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Maarit Tihinen[1], Marika Iivari[2], Heikki Ailisto[1], Marjaana Komi[1], Jukka Kääriäinen[1], and Irina Peltomaa[1],

[1] VTT Technical Research Centre of Finland Ltd, PO Box 1100, FI-90571 Oulu, Finland
{Maarit.Tihinen, Heikki.Ailisto, Marjaana.Komi, Jukka.Kaariainen, Irina.Peltomaa}@vtt.fi
[2] Oulu Business School, Martti Ahtisaari Institute, PO Box 4600,
90014 University of Oulu, Finland.
Marika.Iivari@oulu.fi

Abstract. This paper introduces a study that was executed to detect business opportunities of the case companies in the context of Industrial Internet. An exploratory "scenario method" was chosen due to its ability to provide collaborative decision-making tool in a new business context. The study reveals four key perspectives identified together with case companies when looking for new business potential. Furthermore, the findings highlight the vital role of new business models and the need for transformation actions from product based business to service business. Rapid technology development and maturation provide basis for new service-focused business opportunities however companies need to be aware of new market dynamics and synergy advantages. In this study, future scenarios method was proven to be useful tool in both increasing awareness as well as in assisting to recognise the existing business potential in this new context.

Keywords: Business opportunity; future scenario; exploratory; Industrial Internet.

1 Introduction

Digital revolution is an ongoing megatrend continually changing and evolving. Ubiquitous, increasing presence of digital technologies and Industrial Internet and the Internet of Things (IoT) have attracted increasing attention in both academia and practice [1]. Industrial Internet is included in the group of the fast emerging digital ecosystems, along with smart cities [2]. Accordingly, constant change in business environment in a form of globalization, digitalization and technology development has changed the position of companies towards collaboration: no company is an island [3,4]. Close interaction and collaboration are seen as essential mode of operation of business ecosystems [3][5,6,7].

During the last decade, impressive improvements in information, communication, and connectivity technologies have unleashed new business opportunities. The reported and forecasted benefits of Industrial Internet building on these core

technologies include huge opportunities reported as boosting economic growth, optimizing value chains, streamlining information flows, enabling real-time decisions, enhancing customer satisfaction and loyalty, improving on-time delivery performance, enabling higher quality, enhancing marketing, lowering costs, optimizing assets, and increasing revenues [8]. Products and services are merged with digital technologies; it is becoming increasingly difficult to disentangle digital products and services from their underlying IT infrastructures [9].

As the pace of technological development has been rapid there is a lot of confusion on how to define the terms of Industrial Internet and Internet of Things (IoT). These terms are often used interchangeably, but do not mean the same. Furthermore, a third concept, namely Industry 4.0 or Industrie 4.0 in German is relevant to the digitalization of industry. However, Industry 4.0 differs from IoT and Industrial Internet in that it focuses more on using digital and information technologies in supply chain, manufacturing and distribution [10,11] where as IoT and Industrial Internet focus more on the use, operation and maintenance of smart products during their whole lifecycle.

One rationale for conducting this study was the recognition of terminology discontinuity; the use of various definitions does not only relate to literature, but also extends to practice. This confusion also impacts on how business potential is understood. Accordingly, the purpose of this study is to clarify using case-study method what kind of business potential relates to Industrial Internet. The research questions are identified as follows: 1) *What are the characteristics of Industrial Internet*, and 2) *How to collaboratively discover its new business potential*.

In order to answer these research questions, this study uses an exploratory scenario method [12,13]. This method is a collaborative decision-making tool in building common understanding and identifying new business potential. Building scenarios was executed through a workshop carried out among four business enterprises in Finland during Spring 2015.

This paper is structured in the following way. In the second chapter background information about the context of Industrial Internet are introduced and the term Industrial Internet is defined. The third chapter presents the research approach of the conducted case study. In the fourth chapter, the findings of the case study are introduced. The fifth chapter provides discussion on research findings and the last chapter concludes the study.

2 Background

As the pace of changes is increasing, constant development of products and services is required from companies. Companies need to utilise novel and agile ways of working across ecosystems composed of looser, partner-based collaboration [2]. Continuous innovation and global dissemination of new technologies and tools provides tools enabling better connectivity, collaboration, and co-creation across multiple businesses [14]. Ecosystems often exist on top of a platform [7]. Platform ecosystems have driven up productivity of economies in multiple ways, for example providing efficient matching, supporting more efficient asset utilization and acting as

sources of innovation [15]. Actors of ecosystem create, offer and maintain products and services that are complementary to one another. This leads to network effects where more value is extracted as more users take part [15,16].

The terms IoT and Industrial Internet are often used interchangeably, although they do not mean the same. Techopedia [17] defines Industrial Internet to be "the integration and linking of big data, analytical tools and wireless networks with physical and industrial equipment, or otherwise applying meta-level networking functions, to distributed systems". Similarly, IoT Agenda [18] adds in machine learning and M2M communication. These definitions keep Industrial Internet as narrow particle of IoT. On the other hand, the Industrial Internet Consortium (IIC) defines Industrial Internet as a broader concept than IoT, where machines, computers and people enable intelligent industrial operations using advanced data analytics for transformational business outcomes [19]. The definition of IIC is based on whitepaper by GE [15], stating that three elements, which embody the essence of the Industrial Internet are Intelligent machines, Advanced Analytics and People at work. These definitions reflect the sight where the target is to gain greater effectiveness and new business, and the wider internet-economic characteristics must be considered. This means for instance, openness and the ability of third-party business partners to provide their added value to company's platform product. We see this collaborative, ecosystemic view of Industrial Internet as the current step in the evolution chain illustrated in Figure 1.

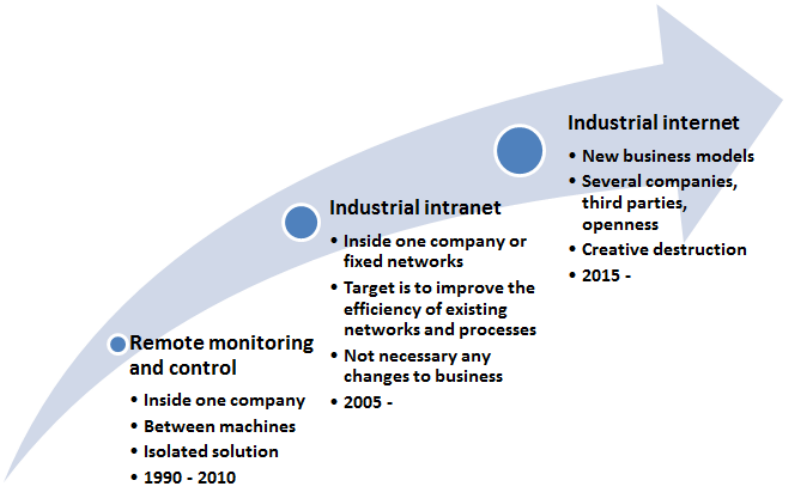

Fig. 1. Industrial Internet expands business potential.

The evolution started from company-internal *remote monitoring and control* solutions. Next step were *industrial intranet* solutions that served a company or fixed network of partners. The current step in this evolution is Industrial Internet. In this article we define that ***Industrial Internet*** *automates and rationalizes operations as*

well as enables new business in the industrial ecosystem by connecting intelligent machines, equipment, users and organizations together so that decision making can be improved by using advanced data-analytics methods. The fundamental difference with earlier generations of automation and rationalization is the scalable nature of networks, both from data and business viewpoints, enabled by dramatically improved communication, computing and data management capability – the internet. This difference is exemplified as a transformation from industrial *intranet* thinking towards industrial *internet* thinking in Figure 1.

3 Exploratory Futures Research Approach

This study applies a futures perspective into Industrial Internet and utilises a qualitative, exploratory future scenario method [12,13]. Future scenarios -method was chosen, as it is can be utilized as a participatory, collaborative decision-making tool in the process of exploring possible outcomes and building common view of a specific context. Exploratory scenarios describe events, trends and choices as they might evolve based on alternative assumptions on how these events, trends and choices potentially influence the future [20]. In this study, the scenario method was utilized in particular to explore, outline and assess business potential in the context of Industrial internet

The data for the alternative Industrial Internet future scenarios presented were mapped within the TINTTI project, IT Houses to boost Industrial Internet research project. The scenarios were generated in early 2015 in one facilitated full-day (8h) scenario workshop by a group of 12 professionals including researchers, industrial representatives and business managers from both large and small firms. The participants were divided in two teams, where each team ensured maximum variation based on the participants' backgrounds. The scenario work process discussed in this study consisted of the following main steps:

1. identifying and evaluating Industrial Internet related trends, and choosing the most the critical ones based on their anticipated impact and predictability of consequences;
2. setting up the scenario logic by selecting two unrelated scenario dimensions out of critical trends;
3. creating the scenarios by building on different perspectives of Industrial Internet and identifying drivers, limitations, and challenges emerging from the created scenarios; and
4. assessing the scenarios based on their probability, plausibility, and preferability. In total, eight alternative scenarios were generated by the workshop participants in two teams composed. These results are presented in the following chapter.

4 Industrial Internet Future Scenarios

4.1 The Scenario Dimensions

In the first step of the scenario work process the most critical scenarios were recognized and evaluated. These scenario dimensions are based on the main drivers the teams identified, where the dimensions are seen to include two extreme opposite ends, i.e. two possible alternatives. These dimensions are summarized in the following Table 1 and further elaborated in Section 4.2.

Table 1. Critical change dimensions for the scenarios

End 1	*Dimension*	End 2
Legislation B2C	*Security*	Case-based B2B
Experimentation, technical	*Organizational capabilities*	Risk mgmt. functional
Do it yourself (DIY) Technical	*Partnerships*	Seeking partners Commercial
Data ownership Increasing performance	*Ownership and use of knowledge*	Open data Creating new business
Separate	*Integration of systems*	Standardised
Pay-per-use; Product-based	*Logic of revenue*	Subscription; Service-based
Attitude: Excel-world	*IoT readiness*	Hype, Technically up-to-date
Contract-based Preventing	*Legal issues*	Open data Enabling

The extensive discussions during the selection of dimensions for the scenarios reflect the discussions in academic literature, hence indicating the validity of research outcomes. Some thematic overlapping also occurred, particularly in reference to the role of data ownership and legal issues around it, integration issues and the readiness and capabilities for the extensive spread of Industrial Internet solutions, both technically and commercially.

4.2 The Alternative Scenarios

The results of both teams are presented as they were formed, including the original names created to describe the scenarios. Hence, in this study, the description and analysis of the results is based on how the possible outcomes of the future were discussed at the workshop, and how the groups outlined and assessed the scenarios created. Thus, as a participatory approach, the scenario method includes the evaluation and analysis of the scenarios as they are created in practice. The rationale for needing to choose unrelated dimensions is that if one dimension can explain the existence of another, the scenario is not possible to build, hence diminishing its probability, plausibility and also preferability. The future scenarios created by the two teams during the workshop are presented below in Figure 2.

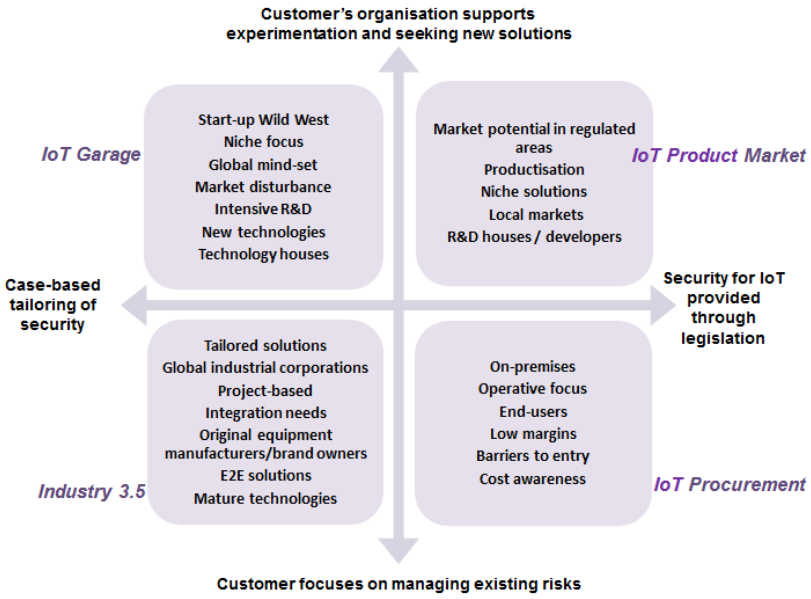

Fig. 2. Team I Industrial Internet scenario matrix

The first team (Team I) built their Industrial Internet future scenarios based on security where they viewed the main critical dimensions for security to be either legislation-driven or case by case determined) and organisational capabilities where experimentation and risk taking culture were highlighted and on the opposite end where risk management dominated.

The IoT Garage scenario involved experimentative and innovative organization culture. This scenario was considered the "wild west of global start-ups". As security is mainly case or customer-based rather than determined through law, a lot of niche solutions exist. This creates constant disturbance on the markets, as predictability for general directions is difficult.

The IoT Product Market scenario presents business potential mainly in regulated areas, as despite seeking new solutions, legislation sets boundaries for business development. Direction for business is easier to predict, but this scenario is very much product-oriented, aiming to serve local markets.

IoT Procurement is mainly operatively focused, with on-premises IoT solutions, and mature technologies. This scenario is based on regulated security and organisation's focus on managing existing risks rather than seeking new innovative solutions. Hence, existing, large organisations dominate and market is difficult for new companies to enter.

Industry 3.5 scenario is highlighted with global industrial enterprises; hence, the needs for integration are also high. This business is mainly project-based with customized solutions as security is mainly provided based on the customer. Therefore, original equipment manufacturers and brand owners dominate in this scenario.

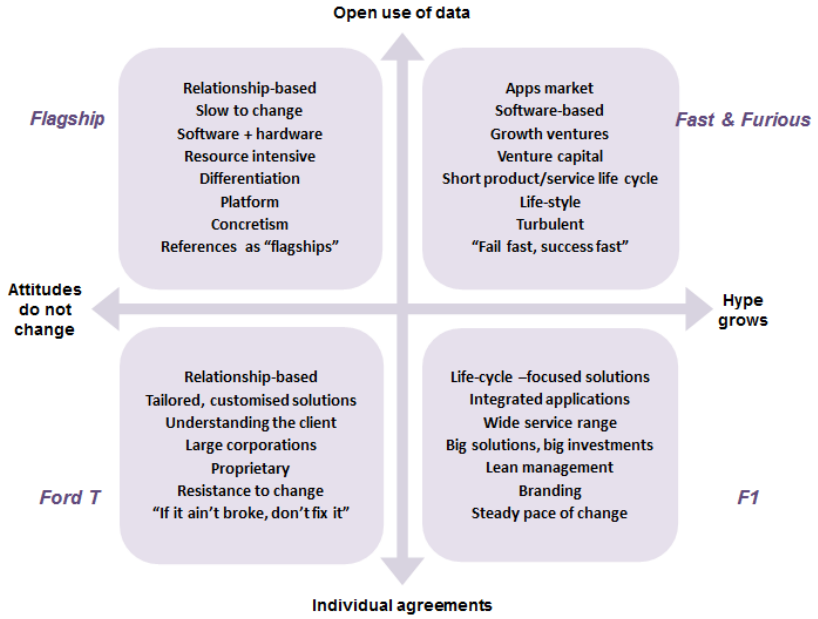

Fig. 3. Team II Industrial Internet scenario matrix

The second team (Team II) chose organisational readiness towards Industrial Internet solutions as one dimension, where critical opposite ends were old-fashioned corporate culture perspective on one side, and hype and first mover attitude one the other side. Legal issues opposite ends were considered to be either publicly available open data – based or individual, contract-based, as presented in Figure 3.

Flagship scenario was considered as the current state Industrial Internet is at the moment. Although opportunities for open use of data are plenty, large organisations are slow to change their attitudes and methods of operation. Trust is built through long-term business relationships as this is still very resource intensive environment.

Fast & Furious scenario is built around the hype of Industrial Internet and open use of data. This scenario is characterized with rapid change, turbulence and the rise and death of start-ups, mainly in software and application-based businesses. Product and service life-cycles are short; therefore ability to scale up the business is the key to success.

Within F1 scenario, even though the hype is high and people are interested in what Industrial Internet may provide, the need to individually agree on legal issues around products, services, security and use of data forces organisations to think not only the opportunities but also the risks involved. In this scenario, start-ups often act as service providers.

Ford T scenario is the most challenging one. In this excel-world, "if it ain't broke, don't fix it" becomes highlighted even more. Successful business can be built from thorough understanding of the customers' needs and long term business relationships with tailored, personalised solutions, but the phase of development is very slow, demanding not only financial resources but also "evangelist" work.

5 Discussion

In building common understanding the scenarios were thoroughly assessed at the end of the workshop. Firstly the likelihood of realization of the created scenarios was evaluated. The probability of the scenarios was assessed against the identified influencing factors. The second step involved assessment of the plausibility of the scenarios by looking at the potential events that could occur. The final step in the assessment was to sort out what scenarios were the most preferred within the teams. The preferability assessment of the scenarios was based on the choices the teams made regarding the alternative future predictions. Typically, probability and plausibility are often clearly correlating, whereas what would be the most preferable scenario is usually considered less plausible or preferable. However, within the scenario assessment the most preferable scenarios were also considered plausible and probable. Despite the different critical dimensions, both teams ended up with similar scenarios, indicating that digital transformation is heading to preferred direction from company business development point of view; therefore there were no major conflicts in assessment of preferability, plausibility and probability regarding the scenarios. The first team based their scenarios on organizational readiness for Industrial Internet from capability perspective, whereas the second team considered speed as one determinant for readiness. Another overlapping element was the role of law, which Team I viewed from security perspective, and Team II from contractual perspective. The outcome of this research identifies business potential to emerge through ecosystemic collaboration, total service solution, through branding and through integration of systems. These areas provide challenges but also act as drivers for new service innovations. Findings highlighted also both the need and potentiality for transformation from product based business to service business [21]. Legal issues were considered fundamental in this transformation. They impact the pace of general development, as they have the power to both enable and hinder the pursuing of business potential within Industrial Internet. These aforementioned bring focus to the need for creating new kinds of business models so that emerging opportunities and business potential of Industrial Internet can fully be utilised. Service providers still struggle with lack of awareness on the benefits of digitalisation among industrial clientele, accompanied with old-fashioned mind-sets regarding the available possibilities. Therefore the benefits of digitalisation need to be explicit and concretely stated.

6 Conclusion

This paper introduced a case study that was carried out in Spring 2015 for clarifying business potential of case companies in the context of Industrial Internet. Because of confusion on how the terms of Industrial Internet and IoT were understood and used in literature and in practice, we first defined the term Industrial Internet as follows: Industrial Internet automates and rationalizes operations as well as enables new business in the industrial ecosystem by connecting intelligent machines, equipment, users and organizations together so that decision making can be improved by using advanced data-analytics methods.

In this paper we point out an ecosystemic view of Industrial Internet. The used research method, the exploratory scenario method, was chosen because it supports the process as being collaborative decision-making tool while providing future scenarios. In total, four key perspectives were identified regarding the choices for assessing the business potential in the context of Industrial Internet. Future scenarios method was proven to be useful tool in both building a common perspective on the context as well as in assisting in the recognition of business potential in the context of Industrial Internet where technology lays the foundation for service-focused business opportunities.

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