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Short paper

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Digital Transformation Supporting Public Service Innovation for Sustainable development – Business modelling interacting with "public service provision modelling"

We build on our recent report (Andersson and Mattsson 2018) on an on-going study of public service innovations that are enabled by digital transformation. That report analyzes four cases about the business modelling challenges for private firms that aim to contribute to public service innovation. We continue this research by addressing the issue on how business modelling interacts with what we label "public service provision modelling" with explicit reference to digitalization and sustainable development objectives. The purpose of this conference paper is to present and discuss a conceptual model to guide further research.

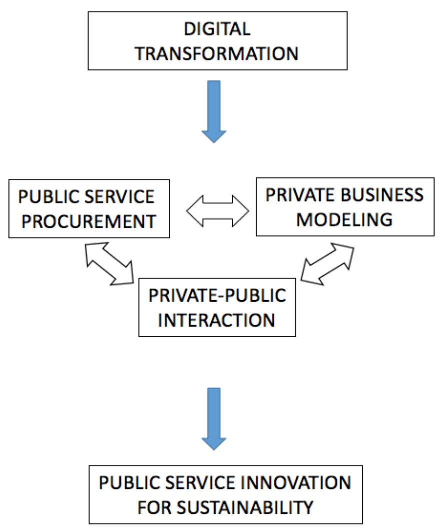
Interaction between private and public actors takes place during tendering processes that may concern established products or services but also be of much wider significance including joint innovation projects, implementation, use and further development of public services. Private actors might e.g. be contracted by a public actor to perform the service. Even if in many countries, Sweden being a prime case, privatization of some public service activities, are of increasing importance, there are publicly imposed rules and procedures that are applied to these service activities performed by private actors.

Next our *Conceptual framework* is presented. Then we briefly present two *Cases*, that are part of "Smart City" ideas (included in Andersson and Mattsson 2018): "City Lighting" and " Mobility as a Service" followed by a brief analysis of the cases in the terms of private-public interaction. Finally we suggest issues for further research on digital transformation and public service innovations for sustainable development.

Conceptual framework

Our conceptual framework is partly based on our research on ICT enabled service innovations and business models (Andersson and Mattsson, 2015).

Fig 1 illustrates the framework. We relate the general “megatrend” digital transformation to public service innovation for sustainable development, another “megatrend”, as dependent on interaction between private business modelling and public service provision modelling (public service procurement in a broad sense). The double headed arrows signify interaction dynamics.



Digital Transformation

Based on digitization, the conversion of analog information in any form into digital form there is an ongoing digitalization, i.e. a rapidly growing use of digital technologies in business and society. As a result we see emergence of *digital transformation* processes in many private firms, public organizations and industries, i.e. a profound and accelerating transformation of activities, processes, competencies and business models. Digital transformation requires digitalization, which in turn requires some form of digitization.

Digital transformation encompasses all aspects of business, in other words, both digital start-ups where digital business is the core, and the digital transformation of incumbents, traditional business, and of public organizations. The impact of the ongoing changes justifies the use of the concept *transformation*. It is often stated that this digital transformation leads to a reduced importance of principles related to mass production and mass markets, economies of scale, standardization, centralization and hierarchy, giving way for an increased importance of decentralized integration, network structures, adaptability, agility, customization, knowledge as capital, services, clusters and economies of scope. In short, digital transformation is associated with innovation in a broad sense. For sellers it is a challenge to develop new business models and for both private and public buyers to develop new procurement models.

In two recent book chapters on the strategic challenges that companies and organizations in all industries and sectors of society are meeting due to digitalization (Andersson and Rosenqvist 2018; Andersson and Mattsson 2018), we argue how companies and public organizations currently are face challenging digital transformation processes.

Business Modelling

Development of new business models is crucial during digital transformation (Osterwalder et al. 2005; Andersson and Mattsson 2018). In an extensive analysis of the literature on business models, Zott et al. (2011) found that a business model is a holistic system-level perspective that includes both content and processes; it is firm-centric, yet is boundary spanning with a focus upon value creation rather than value capture. Related to this is how the firm will obtain revenues for its value-creating activities and how value is calculated. Ehret and Wirtz (2017) and Mason and Spring (2011) proposes a network approach to understand the role of business models. This is in line with the original use of the concept in analyses of how new ventures manage to integrate resources by means of network relationships. A general assumption is that a business model expresses the business logic of the firm, what value the company offers to customers and, relating the concept to a business network perspective, the infrastructure and the architecture of the network of partners. Applying a network view, La Rocca and Snehota (2017) stresses the limits to autonomy of individual business firms to perform their own business model. They need to observe and adapt to differences across counterparts.

Digitalization means that technical and economic changes associated with the transformation cannot be separated. Structural changes in whole industries are mirrored in business model changes on the company level. When the consequences of digital transformation is discussed in business fora it is very likely that the effects on private companies' business modelling attracts most attention. Digital transformation is often associated with shifts in several of the major parts of companies' business models.

Public Procurement

Public procurement is arguably different from procurement/purchasing in the private sector. Telgen et al. (2007, pp. 17-19) list differences in terms external and internal demands, context demands, process demands, multiple roles. Arlbjörn and Freytag (2012) provide a useful literature review on public procurement that helps to analyze how traditional procurement of well-defined products and services differs from public-private interaction for innovation.

Recently, in line with new EU regulations (EU 2015) Swedish Government has made some changes, signalling a more positive attitude to cooperation between public buyers and private sellers, more emphasis on qualitative criteria, especially on sustainability. New rules for public-private innovation partnership (more long term relationships possible than during present rules) are established by the Swedish Public Procurement Act (Lag 2016: 1145). A new government agency for support of public procurement in Sweden has been established, the Swedish Public Procurement Agency while the Swedish Competition Authority is still the supervisory body.

One of the major effects of ongoing digital transformation processes in society on public service procurement is how it both enables and drives a general shift towards *servitization*, i.e. a move towards procurement of hardware and software to provide a community with bundled services.

Private/public interaction is a phenomenon of increasing, but still limitred concern in the literature (e.g. Donahue and Zeckhauser, 2006; Marzillo et al., 2011; Leferlink et al., 2013).

How the business model process interacts with public procurement processes during innovation, is not a much researched phenomenon (cf. Clarke et al. 2012; Munksgaard et al. 2017). We argue that due to the dynamics and heterogeneity associated with innovation processes, “modelling” rather “model” is a more valid concept.

Based on our case observations digital transformation affects private-public interactions in the sense that it shifts interaction patterns in the different phases of tendering processes, driving the need for changed internal interactions within public procurement organizations, in turn leading to shifts in interactions with private suppliers, much along the lines earlier found in studies of functional, systems, and solution selling.

Public Service Innovation for Sustainability

Innovations always require some new combinations of resources, some of them controlled by different actors. Values in an innovation process are therefore co-created in interaction between actors. Cf. e.g. Haas et al. (2012) and Vargo et al., (2017) on value co-created within relationships. For a public service innovation both private and public actors are involved. A service innovation has to find use in socio-economic technical contexts. This might require added innovative resource combinations, adaptation between existing and new resources as well as co-existence with other, established or newly developed, services.

Debates on how to achieve sustainable development stress innovations, and the role of digital transformation and more effective private-public interaction during innovation. Sustainability criteria/objectives are often cited in arguments for service innovations in the public sector. A WEF report (World Economic Forum , 2016, p 9.) states: “We believe that digital solutions can bolster the three pillars of development on which the Sustainable Development Goals (UN) are built…” The report stress that digital innovation disrupts existing business models and argues the interconnected business models of both private and public stakeholders need to harbour various forms of commercial, *business value* (for example, manifested in new, extended, revised revenues and/or efficiency improvements), as well as *societal values* (where the digital transformation might lead to improving people’s quality of life, foster equitable growth, and protect the environment). The whole ecosystem of government, business, and civil society need to be engaged in these processes. (WEF 2016).

Recent development of the service dominant logic approach to market studies has adopted a service ecosystem perspective (e.g.Vargo et al. 2015) in which also non-market actors, like policy actors are included. Services are embedded in a socio-technical-economic context, should be provided for the "common wellbeing". This assumption provides a link to analysis of sustainable development in market economies and issues regarding interaction between public policy practices and market practices (Mattsson 2016). The dynamic interaction between the private "business modelling" and the public "service provision modelling" is thus of major importance.

Thus, we argue the public service innovation process for sustainability as dependent on private business modelling, public service provision modelling and private/public interaction.

Two cases

Lighting as a service/Philips

As part of sustainability initiatives to save energy, LED light lighting of urban areas, has become widely spread as evidenced by EU reports (Valentova et al, 2012) and information on tenders for smart lighting projects in several urban areas.

In 2016, based on "Best Value" procurement principles, the city of Eindhoven, contracted Philips and construction firm Heijmans for five years to develop and test a new city lighting system. The development project is a part of Eindhoven´s Roadmap 2030 to become a "smart city".

Philips original idea as stated in Andersson and Mattsson (2018) was to offer city lighting as a service to urban communities. Instead of selling lamps and get paid for the products, the offer is to provide a managed lighting service including installation of "smart" LED based digital systems allowing adapting light to need variation, maintenance, including exchange of lamps and equipment for material reuse as well as being involved in further developments. The idea is that Philips and partners should get paid for the actual amount of energy consumed and be compensated for the upfront costs of installation by a performance contract related to the achieved savings produced by retrofit. Ownership of the equipment and the investment financing and cost of installation are transferred from the public municipal agency to the service provider.

The value offering provided by Philips is formulated in a performance contract that promises significant environmental and financial benefits for the public customers. Digital transformation makes it possible to tailor lightning to changing needs for light and to optimise resources. Retained ownership of the products and equipment enables Philips to apply circular economy principles and to be a technology partner to the customer in application of new more effective lighting methods in the future. How should values that are co-created by public and private actors be calculated? How should performance contracts be written and enforced? When the contract ends, will it be possible to open a competitive tender process or will the public customer be too integrated with the incumbent service provider?

Mobility as a service/Nobina

Mobility as a service is a growing phenomenon attracting interests from the established and new private and public actors around the world. There is even an acronym MaaS for it, an organization to promote MaaS, the European Mobility as a Service Alliance, has been established. As active in this development Nobina, a major provider of public transportation in the Nordic countries, aims to change its role from "bus operator" to "mobility provider". More effective public transportation serves to reduce greenhouse gas emissions and increase energy efficiency, increase road safety, reduce traffic congestion and make access to public transportation more equal for citizens. Mobility as a service, enabled by the internet of things may be provided by coordination of different transportation means (bus, private cars, taxis and bikes) and development of technical platforms. Online platforms, smartphones and apps, digital payment solutions and analysis of big data will enable Intelligent Transportation for mobility.

Nobina argues that industry needs to shift from a production culture to a service culture and towards a greater integration of services. A private actor, like Nobina might even manage the overall integration of the public/private transportation network including the implementation and maintenance of a technological platform. This requires new contractual agreements as regards responsibilities (operation, investments), structure of payments and financing and contract period.

Nobina's shift towards mobility-as-a-service was partly driven by the shifts in the role of digital technical platforms, consumer (traveller) apps, and the access to digital consumer traveller data.

The shift from a public tendering procedure based on estimations of bus ticket sales per time period to a tendering process based on "the city citizens' total travel service needs" affected the regional public procurement principles and processes in all major stages (UNEP 2014). In the Preparatory stage, where the problem is defined and an inventory is made of the demands the citizens total travel service needs, including digital information access, drive the Preparatory stage of related internal and external stakeholders, resulting in a first set of specifications, including what total service package that should/could be offered to city citizens. Secondly, the activities and operations in the Specification stage needs to be adapted, defining the now broader service concept, including both services and the technical platform enabling the travel service package. The Sourcing stage with the new tender process needs to be adapted in all its steps from when the new service package specifications are made public to potential suppliers, to the stages and where the service supplier(s) – one or several in cooperation - are selected and signed. Finally, it is likely that the Utilization stage will require new public procurement procedures for following up on the delivery of the new, broader service package.

Reflections on both cases

Sustainable development criteria involve a wider perspective on *what types* of values are involved compared with a more narrow traditional business model analysis. To *balance and coordinate* the business and the societal *values* (including financial/economic ones) associated with service innovations emerge as one common business modelling challenge. For private actors such as Philips and Nobina, this implies a radical *revenue model shift*. Increased overlapping between public and private networks will blur the boundaries between the customer, the key partner, and the roles of supplier and distributor. In this respect, variation between different communities and different geographic locations adds to the challenges of developing business models aimed to coordinate activities across several involved business firms and localities, and to handle tensions between private and societal values. .

Public actors need to rethink policies in order to participate in the co-creation of service innovations: for example, this relates to procurement procedures, service operations, pricing and cost accounting models, infrastructure, and principles for public/private collaboration. The two cases point to the general attribute of public service innovations that resources of several cooperating actors, private and public, that have to find their roles, positions and relationships.

The WEF 2016 report states: ”Government leaders, regulators and civil servants have a significant opportunity to support the adoption and dissemination of new technologies, using the key levers that are available to them: setting the appropriate policies, regulations and national strategy for digital, while also transforming government agencies into hotbeds of innovation. Other important success factors include enhanced collaboration, both nationally and internationally, and the ability to engage the whole ecosystem of government, business and civil society.”(p.22) WEF´s statement focuses upon public actors while we present a private business perspective..

Issues for further research

Below we list five issues that we argue should receive increased attention in practice and research. Both the cases refer to public service innovations that are in an experimental stage. Both refer to two megatrends in society, concern for sustainable development and for digital transformation. It seems that following such early stages in public service innovation processes would allow researchers to understand the interaction between business modelling and public service provisioning modelling and more generally private-public interaction for sustainable development.

Of special interest then is:

1. Adaptation of procurement practices from tendering individual products/services to “procurement” of service innovations in private/public interaction. Procurement and service organization, criteria, negotiation procedures, contracting, investments, ownership. Institutional considerations. Tensions and conflicts. National government influences, e.g. innovation support, legal adaptation.

2. Adaptation of the seller´s business modelling before, during and after the specific procurement case. Development of value offerings. Organization to handle the increased complexity on the customer side. Internal and external resources needed to design and effectuate an offer, including performance criteria. New partnerships or further development of established ones. Role and position in the supplier network. Tensions and conflicts. Points 1 and 2 have much in common with prior practice and research on systems selling, functional selling and solution business.
3. Development of digital infrastructure for performance of the service innovation. Creating new or association to established technical platforms, establishing network of sensors and accessing data to operate the service. Which actors that are involved in developing, managing, owning these infrastructure elements and systems are of great importance.
4. Evaluation of how the innovation has performed in terms of sustainability criteria and in terms of public-private interaction and cooperation. Performance evaluation of an innovation involves many actors, including specialized actors. (Examples exist of poor performance of public-private cooperation initiatives, cf. the Swedish hospital case NKS, indicating that learning based on experience and research is needed)
5. How is the specific service innovation (like City Lighting or MaaS) diffused across space and time, maybe with different origins and in different forms and with different business actors involved. Different business models and service provision models?

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