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# Service innovations enabled by Internet of Things

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## Introduction

Contemporary service innovation is to an important extent stimulated and enabled by developments of information technology. A fairly recent technical development is labelled *Internet of Things* (IoT) based on the fact that also devices and objects are connected to the Internet. IoT also means that individual objects, and interrelated collections of objects e.g. in homes and cars, can be made uniquely identifiable by radio tags, sensors and actuators, and thereby become virtually represented in wireless and wired internet structures. New Internet Protocol (IP) versions have the capacity to communicate with all and any kind of natural or man-made objects.

The dominating focus in IoT discussions between business and academia (mostly technical universities) is on technology, infrastructure and technology suppliers. Much less is devoted to aspects of *business* network dynamics even if there is growing awareness that service innovation processes engage resources across many industries and knowledge areas, requiring interaction and restructuring of roles and relationships including also the users. Analyses of service innovation in practice most often perceive them as network processes. This is the network phenomenon we focus on.

This paper draws on empirical insights from a number of research projects with different connections to the Internet of Things.[1] In this research, various recurrent views and ideas appear on which we base a conceptual framework for

[1] For example: *Business models for the Internet of Things*, Marketing Technology Center (MTC), (ongoing research project initiated 2012) (http://www.mtcstiftelsen.se/Bazment/484.aspx)

further analysis of service innovations: *business models, overlapping networks, intermediation*, and *objectification of actors*.

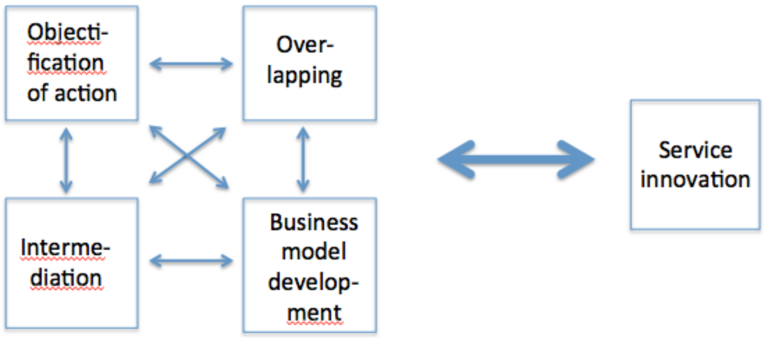


Figure1. Network processes for service innovation

**Purpose and disposition**

Our purpose is to analyze IoT enabled *service innovations as network processes*. IMP thinking has already from the beginning taken place in a multidisciplinary setting in the sense that *inputs* emanate from a number of scientific disciplines, such as economics, sociology, psychology, organization, technology. (Unfortunately to a much lesser extent, IMP research *output* has had a multidisciplinary impact.) Our prior understanding, based on own research and literature on ICT related service innovations, has allowed us to construct a conceptual, analytic framework. Service innovation processes are regarded as dependent on the interaction between *business models*, *objectification of actors* and the business network concepts of *overlapping* and *intermediation*, related to the ARA layers of network relationships. Application of IMP thinking in a multidisciplinary setting refers to the two variables *business model* and *objectification of actors.* The business model concept has recently been widely diffused in ICT business practice and in the literature mostly in technical and strategy journals and to only a small extent in marketing research publications (Coombs and Nicholson, 2013). Allowing agency for objects as included in “socio-technical devices” or “socio-technical agencements” is part of sociology of technology studies (STS) and in actor-network theory (ANT), stressing materiality aspects of actors (e.g. Callon 2008) while in IMP thinking objects are considered as resources.

First we will discuss the service and service innovation concepts, referring also to business network research. Second, we will describe and discuss the IoT phenomenon. Third, we will focus on the business model concept in a network perspective. Fourth, we present and discuss, related to our conceptual framework, some observations on early stages in an IoT enabled service innovation process. We conclude by some ideas about continued research on service innovations applying IMP thinking in a multidisciplinary setting.

## Service innovation

Service innovations engage physical products, many knowledge areas, actors from different industries, in combination between established and new, as complement to, or as substitute to old service combinations. When different knowledge areas and industries are involved in service innovation, cooperative and competitive relationships in business practice change. Service innovation processes of this nature also involve a number of often heterogeneously designed pilot projects aimed to test technical feasibility, business connections and value co-creation (Andersson et al. 2012). Such pilot studies can be regarded as design and tests of potential business models for a service innovation. The service providers´ interface with the customer/user may change as well as allocation of costs and revenue. The complexity of and interdependencies in service networks, demonstrated in Henneberg et al. (2013) illustrate these problems. The perspective on value of a service needs to be widened to more actors than a supplier and a user and value creation need to be analyzed and handled through interaction and co-creation of values (Ford & Mouzas 2013).

## Internet of Things

It is often argued that with the IoT we are witnessing the next major step in the evolution of the ICT industries and infrastructures. IoT is said to represent a major departure in the history of the Internet, "as connections move beyond computing devices, and begin to power billions of everyday devices, from parking meters to home thermostats".[2] The definition of IoT is still rather fuzzy and still developing. A short one is: IoT is a world-wide network of uniquely addressable interconnected objects (Eposs 2008). In focus is the impressive number of devices that will be connected in the new IoT infrastructures. Objects can communicate regardless of their position in space. Their spatial position, and changes in position, may be observed. IoT opens new opportunities to connect activities, resources and actors in business networks. Examples include innovative bundling of services and establishment of new business actors.

A large and diffuse layer of devices, sensors, and computing power that overlays various industry sectors is depicted where the emerging IoT systems account for an increasingly huge number of connections between the devices. However, more importantly, this massive number of connected, real-world objects get digital identities and can then be integrated into a network and be associated with digital information or services. Hence, the initial interest in IoT as a *technical innovation* is successively being replaced by an increasing interest in IoT as a foundation for (information based) *service innovations.*

## Business models - a concept used for commercial ICT implementation

In the intersection between ICT and business, a new concept has emerged during the 1990s and has become widely adopted in practice: the *business model*. It originated when the rapid internet and other ICT developments stimulated entrepreneurial activities to develop new services. The technology opened up for new and alternative designs for quality, provision and use of services. Traditional industry and market boundaries became blurred (Osterwalder et al. 2005) and it became necessary for new ventures to explicitly consider how to relate to complementary resources for co-creation of values potentially emanating from the technology development. Later the business model concept was also diffused to established firms involved in development and commercialization of ICT innovation. For new ventures, business models included network considerations

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[2] Business Insider headline: Here's Why 'The Internet Of Things' Will Be Huge, And Drive Tremendous Value For People And Businesses" describing a new report: *Here Comes The Internet Of Things* (http://www.businessinsider.com/growth-in-the-internet-of-things-market-2014-1#ixzz2ryi2krJN)

and that has more or less been inherited for application also to business models in established firms (Ehret et al. 2013). .

Our experience from interviews and workshops is that managers keep coming back to the problems of how to develop and implement “the new business models” for service innovations. Attention is thus directed from the technical aspects of innovation to the business aspects of service innovations enabled by the technology. Alternatively, more or less new configurations of business units involved in co-creation of the value of a service innovation challenge traditional roles and network positions. Thus, a service innovation process involves not only technical innovations but also business innovations, i.e. development and implemenation of new business models. To develop and stabilize new business models in practice is problematic since the network configuration and old business models of actors involved in co-creation of value of the service innovation need to change, which might be regarded as negative for some actors who might prefer alternative business models. An example is the problem to get a wide adoption of mobile payments due to different revenue consequences for involved actors depending on business model alternative (e.g. banks, mobile operators, card companies, sellers, buyers).

There is a diversity of understanding and use of business models (Osterwalder et al. 2005). Some business models are customer-value oriented and some are more technology oriented. The former are more outward looking and the latter are more inward looking. Business models are mediating constructs between technology and economic value, a sort of blueprint for how a service provision may be organized and how values and revenues should be realized. A business model expresses the business logic of the firm, what value the company offers to customers and the architecture of the network of partners. The main function of the business model is to connect technical potential with realization of economic value (Chesbrough & Rosenbloom 2002). The business model serves as a link between business strategy, ICT and business organization (Osterwalder et al a.a.).

A definition of business model (Timmers, 1998) contains the following elements:

1. An architecture for the product, service and information flows, including description of the various business actors and their roles
2. A description of the potential benefits for the various business actor
3. A description of the sources of revenues

The first point can be seen as network structure and the second and third points as outcomes in terms of value for the actors involved. A literature review conducted by Coombs & Nicholson (2013) finds that business models is a subject that has been sparsely treated in marketing journals, compared to journals focused on ICT, organization and strategy. A typical example is the contributions to a special issue on business models in *Long Range Planning* (2010). In this issue the articles put an individual supplying firm´s business model in focus, largely disregarding the dynamics of interaction with other firms to design and implement joint or complementary business models that promote a wider adoption of a service innovation than that emanating from a specific individual firm.

Coombs & Nicholson (a.a.) suggest that marketing studies, including business network studies, with a focus on value co-creation would contribute importantly to knowledge about business models. Also Ehret et al. (2013) and Mason & Spring (2011) propose a network approach to understand the role of business models, in line with the original use of the concept in analyses of how new ventures might manage to integrate resources by means of network relationships. Palo & Tähtinen (2013) present and analyze a case of ICT enabled service development including urban computing services. They refer to *networked business models* as dynamic devices to develop "strategic nets" of cooperating actors, with a more or less defined leadership, serving as mental models and devices to explore the market, to shape and coordinate action and to aid the development from pilot stage to full scale market introduction.
Mason & Spring (a.a.) discuss how business models of networked firms must in some way overlap or be complementary. Business models must have multiple

sites. Business model processes are incrementally emerging, ever-changing and must be awarded performative power.

Adding to the above arguments for a network perspective on business models, Olsson et al. (2013) find that the three network layers of the ARA model fit well with what in the literature (e.g. Zott & Amit, 2009) is declared to be the main aspects of business model. Thus, the network structure and processes that a specific business model represents needs for its implementation to be seen as embedded in a wider dynamic network with a heterogeneous history. Different actors that need to cooperate in a business model may prefer different designs. The design of a business model may to a different extent be influenced by a specific, individual actor. Conflicts between actors with different business models need to be handled. The design and implementation of the business model needs to take into account how a specific architecture can be realized.

For an innovation of the magnitude and uncertainties represented by IoT with the multitude of network interdependencies it is not possible for an individual actor to independently develop and implement a sustainable business model for IoT enabled service innovation. Interaction with other actors, whose business models may be in harmony and/or conflict with each other are needed. A service *net* (embedded in a wider business network) needs to be established and stabilized during the service innovation process.

**Overlapping between networks**

In principle, business networks are inherently open. However, connectivity in the overall network is not evenly distributed. Some actors, activities and resources are more strongly connected than others. Since the overall network cannot be understood by analysts or business actors, some criteria for boundaries between different networks need, for analytical and/or managerial purposes, to be applied. Some such criteria are defined in objective representations like spatially delimited markets and industry classifications. Some are related to subjective perceptions of interdependencies in networks, e.g related to actual or potential competition and cooperation. Over time, connectivity and interdependence between networks change. Examples are globalization, mergers and acquisitions, technical convergence, and the bundling of services. We may conceptualize such processes as *overlapping* between networks. (Mattsson 1998). "Overlapping changes the network structure and thus also actors´ positions and the conditions for network coordination" (Mattsson a.a. p 245).

IoT enabled service innovations provide many examples of network overlapping. These processes require an increased number of network connections between actors and resources positioned in what is considered as different industries with prior few network connections. Such overlapping between networks, imply the need to consider and handle new interdependencies within and between the ARA layers (Håkansson & Snehota 1995). Activity patterns, resource constellations and actor webs that provided a specific service before the IoT application may, or may not contribute to, co-exist with or compete with the emerging service innovation.

**Intermediation**

The *intermediary* concept is mostly used in distribution literature for actors intervening between production and consumption. In a business network perspective the concepts has a wider meaning. All actors are intermediaries in the sense that they make other actors indirectly related to each other (Snehota & Gadde 2001). With reference to the ARA model also all activities and all resources might be seen as intermediaries within a network´s activity pattern and resource constellation. Intermediaries *intermediate* in network processes. Intermediaries affect, and are affected by network processes. Intermediation is thus a network process that also has technological attributes in terms of relationship substance and network effects (Håkansson & Snehota (a.a) that are of special interest in an IoT context.

In contrast to the ANT conceptual framework (Latour 2005, p.39) we use "intermediaries" in the sense of "mediators", i.e. they are engaged in material and immaterial transformation.

Service innovation processes might require, or stimulate, changes in intermediation sometimes also entry of new actors as intermediaries (Andersson et al 2011). Application of IoT results in changes in *intermediation technology*. For example, this could be a change in which actor intermediates with a user when individual services are bundled and become available via a common platform, rather than individually via separate platforms. Such a change in the actor layer change also affects intermediation in the activity and resource layers.

*Overlapping and intermediation are two interdependent network processes.* Service innovation requires actors to handle overlapping and intermediation in new ways. This is important because in a business network the value of each resource is dependent on its connection to other resources and the execution and outcome of any activity is dependent on other activities. Actors do not evolve autonomously, they co-evolve with specific others (Håkansson et al. 2009). Overlapping and intermediation are in these respects important for service innovation and need also to be handled in emerging business models.

Implementation of business models and overlapping between networks as part of the service innovation process have effect on how ARA layers are related to each other in the network. Changes in how actors are connected to each other, including entry and exit of actors, change intermediation structures and processes. Of special interest is that in IoT also material resources are awarded agency and may, as actors intermediate between human, as well as between material actors. The new intermediation technology that IoT enabled services imply, likely changes connections in networks (e.g. location and bundling of assortment of services, connection between provider and user of services).

For example, mobile operators who used to have a dominating role as intermediary for mobile telecom services, linking service application and technology providers with individual consumers and enterprise customers, will in IoT applications see their position threatened by other actors. For example, IoT based remote patient monitoring, implying increasing access to care and decreasing health care costs, require re-organization, sometimes radical, of relations between patients, care providers, health care support units, technology providers, hospitals, wireless system providers and others. *Intermediation* in the network will change, and actors, including objects, will take new roles as *intermediaries*.

**Objectification of actors**

An object, a resource equipped with sensor, actuators etc. due to its identity on the internet web, can be seen as an actor in its own right, acting with or without interference from a human actor (even if there always is, or has been, a human element in the programming of how, why and when, to act). These sensor-laden, intelligent devices will be able to communicate with other things in people's lives and in the activities of organizations. In the everyday life of consumers many products have already crossed over into the IoT, including kitchen and home appliances, lighting and heating products, and insurance company-issued car monitoring devices. This leads to what we here label, *objectification of actors*. Objects/devices, alone or related to humans, as capable of agency in innovation processes is an important aspect of STS/ANT- related studies of markets, and action taking place in hybrid collectives, techno-economic networks (Callon 1992) later labelled "socio-technical agencements" (Callon 2008). Cf also market practice and market shaping studies emanating from industrial marketing research, in which devices have an important role (Araujo et al. 2010).

In a prior study of payments using mobile phones, these objects/devices/things depending on their design (e.g. location of the "secure element"), change the network positions of established and new business actors, including other devices, and shape the assortment of services available to users of the phone (Andersson et al. 2009)

Activities performed by uniquely identifiable objects can be linked to activities performed by other such objects. IoT technologies enable new resource ties, thus also potentially affecting activity links and in turn activity patterns. As an actor, an IoT related object may also develop bonds to other actors, inside and outside of IoT and become a node in a web of human and non-human actors. A specific object, as an IoT represented node, might be owned by a specific company, might be co-owned by several companies or might be part of a public or private infrastructure. An important issue, related to business model design, is who has the authority to equip an IoT object with agency including how it is interacting with other IoT objects. At the company level in the ARA framework, activity structures and resource collections will be affected if IoT based service innovations are developed and implemented in the business networks in which the company is embedded. The IoT network might attract and integrate new intermediaries.

As IoT links uniquely identifiable objects to their virtual representations in the Internet, the objects that are connected are likely to receive a changed status in the networks. Facts about an object, such as its location in time and space - given that this information is important for some action being taken – will lead to a changed status and role of objects.

Below we will provide an empirical illustration from on-going IoT based service innovation processes. aimed at testing the validity of the conceptual framework and suggest directions for further research on ICT enabled service innovations.

**Empirical Illustration: The Connected Vehicle**

IoT technology currently covers many application areas, sometimes in combination, such as security (e.g. access control, security care for elderly, time reporting for home care), tracking and tracing (e.g. fleet management, logistics for goods transportation), payment (e.g. mobile payments), health (e.g. e-home care), remote control and maintenance (e.g. smart homes, environmental monitoring) and metering (e.g. smart power grids). Academic research in management and marketing on IoT are yet quite few and consultants and specialists on information technology have been more active, see e.g. Chui et al. (2010).

In this paper we refer to the case of *the Connected Vehicle* as illustration of our conceptual discussion, an ongoing (in Spring 2014) case study in which we are involved as academic observers. In this paper, we present a general picture of the fairly new processes leading to the emergence of systems in which cars and trucks more and more become connected to the Internet and wireless networks. The data presented is collected mainly from different (mainly publicly available) secondary sources. Some data upon which the generalized case is based has also been collected in a first round of interviews and meetings with representatives of a car manufacturer and one of its major technology platform suppliers. The case is mainly used as support for our conceptual analysis. The empirical accounts presented are kept on a general level, but includes some specified actors involved in these processes, for example automaker Volvo Car Group and technology supplier Ericsson.

Thus, the information on which the case is built only refers to service innovation processes in early stages, plans, visions, technical feasibility, pilot projects. Even if it will take a long time before the specific IoT based services have come into wide-spread use we believe that studies of early stages will reflect important aspects of service innovation processes, related changes in market practice and help in development of analytical frameworks for further studies.

## The Case

In December 2012, the auto manufacturer Volvo Car Group and Ericsson announced in a press release their new partnership to take the new Connected Vehicle Services to market.[3] The Connected Vehicle concept was not new, but this announcement signalled a step towards commercialization of the technical innovation, and the associated, new services. Ericsson's Multiservice Delivery Platform and Connected Vehicle Cloud solution would form the technical foundation for providing infotainment, apps, communication services and more in Volvo's new cars. Hence, drivers and passengers would be able to access applications for information, navigation, and entertainment from a screen in the car. Volvo Car Group would also be able to open parts of the platform to many other members of the automotive industry´s "eco-system". Content providers would be able to have agreements with Volvo and internet radio providers, road

[3] "Connected Car services come to market with Volvo Car Group and Ericsson", press release, December 17, 2012 (Ericsson)

authorities, cities' governments, toll-road operators and others. The car would become a new hub for a number of connected services, by allowing the car to share internet access to other devices, inside and outside the vehicle. IoT technology would provide additional benefits, e.g. automatic notification of crashes, notification of speeding, and more. Interaction with the driver's Smartphone, and apps would be available and would interact with the car from any distance. Drivers could unlock their cars, check the status of batteries on electric cars, find the location of the car, etc. Various sensors in the car would allow for continuous, remote diagnostics and interaction with various functions of the vehicle. Drivers would be able to download applications and interact with many new partners through the Connected Vehicle Cloud built on Ericsson's Service Enablement Platform.

The business press described the automotive industry as one of the forerunners in the devlopment towards the new networked society:

> "In the rapidly evolving networked society, everyone, everything and everywhere will be connected in real time. Smart connected devices, broadband networks and cloud-based services will further drive networking among consumers, enterprises and within society in general. An early beneficiary of this revolution will be the automotive industry. Consumers will enter an era where vehicles understand who is inside them and how to connect them to what they consider important. " (Wirelessweek).

Powered by the cloud, the connected car promised to extend this interactive dynamic to drivers and passengers on the road. The new technical platforms would allow for the emergence of new ecosystems of actors in different sectors coming together as parts of the new interconnected infrastructure. (See fig 2)

It was also expected that this would allow some actors to create stronger relations and partnerships:

> "Partners such as dealerships, repair shops and other relevant third-party entities will benefit through drivers' enhanced ability to interact with vehicle manufacturer's CRM interfaces and databases." (Wirelessweek).

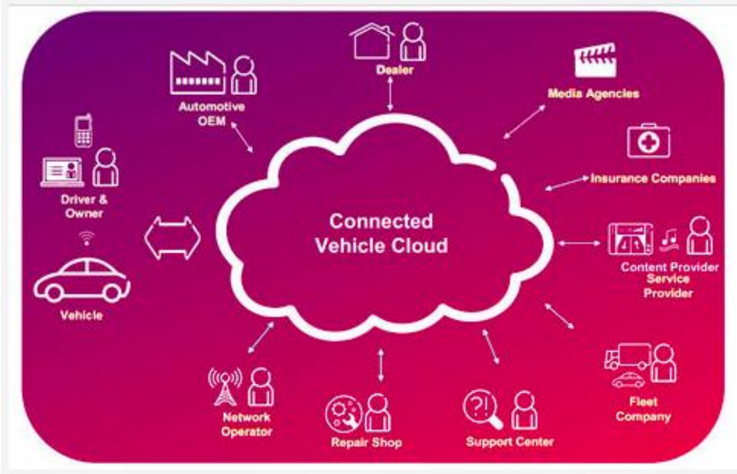


*Figure 2 . The Connected Vehicle Cloud ecosystem*

New innovative developers would likely be attracted by the prospect of access to an open platform on which they could create new apps or extend existing offerings.

Ericsson presented the new interconnections between previously unconnected or weakly connected sub systems in a figure depicting five broad activity and service areas.[4] (See fig 3) Volvo Cars would be able to open parts of the platform to other members of the automotive industry´s eco-system such as content providers that will have agreements with not only Volvo but also internet radio providers, road authorities, cities and governments. As noted, the new system of actors would connect both business actors and public actors like road authorities. The system would also connect actors within the existing car business networks with actors previously more remotely connected, like e.g. media and entertainment actors.

In early 2014, several new partnerships and alliances connected to the car platform were announced. Ericsson's large customer in the mobile operator business, AT&T, announced that the company was launching together with Ericsson a modular connected car platform, packaging connectivity, billing, data analytics and infotainment to car makers and developers, for them to create their

[4] http://www.ericsson.com/thecompany/press/mediakits/connected-vehicle

own customised offerings. The operator teamed up with Ericsson to create the platform (Ericsson's Connected Vehicle Cloud based on Ericsson's Service Enablement Platform), which AT&T as supplier would bring to the automakers. AT&T also announced the opening of a new connected car centre in Atlanta, the AT&T Drive Studio, serving as new a hub where AT&T would be able to respond to needs of automotive manufacturers and the auto ecosystem at large.


*Figure 3. Ericsson: "What is Connected Vehicle Cloud?"*

New services were also being tested. For example, in February 2014, Volvo Cars in Sweden announced the test of a new service based on the connected car concept: food delivery to the car.[5] Once an order is placed online by the car owner and the vehicle of choice is selected as the drop-off, a courier is given GPS coordinates to that location and a one-time use digital key. After the car owner has accepted the delivery via smartphone or tablet, the digital key is activated, allowing the one-time access to the trunk. The food supplier Linas Matkasse was the first of its kind to participate in the new delivery service. However, the connected car concept as a base for service innovations with the potential to reach mass markets was not without obstacles.[6] For example, Machina Research

[5] http://www.engadget.com/2014/02/20/volvos-roam-delivery/
[6] Reported in the business press (Forbes): http://www.forbes.com/pictures/mkk45ihlk/10-obstacles-for-connected-cars/

and Telefónica Digital (2013) found one such obstacle to be differences between the automotive industry and the mobile communication industry:

> "The difference in lifecycles in the automotive and the mobile industry is a serious challenge for the future of connected cars. New features, such as operating system upgrades and new applications, are provided almost constantly for the smartphone, whereas car manufacturers work on five-year cycles." (ibid)

Uncertainties between mobile operators and car manufacturers also concerned the best way to connect the car to the web. Basically two different options were discussed and used, each with different implications for the relations between actors, including those with drivers/consumers: 1) Built-in car applications were expected to be preferred for features that consumers expect in a vehicle: navigation, driver safety, security, and more. Many of these applications could be enhanced by connectivity, but might not require that, and 2) some drivers would prefer non built in, pocket applications that were brought into the vehicle on smart phones and other consumer devices. In addition, cloud application could be reached also with the help of a browser or lightweight web app the vehicle.

It was debated whether the built-in options might provide stronger connections, and that some consumers would still prefer connecting their existing smartphone to the car via Bluetooth or USB cable, having full access to their personal contacts and playlists (ibid). It was also expected that introduction of the connected car would change the relationships between the actors in the existing car distribution system, even dramatically change the operations of the car dealerships. Teaching and supporting customers how to use their car's advanced technology was expected to lead to new relationships between established actors in the car distribution system, perhaps also strengthening the relationships with the consumers: "Automotive manufacturers will be able to shift their focus to creating long-term customer relationships in chasing infrequent, ad-hoc opportunities to sell isolated technology solutions. They will also be able to develop new revenue streams from integrated services." [7]. New

[7] http://www.wirelessweek.com/articles/2013/10/opinion-connected-vehicle-profit-and-value-hinge-m2m-and-cloud

business opportunities based on new services would lead to new revenue streams. This leads to the problematic issue of establishing completely new business models: “Service bundles, delivery channels, product pipelines, pricing and customer support will be heavily impacted, and in some cases new business models will need to be created from scratch as the dynamic between manufacturer, dealer and customer evolves.”[8]

Expectations regarding one important part of the emerging business model associated with the connected car, the revenue streams, were high. It was hoped that the connected car would unlock “a multitude of new revenue streams by creating new opportunities to connect with customers and opening up new business models that will allow for new and profitable relationships with third parties.” (ibid). However, for the mobile operators for example, creating a profitable business around this new IoT communication was a challenge. Traditionally, operators had not been geared towards delivering large numbers of subscriptions on a very-low-revenue per-connection basis:

> “A standardized and managed service delivered over the cloud can lower the threshold for network operators hoping to enter the M2M service market. Recruiting the support of infrastructure partners who can help present network and data assets in a reusable, standardized way can help the operator take full advantage of the opportunity. This “service enablement” approach permits in-house and, critically, external third parties to create new marketable value-added services quickly and efficiently.” (ibid)

Questions were also raised on who will pay for connected car services:

> “Consumers are used to a one-off payment when purchasing a car, but with an embedded connection there is an additional bill to be paid in terms of connectivity. Will you add your car as a "device" to your existing mobile bill? Or will the added cost be rolled into your car payment? Who will pay for roaming and data usage? New business models will need to be developed.” (Forbes 2013)

[8] file:///Users/dpa/Desktop/Connected%20car%20mtrl/Report%20-%20Connected%20Car%202013%20reveals%20car%20industry%20must%20remodel%20itself.webarchive

This also raised ideas that the future car customer in some cases would prefer other business and payment models, that is, connected cars might in the near future be likely to be shared cars:

> "Automakers agree that selling 'just' cars is no longer feasible. It is mobility - with required connectivity to customer services and advanced functions like power management for electric vehicles- that is needed today. That creates opportunities for new ownership models, like Zipcar's car-sharing service." (ibid)

Mikael Gustavsson, Connectivity HUB Leader at Volvo Cars presented his view of the future business models and revenue flows:[9]

> "Increased aftermarket customer spend is probably not a remarkable add to an OEM revenue, except for one area: map updates and added information into navigation applications. Remote diagnostics, predictive maintenance and, by that, reduced warranty cost are some of the most important parts in the connectivity business case, besides the traditional parts of revenue, like car and option sales. 'No one gets rich on apps or Internet content,' especially not a car OEM. No, this is not a direct revenue generator for an OEM. Indirectly, it will create customer satisfaction and, by that, revenue in car and option sales. With competition in the aftermarket in Europe, the connected car and connected customer (CRM) could be very important tools to create customer loyalty. One example is the connected service booking that Volvo Cars is running a pilot on for the past one-and- a-half years, with thousands of customers connected. This creates customer satisfaction in the TCO (total cost of ownership) area and also increased workshop traffic in our workshops instead of the independent workshops."

Ericsson's Magnus Lundgren, Director-Service Enablement stated:

> "Connection to your customer is vital to make offers. In the classic 'product, place, price and promotion,' you are with the connected car able to better act on 'place' and 'promotion.' Ericsson is helping many industries connect their products and enable them to transform as a player in the networked society. There is no doubt that the efficiency gains for a connected industry process are large. The automotive industry is no different. Acting on real time data in a correct way will improve the manufacturing process. The connected car opens a world of possibilities to engage for actors in the automotive ecosystem. The user of the service might not be the one directly paying for the service; there will be many different ways for charging for services." (ibid)

[9] The Connected Car Business Model, Telematics Update White paper (2013)

The mobile operators' own industry organization asked for a business model innovation, stating that:

> "The strategic positioning of automakers on telematics and infotainment services is at the heart of defining their value proposition and the appropriate business model. Up to now, this positioning generally has been based upon the assumption that automakers will be the owner of the whole process and the final customer. This position may need to be reconsidered, given the greater complexity of forthcoming services and the need for swift deployment. Expanded value-chains are going to be required to create multiple revenue streams. Automakers are going to have to define how to pursue their core interests while building the strategic alliances that can provide a fast time to market. Attracting and leveraging the involvement of developers will also be important for the evolution of the service supply."[10]

Particularly challenging for business model innovation was the fact that two actors and industries with little prior experiences from deep cooperation had to find new modes of working together. Operator Telefonica described in their Connected Car Industry report (2013) in a figure (see fig 4), stressing the differences in industry backgrounds and logics:

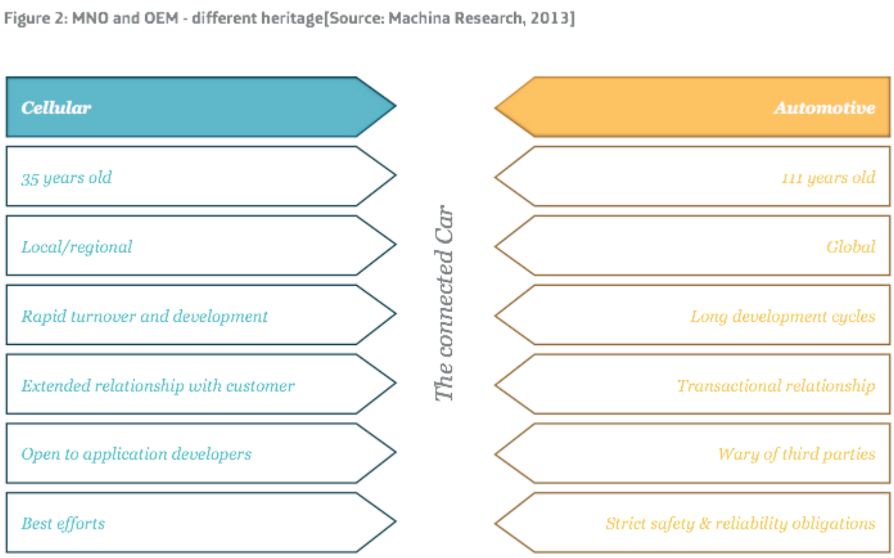


*Figure 4 Telefonica: Connected Car Industry report (2013)*

[10] GSMA: "Connected Cars: Business model innovation" (May 2012)

It is also argued that the connected cars will likely be associated with shared cars. Selling ‘just’ cars is no longer feasible. This implies a radically changed business model. It is mobility - with required connectivity to customer services and advanced functions like power management for electric vehicles that will be needed. That creates opportunities for new ownership models, new business models supporting for example car-sharing services. As stated by Forbes when asking “Who will pay for connected car services”:

> “Consumers are used to a one-off payment when purchasing a car, but with an embedded connection there is an additional bill to be paid in terms of connectivity. Will you add your car as a "device" to your existing mobile bill? Or will the added cost be rolled into your car payment? Who will pay for roaming and data usage? New business models will need to be developed.”

Lastly, in order for e.g. a mobile operator (like AT&T) to be able to support the provision of new ICT based services by the automaker, they had to rely on technology suppliers like Ericsson to deliver new, *technical platforms*. Hence, Ericsson delivered a scalable platform architecture that was required from e.g. an automaker to be able to manage the ecosystem of actors providing the new set of services. The new technical platform became a new important *point of connection* for actors of many types, delivering associated with the connected cars.

**Discussion**

What does the case illustration above say about IoT based service innovations? Starting from the very end of the case, it is obvious that how *the new technical platform* delivered by one of the technology suppliers (Ericsson in this case) received an important role as intermediary in the network linking the car and its user to a very diverse set of actors delivering a new bundle of services. A similar situation is when service innovations are based on smartphones acting as intermediaries between providers and users for a new assortment of (mobile) services. The technical platform in this case becomes the connection point for car use related services of many different kinds (entertainment services, road safety services, after sales services and more.) Which actor that will have the main control or influence over the new intermediate platform, and hence what set of actors/suppliers that will become connected to it, seems not to be stabilized in the case. While the automakers, for many reasons, probably claim an important role in controlling the technical platform, also powerful mobile operators like AT&T, seem to have such ambitions. As the technical platform was built up of many separate, technical modules, this opened up for the actor(s) controlling the platform, to manage the degree of openness and flexibility concerning which new actors that would be able to connect their services to the platform.

The tensions between the two main actors (operators and automakers) involved in the management of the new intermediate, technical platform indicated the difficulties to connect two partly opposed *business logics* (see figure 4). The difficulty to create and increase the overlap between the mobile operator and the automaker networks was in the case and by the actors themselves explained by the difficulties to connect actors with very different *business models.* The difficulties to implement the new service innovation(s) - manifested for example in the end user being able to access and perform a new bundle of previously un-connected services – was explained by the fact that the two types of actors´ business models were based on different, *temporal and spatial business logics* (see fig4 where differences in industrial "life cycles" are stressed).

In ARA model terms, the web of actors in the automakers and the operators networks did not overlap to a large extent but each were internally interconnected by long-term interactions and relationships. As for the activity layer, temporal routines in the ways that activities were performed and connected were also very different in the two networks (cf Ford et al 2008). The same applies to the resource layer. Successive interaction over time had resulted in two different industrial logics in the two networks. In line with Mason & Spring (2011), the (different) business models seem to involve many locally adapted situations, i.e. business models are locally situated. The business model associated with Ericsson´s cooperation in Sweden with automaker Volvo is different compared to Ericsson´s links to American automakers in USA, via its relationships with the operator AT&T. In other words, the structure of intermediation in the network potentially strongly affects how the business model for one and the same actor has to be locally adapted. It can also be anticipated that the actual service innovation – here manifested in *a new bundle of services* offered to the car user – also would look different to the local Swedish and the local American car users, depending on differences in the intermediary role that the local car manufacturer and/or the mobile operator would take. The network position of local actors would affect important dimensions of the business model.

**Implications for continued multidisciplinary research**

Relating to IMP thinking in a multidisciplinary setting we propose that basic IMP ideas can be applied to service innovations enabled by new ICT developments (IoT) in which a management phenomenon, i.e. business models and a technological phenomenon i.e. representation of objects on the Internet (IoT) are put in a business network context. We propose, and have also in our conceptual and case analyses demonstrated, that the four interdependent concepts in the model are important to understand the service innovation process. The arrows in the model are double-headed to indicate dynamic interdependencies in the service innovation processes. Below we discuss some research issues based on figure 1 that we for ease of reading repeat below.

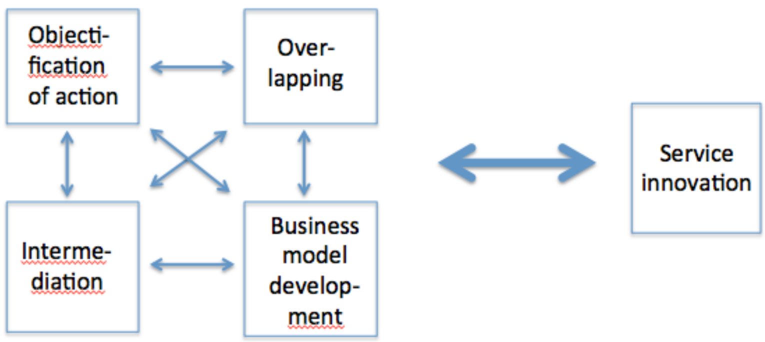


*Figure 1 Network processes for service innovation*

First, what is the role of *overlapping* in *service innovation*? It is commonly argued that for an IoT enabled service innovation to develop an overlapping process is necessary involving networks with previously little interaction. This is sometimes labeled technical or market convergence. As the service innovation proceeds overlapping will influence both cooperation and competition, sometimes leading to co-opetition, between actors during the overlapping network process, e.g during a number of pilot projects (as demonstrated in Andersson et al. 2012).

Second, how is *intermediation* related to *overlapping* in *service innovation*? An example is to what extent services are bundled and provided by one or more intermediary. Some observers argue that IoT solutions, and thinking about problems and solutions, are still most often focused within traditional application boundaries thus separating provision of services for energy, transport, health, media etc. and intermediating separately with customers (references to be added). IoT might however also enable a common platform for intermediation. Due to heterogeneity in business networks and temporal aspects of relationships, *intermediation* is dependent on earlier adaptation and stabilization in the network.

Third, how does *objectification of actors* affect *overlapping* and *intermediation* in service innovation? Studies of innovations based on smartphones showed that assortment of services could be stored in, acquired by or provided by this object acting as an intermediary between providers and users (e.g. Andersson et al. 2009). In IoT several objects are interconnected on Internet, which means that intermediation becomes of growing interest for understanding service innovation. How objects (the "things") are connected via the web is thus of major interest since it is related to the bonds in the web of actors, the resources, activity links in activity patterns and resource ties in the resource constellation.

Lastly, how is the development of *business models* affecting *service innovation* processes? A business model can, before it becomes part of realized practice, be described as a potential network structure (that is embedded in a wider network). Overlapping, intermediation and objectification of actors are processes needed to realize a ICT business model´s network attributes and to advance a service innovation process towards practical implementation and spread of the innovation among users. However, business models for different actors might be in conflict with each other and also with business models for established services in which an actor is involved.

Examples of research issues above show that all the four variables are involved in service innovation and also that service innovation affect the these variables which in turn further affects change and stabilization of the innovation.

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