

Ericsson – The History from Product to Solution Provider and Challenges and Opportunities in an Evolving Environment

Sofi W. Elfving, Mattias Lindahl and Erik Sundin

Linköping University Post Print



N.B.: When citing this work, cite the original article.

Original Publication:

Sofi W. Elfving, Mattias Lindahl and Erik Sundin, Ericsson – The History from Product to Solution Provider and Challenges and Opportunities in an Evolving Environment, 2015, Procedia CIRP, (30), 239-244.

<http://dx.doi.org/10.1016/j.procir.2015.02.107>

Copyright: Elsevier

<http://www.elsevier.com/>

Postprint available at: Linköping University Electronic Press

<http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-121586>

7th Industrial Product-Service Systems Conference - PSS, industry transformation for sustainability and business

Ericsson – The History from Product to Solution Provider and Challenges and Opportunities in an Evolving Environment

Sofi W. Elfving^a, Mattias Lindahl^b*, Erik Sundin^b

^aEricsson AB, Färögatan 6, 164 80 Stockholm, Sweden

^bDepartment of Management and Engineering, Linköping

* Corresponding author. Tel.: +46-13-281108. E-mail address: mattias.lindahl@liu.se

Abstract

An increasing number of Original Equipment Manufacturers (OEM) are realizing that their products, earlier the foundation of their success, no longer stand alone in satisfying customer requirements. Customers now demand integration of services and bundling as well as increased active participation of OEMs during the use phase. Ericsson, a Swedish multinational OEM of communications technology and services, is an example of such a company. The objective of this paper is to describe, compare and discuss Ericsson's journey from a product provider to a PSS provider, e.g. by comparison with other industry examples. Furthermore, the paper highlights future challenges and opportunities for instance regarding business models, trends and product design.

© 2015 The Authors. Published by Elsevier B.V This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the International Scientific Committee of the 7th Industrial Product-Service Systems Conference - PSS, industry transformation for sustainability and business

Keywords: Transitions; Integrated Product Service Offerings; Mindset changes

1. Introduction

Besides intensified global competition, an increasing number of Original Equipment Manufacturers (OEMs) are realizing that their products, earlier the foundation of their success, no longer stand alone to satisfy their customers' requirements (see e.g. Kowalkowski [1], Lindahl, Sakao et al. [2] and Tukker and Tischner [3]). Their customers now demand integration of e.g. services and increased active participation of OEMs during the use phase. Service in this paper includes operation, maintenance, repair, upgrade, take-back, and consultation.

In parallel, and caused by society's and customers' increased awareness of growing environmental problems, the environmental and resource-related requirements of the OEM are getting tougher [4]. There exists today in society a desire for economic growth that is decoupled from resource consumption – in many cases the cause of environmental problems - to achieve a more circular economy [5].

The challenges above are forcing OEMs to find new ways to keep their offerings competitive, and among the most popular and fastest-growing solutions is to evolve from product to solution provider with a lifecycle perspective, e.g. by adding on service and taking increased responsibility for the use and end-of-life phases. This type of solution is also called Product-Service Systems (PSS) or Integrated Product Service Offerings (IPSO) [3, 6-9]. PSS is defined as “*tangible products and services designed and combined to jointly fulfill specific customer needs*” [3]. This paper uses the term IPSO in referring to this type of business offering in order to emphasize the integration aspect.

Xerox, a pioneering company in the IPSO area, realized when evolving from product to IPSO provider that they had to change their operations and faced new challenges. Remanufacturing, e.g., required an organized and predictable flow of cores and a new reverse logistics system. This resulted in new business models, e.g. leasing of copy machines, and the focus was moved towards creating customer value by providing performance, e.g. being paid per copy [10].

Furthermore, the focus came to provide more resource-efficient solutions with fewer products than seen historically.

This change towards IPSO made it possible for Xerox to reuse parts and remanufacture products several times in several offerings. There are economic and environmental benefits in combining PSS and remanufacturing (see Sundin and Bras [11]), but PSS by itself and remanufacturing have been found to be environmentally benign (see Lindahl, Sundin et al. [12] and Sundin and Lee [13]). In addition, if one is considering PSS and/or remanufacturing in the design phase, even more benefits can be gained (see Kerr and Ryan [14]). The experiences from Xerox are also supported by other studies; see e.g. Emtairah and Mont [15] and van Beers, Grossi et al. [16].

The objective of this paper is to describe, compare and discuss Ericsson's journey from that of product provider to IPSO provider, e.g. by comparison with other industry examples. Furthermore, it is to highlight future challenges and opportunities regarding e.g. business models, trends and product design.

2. Method

Besides a literature review about IPSO-related issues, this paper is based on an industry case – Ericsson, a Swedish multinational OEM of communications technology and services [17, 18]. One of the authors, Sofi W. Elfving, has been employed at the case company since 2011 as *Manager Service Systems Research*, which has enabled good access to relevant material and respondents.

The main data collection was based on semi-structured interviews [18, 19] with Ericsson staff, reports and one of the authors' experience in the business, in particular at Ericsson. The interviews were conducted in two phases in May 2013 and January 2015. Table 1 shows all respondents' positions and years at the company.

Table 1. Respondents' positions and years at the company.

#	Position	Years
1	Director, Strategy, Group Function,	19
2	Process & Portfolio Development, Group Function	15
3	Service Delivery Operations, Global Services	20
4	Manager, Business Development, Group Function	30
5	Manager, Strategy & Tactical Planning, Region Northeast Asia	16
6	Director, Strategy & Business Planning, Networks	30
7	Senior Specialist, Research and Development	15

The respondents were chosen with the aim to retrieve a service perspective, a product perspective and the perspective of group functions, i.e. the overall company strategy. The first run of interviews was conducted face-to-face using a semi-structured interview guide. The guide was developed from knowledge attained in a series of previously conducted studies in the field of IPSO transformation (described further in Elfving and Urquhart [20] in combination with literature studies aiming at formulating assumptions and testing those, i.e. iterating in between description and prescription of the studied phenomenon (see Blessing, Chakrabarti *et al.* [21]). The interviews were transcribed and analyzed using an advanced developed framework based on an activity model

(see Johnsson [22]), revealing a number of factors describing the transformation process as perceived by the respondents and current state including challenges, opportunities and next steps. The second run of interviews was carried out with respondents via mail and followed up with additional clarifying questions.

3. Ericsson's Journey

Ericsson, founded in 1876, has customers in more than 180 countries [17]. The company started as a telegraph repair shop but soon after began to make and sell their own telephone equipment, and has successfully expanded their product range to cover e.g. infrastructure within ICT for telecommunication operators, including telecommunications and IP networking equipment, mobile and fixed broadband. Ericsson has a broad services portfolio including business consulting, system integration, and managed services.

During the last 30 years the service business at Ericsson has evolved, and most services have been created to meet the current needs of today's telecommunication operators, for instance the introduction of stored program control switches (AXE family of telephony switches), using computers to control the switching of calls through telephony exchanges which marked the way for service enablement. The approach that Ericsson took was to make both the software and hardware modular and easily expandable. This has been a successful approach, enabling advances in processing power and component density to be easily adopted and upgraded on live switches, and to introduce new functionality in software to be added in real-time. This approach also formed the basis of switches used in the cellular networks introduced around 1980 in the first generation of mobile telephony.

Services delivered during the introduction of AXE were offered as part of the contracts to supply value in the form of hardware and software. Services were thus considered part of the telephony systems and were dependent on those to exist. At this time Ericsson could be defined as a true product company, with each technology having its own services organization responsible to ensure that the hardware and software were delivered, installed, commissioned, and supported during their lifetime.

The creation of the first service portfolios (based on technology) began in the early 1990s and marked the first attempts to enable the sales organizations to position services as offerings. These early portfolios all followed the established ways of working that had been used in traditional design and product development. The beginning of 2000 marked a radical change of departure for Ericsson when it came to services. At the time, governments were selling 3G spectrum to existing and new operators. In a number of countries existing operators had to outbid potential new operators in order not to lose their market position; this led to inflated license costs, a slowdown in investment and a decrease in hardware and software sales for the vendors. Subsequently, in 2003 customer orders continued to rapidly decline, staff were laid off, and the company were close to bankrupt.

At a conference for Ericsson's top managers, Thomas Geitner, CTO at Vodafone, explained: *"We operators are on the brink of a fundamental paradigm shift. Now that many markets have exceeded the 70 percent mobile phone density mark, our challenge is no longer to secure the supply from Ericsson and other vendors so that we can build out our mobile networks and win new subscribers. Instead we must focus on increased usage of those networks and retaining the customers that we have captured"* [23].

These events marked the starting point of a radical change in the business mix and governance of the company. With the aim to take advantage of synergies all separate services organizations and portfolios, which existed in the various technology organizations, merged into one service portfolio with one responsible organization. The business unit Global Services was established and despite the difficult times, the unit made progress with turnover reaching SEK 26–27 billion. The raw model was IBM, which had gone from a technically-driven company into one adapted to its customers, which changed its focus from hardware to software, and which developed consulting and outsourcing into core business areas.

Today, Ericsson earns close to 50 percent of its sales from its service and solutions business [17], and IPSO is an important issue for Ericsson's current and future businesses. In contrast to a number of other OEMs, e.g. GE, Siemens etc., Ericsson is not structured as a conglomerate. Instead, it is divided into a number of business units responsible, for instance, for strategy and development; 10 regions responsible for sales and delivery; and an overarching group function which covers e.g. research, IT, finance, corporate strategy etc. The Global Services unit has been entrusted with planning, building, running and enhancing more networks than any other and has the ability to build, operate and manage any network, or integrate any network technology, regardless of the equipment currently in place, anywhere in the world.

Currently, Ericsson faces both internal (e.g. mindset change) and external challenges (e.g. competition) which need to be overcome in order to have a successful and smooth transition towards IPSO. These challenges, along with future challenges, are described in this paper.

4. Main Challenges and Needs

The sections below summarize the response from respondents about Ericsson's current main challenges and their perception about how those ought to be solved.

4.1. Changed Market Situation

The market in telecommunications industry has changed dramatically over the past years, and many of Ericsson's major competitors are no longer on the market (5). New ones have emerged, however, which has changed the ways the company has to compete. These new competitors have gone from being "copycats" to being very innovative, quality-driven and drivers of the market (5). In total, there are fewer telecommunication competitors on the market today and the price pressure is very high. However, as the ICT industry

grows there will be more competitors competing for the same business (5).

Part of the changed market situation is the ongoing shift in customer needs, from products and features to services and value (5). Eventually, the offerings will be driven from a services point of view rather than a technical perspective, and the company needs to prepare for such a shift (5, 7).

4.2. The Company's Mindset

Another challenge is the company's legacy of being product-driven – something that is still deep in the company's soul and employees' mindset, and which defines how it/they manage and act (5, 7). The result is a perception vs. reality gap. The company says that they deliver IPSO, but in practice they actually do not. To a large extent, their hardware and software development is still based on the old business model, selling products. The potential that IPSO can provide is not possible to achieve (2, 4-5, 7).

4.3. Ericsson's Employees' Understanding of IPSO

According to the respondents (1-7), in general the company's employees are positive to IPSO.

In the delivery and operations in the regions, the part of Ericsson responsible for the roll-out, installation and delivery of services, products and solutions, there is a good understanding of how products and services are integrated. Improvements and evolution to products come from the services organization being close to the implementation and operations of the products, as well as being close to the customer needs. However, therein lies a challenge in finding and sustaining the competences that possesses in-depth knowledge about this integration process. (3-7)

The sales force needs to better understand the benefits of the integrated offering and ensure that the customers understand it. Also, the sales force needs to secure that the efficiency gains and other benefits are not given away to the customers. The general view is that this is beneficial for both the company and the customer. (3-6)

4.4. A Product-Focused Development Process

Linked to above challenge, another challenge is to link and integrate the product and service development within the company. To a predominant extent, the services are developed after the hardware and software are developed. (5, 7)

Hardware and software development is also mainly centralized, while services are developed decentralized, often independently in different countries. The latter makes it hard to manage and enable appropriate integration with the hardware development. It also makes it hard to manage product and business planning from a more strategic point of view. (5-7)

An important statement is made by Respondent 7, a senior specialist at R&D who works with the future architecture of the Ericsson RBS (Radio Base Station) products and provides strategies within the test and continuous integration areas. He also acts as a mentor to their development teams and assists

them in their future development work as well as product maintenance.

According to him, the internal view within R&D is that these types of contracts benefit both Ericsson and their customers. Ericsson, and especially R&D, know more about their products and how they should be configured and monitored than their customers, and they can provide a better optimized network for their customers. However, at the same time, R&D is not really connected and involved in the offering development so they cannot really contribute on the level they believe they could if involved. In other words, it is hard to develop good solutions if you do not fully understand how the offerings and their ingoing products and services are used by the customer. (7)

Based on the above, the respondents (1-2, 4-5, 7) state that there is a need to connect the development processes for service and product design, which implies to redesign what exists today in terms of development processes, as well as business processes. It is a general view that investments need to move from product development to service development.

Further, the need for industrialization of the service business is stressed, both in terms of increased efficiency in delivery process, e.g. automation and remote delivery, and to close the feedback loop between service delivery and customer interaction with R&D, i.e. the now sometimes lacking reuse of delivery knowledge in both product and service development process. (5, 7)

4.5. Customers' Understanding of IPSO

Like Ericsson's soul and mindset still to a large extent are product-focused, so are customers' mindsets (5). Customers are used to paying for hardware but are reluctant to pay for outcome. According to the respondents (4-5, 7), a major challenge is to make the customer, especially traditional telecommunication companies, see and understand the value of outcome-based models – they are, however, still not mature enough for this type of new mindset. They lack the knowledge, skills and methods for how to evaluate and compare traditional product-based offerings with IPSO. One of the challenges relates to the fact that an outcome-based business model demands an increased focus on Operating Expenditures – OPEX instead of Capital Expenditures – CAPEX, where the customer no longer owns the products (4-5, 7). From Ericsson perspective, this stresses the need for a transformation of the delivery model (4-5). However, new types of business and customer segments not traditionally linked to telecommunications industry like media are more aligned (4-5).

4.6. Business Management and Business Model

Respondents (2-7) state that top management decisions and communications, e.g. *“that we shall pursue this path”*, are needed.

The challenges described in the previous section, according to the respondents (2-7), imply an overall challenge: to change Ericsson's current product culture, i.e. the business model. Even though much has been done, there is still more to

do. At the moment, different views on what e.g. IPSO is creates confusion, misunderstandings and an unwanted communication noise. What is needed is one view globally on the business model and its different parts (2-7).

Respondents (2-7) also mention that a challenge today is that different business units within Ericsson have different perspectives, focus and measures (see also below).

4.7. Measurement, Incentive Models and Risk Management

A transfer to IPSO implies a need and challenge to find and define a new position in the value chain, not only for Ericsson as a company but also for the different business units within Ericsson, not the least for enabling the ability to measure end-to-end, input/output in the value chain. (5-6)

This also implies a need to change the performance measurement system. What is needed is to measure products and services together, and to integrate profit and loss responsibility, i.e. to transform the incentive models within the company. Several respondents emphasize the urgent need for this but also stress that this would imply a huge shift in the governance, and thus the performance measurement system is raised as a delicate challenge for the future, if the company decides to pursue that path. (5-6)

Another consequence of IPSO is a need for new KPIs on business values and business use instead of on the product level. (5-6)

Related to performance and measurement is risk management. One highlighted challenge is that internally, people are adverse to the new types of risks introduced, risks that are a consequence of a higher exposure during the use phase. There are also investment risks related to competences building. The consequences of a traditional ownership-based business model are that the service development and competence build-up is done short-term, in projects. To transform there has to be investments on the service side, which Ericsson today perceives as more risky than to invest in product R&D. (5-7)

5. Discussion About Needed Changes

To stay competitive long-term there is a need to transform the current business in two dimensions: (1) transform the offering of combined products and services into true IPSO, and (2) enable business models with outcome-based value propositions (from ownership to results). These transformations imply a number of challenges for the current business in several areas.

5.1. Mindset Change

Today, the services and the products organizations within Ericsson are to a large extent independent of each other with separate organizational business units, which are consequently confronted with general challenges that come with such setup related to collaboration, e.g. separate profit and loss responsibilities, different organizational cultures, separated information system, etc (see e.g. Lingegård, Lindahl *et al.* [24]). To continue the journey towards a true solution

provider there is an urgent need to develop capabilities needed to drive the two-sided transformation in offering and value proposition.

While doing so, Ericsson cannot disregard its legacy as a technology-driven company; it should be considered as a key competitive advantage to succeed with the transformation. Thus, a delicate challenge resides in combining a technology-driven approach with a value-driven approach simultaneously. It demands a new type of mindset focused on value realization for customers, while maintaining and developing the traditional value-add mindset which is related to developing and selling products. These mindsets need to be combined.

Furthermore, another mindset issue is how faults and problems occurring during the operational phase are managed. From Ericsson's point of view, it would be preferable to create a "fast track" for those faults and problems occurring in Ericsson's managed networks. Since the network is operated by Ericsson it is easier to access adequate data needed for fault and problem solving, but also for testing potential solutions.

This approach will e.g. contribute in avoiding the same faults emerging in Ericsson's other managed networks, and thereby also improve the customer's perceived value of Ericsson's service. Also, it will provide in a more proactive way the same fault and problem solutions to customers that operate their own networks (see e.g. Sundin, Lindahl *et al.* [25]).

5.2. IPSO Business Model

The traditional business model in the telecommunication industry is founded on ownership-based value propositions, and has traditionally worked well as the customers are mainly operators. With a shift in the customer base and the introduction of new industries, the current business model is not fit for the purpose. The new types of customers no longer ask for functions and features, but as-a-Service and results instead (see e.g. Rolls Royce [26]). This implies a need to introduce parallel business models that complement the current one, to enable a smooth transition into new industry segments. Thus, it is not a matter of scrapping the old one and heading directly for a new business model, which is sometimes the assumption being made when presented to the new type of mindset IPSO conveys. Instead, the results indicate the need for a smooth transition into new models while preserving the current one.

5.3. IPSO Development

Establishing a tighter connection between Ericsson's business units Global Services and R&D is needed, but this also requires a better understanding of the actors involved in the IPSO (see e.g. Lindahl, Sakao *et al.* [27]). Today, the teams working with R&D are very much shielded from this part of the business, which lowers their capacity to provide good solutions. Respondents stress the need for aligning the development processes for products and services, and securing knowledge feedback from the customer into new development of IPSO. One way can be by introducing

automatic feedback mechanisms into the managed networks that will report back to R&D when a problem is detected. This is normally not allowed by operators running their own networks (compare with Rolls Royce [26]).

Most likely, this will reveal new types of requirements being put on products to enable efficient service delivery. Consequently, new product capabilities need to be introduced and implemented: for example, a fully-connected product; a data handshake, defined as agreements between a supplier and its customer to share data; systems monitoring; and usage intervention with employees or machines, data analytics, and remote control.

Further, the service maturity needs to be grown into an equal level as on the product side, from data model layers towards a fully-matured service lifecycle management system enabling various degrees of automation, end-use monitoring and implementation of advanced measurement systems, e.g. customer KPI tracking [28].

A first step to align the development processes and enable efficient IPSO development is to identify and establish common integration points between product development and service development, as well as to secure adherence to established processes.

5.4. Advance Customer Understanding of IPSO

To succeed in the transformation to IPSO the entire value chain, from suppliers and OEMs to customers, needs to understand why and what is required to pursue the transformation path. Customers need to understand the differences in buying a product from paying for an outcome to even want to move to other types of business models.

This implies that Ericsson needs to enhance its capacity to provide pedagogical, real business cases, facts and figures that, in a clear way, demonstrate the values of IPSO and in comparison with traditional product-based sales (see Lindahl, Sundin *et al.* [12], who quantitatively compare environmental and economic benefits of IPSO and traditional product-focused sales by using real business cases).

Furthermore, as stated by several respondents, the services delivery engineers need to be more involved in the sales phase to secure that the offerings and solutions make sense to the customer. It is also important that R&D becomes more involved in this process so they in a better way can contribute with valuable information on how the products, e.g. radar base stations, should work and how new features should be tuned.

5.5. IPSO Performance Measurement and Risk Management

To pursue the path of IPSO the steering and behavior (i.e. mindset shift) of the organization needs to be changed. This is proposed to be accomplished partly through a change in the performance measurement system. In this way, the shift of mindset will be driven from products being the main offering towards product service systems enabled by hardware, software and services.

5.6. The Future

The telecommunications industry is transforming and needs to differentiate itself and its offerings to remain competitive. Trends such as the commoditization of products and increasing complexity are forcing telecommunications companies to take a stand: either remain on the path of a technology-push industry, or change towards a more customer value-driven business, i.e. IPSOs. To change an organization's mindset and move an organization towards this takes time [29].

To be able to do so, there is an urgent need to understand and develop capabilities needed to continue the journey and to drive the two-sided transformation in offering and value proposition.

The IPSO phenomenon as such is surprisingly well understood in the presented case, however the capabilities needed to pursue the path still constitute a relatively unexplored area, as is the understanding of the consequences of such a choice of path.

6. Conclusions

Ericsson has just begun an interesting journey to transform its offerings from products into solution-focused business offerings, i.e. IPSOs.

Based on the respondents, all with broad and extensive experience within the company, this paper highlights several of the main challenges and requirements resulting from this transformation process towards IPSO. This paper also highlights several recommendations that have been identified for consideration in order to manage those challenges and needs.

Acknowledgements

The authors would like to express special gratitude to Ericsson and the respondents for their active cooperation in the empirical research.

References

- [1] Kowalkowski, C., Managing the Industrial Service Function, in Institutionen för ekonomisk och industriell utveckling, Industriell marknadsföring och industriell ekonomi, 2008, Linköpings University: Linköping.
- [2] Lindahl, M., Sakao, T., Sundin, E., and Shimomura, Y. Product/Service Systems Experiences – an International Survey of Swedish, Japanese, Italian and German Manufacturing Companies. in CIRP Industrial Product-Service Systems (IPS²) Conference. 2009. Cranfield, The United Kingdom: Cranfield University.
- [3] Tukker, A. and Tischner, U., *New Business for Old Europe*, 2006, Sheffield: Greenleaf Publishing.
- [4] Tukker, A., Product services for a resource-efficient and circular economy – a review. *Journal of Cleaner Production*, In press(0).
- [5] Ellen MacArthur Foundation, *Towards the Circular Economy Vol. 1: an economic and business rationale for an accelerated transition*, 2012.
- [6] Meier, H., Roy, R., and Seliger, G., Industrial Product-Service Systems - IPS². *CIRP Annals Manufacturing Technology*, 2010. 59(2): p. 607-627.
- [7] Boehm, M. and Thomas, O., Looking beyond the rim of one's teacup: a multidisciplinary literature review of Product-Service Systems in Information Systems, Business Management, and Engineering & Design. *Journal of Cleaner Production*, 2013. 51(0): p. 245-260.
- [8] Tukker, A., Product services for a resource-efficient and circular economy—a review, in *Journal of Cleaner Production*, In press, Elsevier.
- [9] Mont, O., Product-service systems: Panacea or myth?, in *The International Institute for Industrial Environmental Economics (IIIEE)*, 2004, Lund University: Lund, Sweden. p. 233.
- [10] Chesbrough, H. and Rosenbloom, R.S., The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, 2002. 11(3): p. 529-555.
- [11] Sundin, E. and Bras, B., Making functional sales environmentally and economically beneficial through product remanufacturing. *Journal of Cleaner Production*, 2005. 13(9): p. 913-925.
- [12] Lindahl, M., Sundin, E., and Sakao, T., Environmental and economic benefits of Integrated Product Service Offerings quantified with real business cases. *Journal of Cleaner Production*, 2014. Volume 64(1 February): p. 288–296.
- [13] Sundin, E. and Lee, H.M., In what way is remanufacturing good for the environment?, in *Proceedings of the 7th International Symposium on Environmentally Conscious Design and Inverse Manufacturing (EcoDesign-11)2011: Kyoto, Japan*. p. 551-556.
- [14] Kerr, W. and Ryan, C., Eco-efficiency gains from remanufacturing - A case study of photocopier remanufacturing at Fuji Xerox Australia. *Journal of Cleaner Production*, 2001. No. 9: p. 75-81.
- [15] Emtairah, T. and Mont, O., Gaining legitimacy in contemporary world: environmental and social activities of organisations. *International Journal of Sustainable Society*, 2008. 1(2): p. 134-148.
- [16] van Beers, D., Grossi, F., Brüggemann, N., and Kiørboe, N., Reflections and Lessons Learnt from EEA's Work on Innovative Business Models for Sustainable Lifestyles, 2014, ETC WGME and ETC/SCP: Copenhagen. p. 70.
- [17] Ericsson. www.ericsson.com. 2003 [cited 2015 3rd of January].
- [18] Elfving, S.W. and Urquhart, N. Servitization Challenges within Telecommunication: From Serviceability to a Product-Service Systems Model. in *Spring Servitization Conference (SSC2013)*. 2013. Birmingham, UK.
- [19] Kvale, S., The qualitative research interview - a phenomenological and hermeneutical mode of understanding. *Journal of Phenomenological Psychology*, 1983. 14: p. 171-196.
- [20] Elfving, S.W. and Urquhart, N., Product Service System Challenges within Telecommunication: Reaching the Era of Mutual Dependency, in *The Philosopher's Stone for Sustainability*, Y. Shimomura and K. Kimita, Editors. 2013, Springer Berlin Heidelberg. p. 269-274.
- [21] Blessing, L.T.M., Chakrabarti, A., and Wallace, K.M., An overview of descriptive studies in relation to a general design research methodology, in *Designers - The Key to Successful Development*, E. Frankenberger, P. Badke-Schaub, and H. Birkhofer, Editors. 1998, Springer-Verlag: London, UK. p. 42-56.
- [22] Johnsson, S., Performance and performance measurements in complex product development, thesis, 2008, Västerås: Mälardalens högskola.
- [23] Karlsson, S. and Lugn, A., Changing the world: the story of Lars Magnus Ericsson and his successors, 2009: Sellin & partner.
- [24] Lingegård, S., Lindahl, M., and Sundin, E. Organizational changes in connection with Integrated Product Service Offerings. in *CIRP's 2nd IPS² Conference*. 2010. Linköping, Sweden: CIRP.
- [25] Sundin, E., Lindahl, M., Comstock, M., Shimomura, Y., and Sakao, T., Achieving Mass Customization through Servicification. *International Journal of Internet Manufacturing and Services*, 2009. 2(1/2).
- [26] Rolls Royce. TotalCare. 2014 [cited 2014 10th of January]; Available from: www.rolls-royce.com/civil/services/totalcare/.
- [27] Lindahl, M., Sakao, T., and Carlsson, E., Actor's and System Maps for Integrated Product Service Offerings – Practical Experience from Two Companies. *Procedia CIRP*, 2014. 16(0): p. 320-325.
- [28] Wood, J.B., Hewlin, T., and Lah, T., B4B – How technology and big data are reinventing the customer-supplier relationship, 2013: TSIA.
- [29] Lindahl, M., Ölundh Sandström, G., Sundin, E., Öhrwall Rönnbäck, A., and Östlin, J., Learning networks: a method for Integrated Product and Service Engineering – experience from the IPSE project, in *Manufacturing Systems and Technologies for the New Frontier*, M. Mitsuishi, K. Ueda, and F. Kimura, Editors. 2008, Manufacturing Systems and Technologies for the New Frontier: Springer, London. p. 495-500.