the expressed interest of several cities in the possibility to leverage their own transport development through collaboration with the AVM initiative, it was very difficult to mobilize a clear legal commitment with corresponding membership responsibilities and fees within a couple of months. Therefore, Synocus's efforts to engage cities resulted in only two cities being recruited during the first half of 2018. (Synocus has continued discussions with several cities to expand the city membership of the ecosystem).

The motivation for the two cities joining the AVM ecosystem was their on-going projects with direct connections to the development of autonomous vehicles (City of Turku) and mobility services (City of Lahti). For the other cities with whom discussions were initiated, similar interests existed, but the lack of an ongoing project with corresponding activities implied the need for further discussion and longer decision-making cycles.

In March 2018, it was informed that the 12 SMEs and the two cities sufficed for AVM to fulfill the criteria to gain financing from Business Finland. With the Business Finland financing decision, the AVM ecosystem reached a certain degree of institutionalization.

The ecosystem was institutionalized through a dual focus on members and Focus Areas. The main attraction of the ecosystem to members are the activities of the ecosystem, organized in the form of Focus Areas.

5.2. Phase 3 (crystallization, September 2018-May 2019)

In its meeting on September 3rd, 2018 the Advisory Group returned to the original goals explicated for the AVM ecosystem in the application to Tekes in October 2017. This illustrated how the attention had shifted from operationalizing the ecosystem to emphasizing delivery of the originally promised outcomes. The international dimension now received increased attention, and this also resulted in changing the name of the ecosystem from AVM to NUME (Nordic Urban Mobility Ecosystem). This also implies that, at this stage, the ecosystem gradually started to gain its own identity, and becoming the collective voice of its members. The updated roadmap of the ecosystem illustrates the activities that NUME was expected to carry out during 2019:

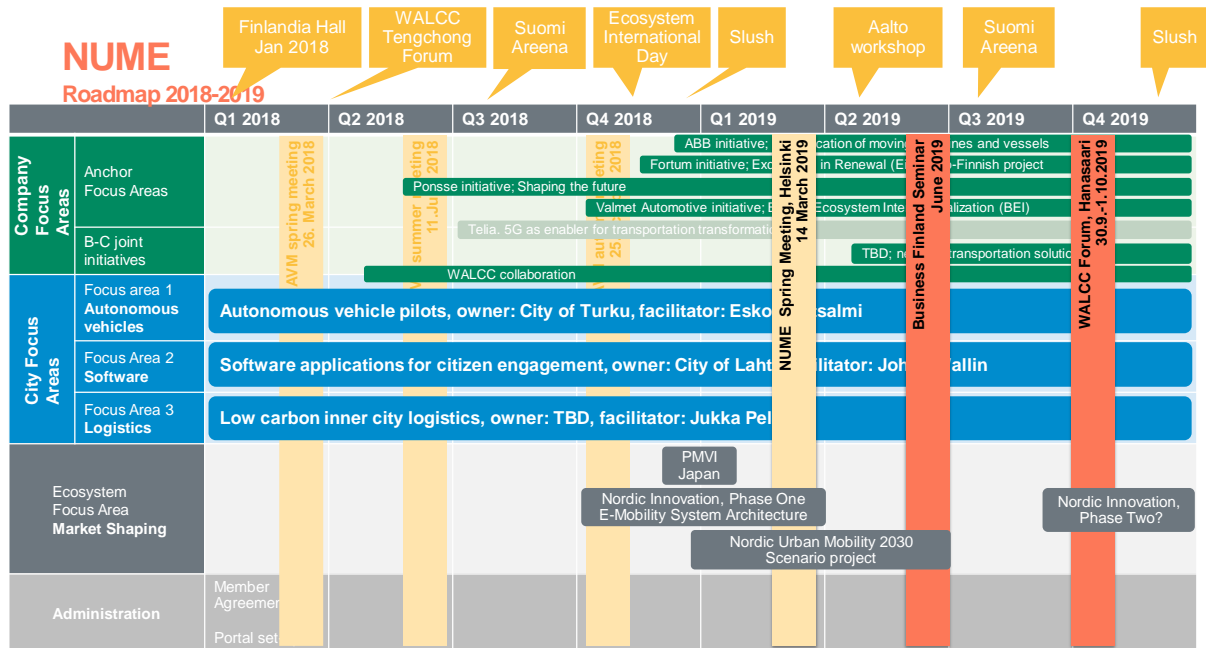


Fig. 4 The NUME ecosystem road map as of end of spring 2019

6. Discussion

As here described, the foundation for entering the ecosystem formation had, in practice, been established between the leading organizations (Synocus and the anchor companies) prior to the initiation of discussions about the mobility ecosystem in early 2017. In this respect, capability building in the context of the ecosystem to be formed emphasized the dynamic capabilities in the first phase. Sensing what the potential members could agree upon, seizing opportunities to gradually move the ecosystem forward and, at the same time, reconfiguring the membership basis of the ecosystem. This characterized the formation process until spring 2018. Once the commitment from Business Finland to provide financial support through July 2019 was secured, the emphasis shifted towards operationalizing the ecosystem, which was done through the legal framework of the membership agreements and the establishing of the governance model for the ecosystem. This established offering and coordination capabilities on the ecosystem level.

The need to deliver on the promises that had been made to all stakeholders, particularly Business Finland, in respect of the ecosystem, creating growth and export revenues, shifted the emphasis from the ecosystem as a community to the individual Focus Areas and the R&D projects in each Focus Area. The Focus Areas were vehicles to create new offerings and establish new business models around the offering that would enable the organizations participating in the Focus Area to rapidly demonstrate the value of the new offerings and then scale up the business to spur growth and exports, such as Battery Ecosystem Internationalization (BEI) by Valmet Automotive.

When considering the capability required for the phase following the establishing of successful demonstrations and pilots in the R&D projects, we can envisage that the fourth phase, after crystallization, will be commercialization, e.g. an expected rapid increase in export revenues from Valmet Automotive based upon the manufacturing of battery packs. The commercialization phase will play out on the level of a Focus Area, or specific offerings/business models within a Focus Area, where the emphasis will then be on the customer's customers, which may become new potential members of the NUME ecosystem as it evolves. This phase will no longer be one of unified development encompassing the whole NUME ecosystem. It can be speculated that the international expansion of the business, based upon a successful demonstration or pilot in Finland, may require the establishing of a new sub-ecosystem around that particular offering with the capabilities to support the scaling up and international expansion that will follow the first successful demonstration in Finland. Such ecosystem requirements may be on different levels of geographical aggregation: regional, national, or supranational. This will represent the third stage of ecosystem evolution, moving into Market Shaping, after the Ecosystem Development activities have reached enough maturity. In the case of NUME, it can be speculated that

this stage will potentially be reached in 2020. Kyyti, which is one of the members of NUME with strong international ambitions, is also actively striving for such a scenario to materialize.

The development of NUME thus implies that the capability building in a mission-driven ecosystem being formed seems to progress according to the Excellence Framework, with capabilities being built gradually starting from Societal Excellence, requiring culturing capability, then proceeding through Innovation Excellence and building dynamic capabilities to enable the ecosystem to take off, and then, in the operationalization phase, calling for offering and coordination capabilities (Offering Excellence) to finally become focused on delivering upon promises, calling for Process Excellence.

It is also worth noting that the ecosystem's center of gravity gradually shifts from resources to markets. Initially, the emphasis is on the ecosystem members and how they will interact, this is then followed by a phase focusing on how the members will work together, which is guided by the quite concrete discussions about what to do when, or the formation of Focus Areas. In a more mature ecosystem, it can be expected that the nurturing of the portfolio of Focus Areas and Focus Area-specific projects will dominate the common activities on the ecosystem level. The actual value-creation, also enabling value-capturing, will take place on the Focus Area level. In this respect, an ecosystem such as the NUME ecosystem is truly a capability-building ecosystem and will never become a value-creating ecosystem in itself, but will indeed, hopefully, give birth to a number of value-creating ecosystems, which then form the basis for the commercialization phase of the ecosystem.

The here presented discussion also conforms to the conceptual IOCC framework (Wallin, 2006:247-258). What this inductive case study has added to the earlier conceptual discussion of the IOCC framework (Initialization, Operationalization, Crystallization, Commercialization) is a more granular understanding of how the capability building progresses as the ecosystem matures.

The findings from the case support the argument by Furr and Shiplov (2018) that there is a need to distinguish between adaptive and centralized ecosystems. The here analyzed cases indicate that one must carefully consider how the capability-building efforts are managed when a new ecosystem is formed. At the same time, our findings suggest that the adaptive approach is particularly useful for innovation, but probably less so for commercialization. This raises the interesting question of how to bridge the innovation and commercialization phases when considering ecosystem management. This is an area that calls for further research.

7. Conclusions

In the case of the formation of NUME, the impact of Tekes as an external part-financier created additional nuances in the formation of the ecosystem. The outcome can be summarized in the following points:

- The initial vision and the framing must have enough potential to attract several organizations to engage in collaboration. The business model and the explication of the capability-building objectives, visualized through the Capability Map and the Excellence Framework, can support the orchestrator when inducing cooperation.
- Anchored in gradually deepening trusting relationships between the ecosystem orchestrator and the participating organizations, the ecosystem should be established step-by-step, mobilizing action through joint activities and physical interactions. This structuration process should focus on building trust and upfront giving (Grant, 2013) to the ecosystem.
- The business model and the action plan for the collaboration must be iteratively developed based on the complementarities and synergies of the participating organizations and the constraints imposed through external conditions. Producing concrete outcomes as well as a permanent new collaboration setup benefitting the ecosystem members is the ultimate test of whether the ecosystem formation has been successful or not.

Ecosystems for capability building are different from those for value creation and appropriation as they are not concerned with turning an immediate profit. This paper presents a detailed account of the formation of such an evolving ecosystem for urban mobility. The paper shows how the actors participating in the collaboration gradually, over a relatively short period, first agreed to interact with each other and then committed to joint activities. This called for subtle steering and persuasion by the ecosystem orchestrator. The outcome of the ecosystem-formation initiative was positive. The original C-MaaS ecosystem, subsequently AVM/NUME, was granted financial support through July of 2019 to serve its members in the pursuit of strengthening the

innovation capabilities in the Finnish transport sector, and at the time of writing this paper NUME is in the process of applying for additional funding from Business Finland, with strong support from all its members.

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