



## Futures Business Models for an IoT Enabled Healthcare Sector: A Causal Layered Analysis Perspective

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### Abstract

**Purpose:** To facilitate futures business research by proposing a novel way to combine business models as a conceptual tool with futures research techniques.

**Design:** A futures perspective is adopted to foresight business models of the Internet of Things (IoT) enabled healthcare sector by using business models as a futures business research tool. In doing so, business model is coupled with one of the most prominent foresight methodology, Causal Layered Analysis (CLA). Qualitative analysis provides deeper understanding of the phenomenon through the layers of CLA; litany, social causes, worldview and myth.

**Findings:** It is difficult to predict the far future for a technology oriented sector like healthcare. This paper presents three scenarios for short-, medium- and long-term future. Based on these scenarios we also present a set of business model elements for different future time frames. This paper shows a way to combine business models with CLA, a foresight methodology; in order to apply business models in futures business research. Besides offering early results for futures business research, this study proposes a conceptual space to work with individual business models for managerial stakeholders.

**Originality / Value:** Several research on business model has offered conceptualization of the phenomenon, innovation through business model and transformation of business models. However, existing literature does not offer much on using business model as a futures research tool. Enabled by futures thinking, we collected key business model elements and building blocks for the futures market and analyzed them through the CLA framework.

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Keywords: Business Models, CLA, IoT, foresight, healthcare, mhealth

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## Introduction

Since the introduction of Internet for public use in the early 1990s, the sphere of technology advancements has propelled extensively till today. Internet has evolved from being only the “Internet of Computers” to be the “Internet of People”, and now to be the “Internet of Things” (IoT) by enacting possibilities of small “things” benefitting humankind with higher scale of usable information (Coetzee & Eksteen, 2011). With billions of connected devices, IoT promises to enhance decision making and data analysis to a heightened level. One major application sector of IoT identified by numerous researchers is Healthcare, since the early stage of IoT innovations (Atzori, Iera & Morabito, 2010; Domingo, 2012; Xu, He & Li, 2014), where IoT eventually combines all three perspectives of Internet, namely computers, people and things, to solve different problems.

Despite enormous hype about IoT’s contribution in healthcare from an innovation perspective, we are still to be sure about economic and business feasibility of such innovations for the longer future. To gain better sight on this ground business model as an analytical concept can play a handy role. Recent studies concerning business models suggest that industrial actors are playing more with their business models than ever to have longer lasting and efficient organizational performance across various industries (Nielsen et al., 2014). In practice, the use of business models has grown significantly in recent years by companies especially to gain and secure competitive advantage (Johnson, Christensen & Kagermann, 2008; Wirtz et al., 2015). Business model has been defined by different authors with varied attributes due to its potential multi-dimensional application. Based on significant advancement in business model research, Ahokangas et al. (2015) argues that the next generation of business model research will focus on the future centrism of the concept. Pondering on Amit & Zott’s (2001) perspective on business models as “unit of analysis”, we consider building on futures thinking, and perceive that industrial future can be foresighted by using business model as the basis of analysis

Previous researches involving IoT and healthcare mostly stress upon narrow specific healthcare context and application possibilities (Domingo, 2012; Atzori et al, 2010, & Farnandez & Pallis, 2014). On the other hand,

business model focused studies for on IoT (West-erlund, Leminen & Rajahonka, 2014) and business model focused studies for IoT-healthcare (Pang et al, 2015) hints of ecosystemic business model. Additionally, there are technical studies focusing of health care IoTs which covers part of the overall business models, but lacks the depth in analysis from a business model view point due to discipline differences (Liu & Jia, 2010; Whitmore, Agarwal & Xu, 2015). IoT is acclaimed to foster the healthcare sector for longer term throughout literature, but the lack of analytical evidence for the promised future in available texts makes it interesting to look into the issue with a longer term and big picture perspective.

According to Masini (2006), “We, in the present time, need to look at the future in ways that go beyond the creation of beautifully conceived but ultimately illusive Utopias. Our future must not only be foreseen and dreamt of, but also chosen and built.” (p:1159). Business models are often perceived to be seen as the practical implementation of abstract strategies (Richardson, 2008). From a strategy perspective, Porter (1991) claimed that many differentiation advantages that firms gain actually comes from initial conditions and managerial choices (Hedman & Kalling, 2003). These initial conditions and managerial choices are arguably covered by different business model elements. Thus, building on futures thinking we attempt to apply business model as basis of analysis to uncover future market for the longer term. This way, for individual organization business model innovation, organizations can make informed “managerial choices” for the future. This paper displays a novel way to look at industry future potential using business models combined with one of the most prominently used futures research methodologies, Causal Layered Analysis (CLA) (Inayat-ullah, 2004).

The objective of this paper is twofold. First, since the emerging market context of IoT enabled healthcare lacks proper attention from business perspective in the academic literature, this paper provides an interesting perspective by looking at the future. Secondly, we use the business model concept to analyze future market ecosystem combining with a scientific foresight methodology. However, since the business model as a concept has not been applied in such a way in the existing

literature so far, the key research question that we handle in this paper is as follows:

### **How the business model framework can be applied to CLA to study the future of an industry?**

The rest of this paper is structured as follows. First, we introduce the theoretical framework surrounding discussions on the IoT enabled healthcare sector, business models and an introductory note on CLA due to lack of using this method in business research. Then the research design is presented. Next, three linear futures scenarios with three different time horizon will illustrate the conceptual and temporal space defined in the layers of CLA followed by concise discussion on the created scenarios. A list of probable business model elements for different time frames in the future is exhibited. Finally, the conclusion of the paper will discuss how the created scenarios from the CLA layers can plug into and deepen the future business models of the IoT enabled healthcare sector. Also, we briefly discuss how business model as a concept can bring additional structure to foresight methodologies for business research.

## **Theoretical framework**

We construct the theoretical framework by first introducing the IoT enabled healthcare sector from a conceptual viewpoint, then present our perception of business models. Finally, we introduce the concept of futures research and CLA.

### **IoT enabled Healthcare sector**

Internet has brought about and enabled numerous advancements since its introduction. One of the most significant aspects of Internet has been varied ways of its utilization. Although there are some deviated definitions of IoT within the literature (Atzori, Iera & Morabito, 2010), we use the definition from Coetzee & Eks-teen (2011). IoT, a vision where objects become part of the Internet through unique identification, accessibility to the network, position and status, where services and intelligence are added to this expanded Internet. The concept is to fuse digital and physical world to impact professional, personal and social environments.

Mobile device assisted healthcare and medical applications are believed to create the next big advancement in the health industry (Balandin et al, 2013) due

to increasing usage of mobile technologies and mobile devices (not limited to mobile phones only) in the recent years (Briggs et al, 2012). This trend is gaining momentum for longer sustainability by more and more introduction of wearables, environmental or implanted medical IoT devices and solutions (Amendola et al, 2014). A recent industry focused study about the trends and facts within mobile health (mHealth) marks business models are going to evolve and broaden (research2guidance, 2013) as the mHealth industry has recently exited the trial phase and now entered the commercialization phase in the market (Research and Market, 2013). However, the challenge for a modern industrial firm lies in understanding the internal and external market environment to keep up with the rapid changes (Hayward, 2004). These rapid changes pose dynamic opportunities in some cases and in other cases lead to complex threats, which need to be tackled with longer term vision for sustainability.

The healthcare sector has fostered in the era of Internet with relative cost efficiency and smart solutions. The biggest advantage of health IoT solutions is perhaps personalized solutions and providing a universally accessible database for better healthcare maintenance (Xu, He & Li, 2014). Successful and wide adaptation of IoT in healthcare will present billions of sensors accumulating a robust network of data collection and sharing coupled with ubiquitous identification system; which will enable the sector with better monitoring, sensing, communicating and controlling abilities. Different types of healthcare information like logistics, diagnosis, recovery, therapy, meditation, management, finance and even daily activities can be collected through the IoT architecture (Domingo, 2012; Xu, He & Li, 2014).

The definition of healthcare innovation has changed dramatically over time, now innovations in patient care, wellness or health tech are considered as innovations in healthcare. IoT can play a substantial role in either of these scopes. Fernandez & Pallis (2014) listed existing wearable devices powered by IoT, which includes heart rate monitors, ECG monitors, glucose monitors, pulse oximeters and blood pressure monitors. A similar notion was shared by Atzori, Iera & Morabito (2010) earlier when they spoke of four major application scope of IoT in healthcare as tracking, identification and authenti-

cation, data collection and sensing.

### Business Model

The business model concept can be defined as a *description* (Applegate, 2001; Weill & Vitale, 2013), an *architecture* (Timmers, 1998; Dubosson-Torbay, Osterwalder & Pigneur, 2002), a *representation* (Morris, Schindehutte & Allen, 2005; Shafer, Smith & Linder, 2005), a *model or conceptual tool* (Osterwalder, 2004; Osterwalder, Pigneur & Tucci, 2005), a *structural template* (Amit & Zott, 2001), a *method* (Afuah & Tucci 2001), a *recipe* (Baden-Fuller & Morgan, 2010) a *framework* (Afuah, 2004) and a *set* (Seelos & Mair, 2007) for business proliferation within academic literature. This dense description of how different authors think about the phenomenon already provides readers with basic understanding of the key logics. However, at the same time it triggers the idea of definitional ambiguity (Jensen, 2014; Osterwalder, Pigneur & Tucci, 2005) among readers questions why a phenomenon should have so many single worded/phrased meanings.

In the latest stream of business models research, different tools are offered as meta-models where authors have accumulated multiple components from the definitions and constructed algorithmic or a flowing relational model. Osterwalder & Pigneur's (2010) business model canvas is one of the most popularly used tools where the author accumulated nine components; they are: value propositions, customer segments, customer relationships, channels, key activities, key resources, key partnerships, cost structure and revenue streams. The business model canvas has provided the concept of business model with tremendous momentum in practice of business model as models. Recently Ahokangas et al (2014) introduced the Business Model Wheel (BMW) where it is argued for business opportunities as the heart of business modeling instead of value proposition. Business Model Wheel as a tool is inspired by Onetti et al's (2012) Locus, Focus and Modus view on business modelling. With opportunity at the center, BMW asks what, how and why questions from the business activities of an entity.

We perceive business modeling to be an opportunity centric and cyclic process. This approach to business model considers the way a company "do business" depends on what opportunity is there in the market to

exploit. Often companies find an opportunity that suits their resources and competencies; and in some cases companies might have resources and offerings for the market which lacks a good enough market opportunity. Thus we argue aligning Ahokangas et al (2014), an opportunity should be identified or discovered first to design the most benefitting business model for an organization. Additionally, we admit that in the modern hyper-volatile technology fueled market, a single opportunity can rarely sustain for a longer period. In such cases, companies need to find newer opportunities and align their overall business model by keeping the business opportunity at the center and gain more competitive advantage by nurturing identified opportunities.

Research on how the concept of business model can be applied in practice has shown different avenues. Amit & Zott (2001) identified Business model as a new unit of analysis and a system-level, holistic approach to explain how a firm "do business" as two key streams which can be considered relevant when considering the future of an industry. Additionally, Bouwman et al (2012) discusses conceptual tools like business model road mapping and business model stress testing for future development of individual organization business model. For individual organizations both these tools seem viable. However, to study a wider sphere of an industry's future, process generalization is required. Also, the concept of business model transformation, appears to be relevant to the future, acknowledging transformation of existing organizations through positioning the core business logic by adapting newer business models into a new market place (Ahokangas & Myllykoski, 2014; Ivori, 2015). The future can be perceived as the new market place and such transformation by repositioning core business logic harnessing the possibilities of business models can take place industry wide over time.

We consider the business model as a dynamic transformational force which helps practitioners conceptualize the rationale behind the overall value creation and delivery for long term economic sustainability. We use the concept of business model to understand the future and analyze an industry development. In doing so, we apply the business model wheel coupled with a foresight technique named Causal Layered Analysis (CLA). In the following subchapter, a brief review on scientific

foresight and CLA is depicted.

### Foresight and Causal Layered Analysis (CLA)

Futures studies as a discipline dates back to the Second World War. Nonetheless, since the beginning of human civilization, practice of thinking about the future regardless of exact time-extent of intervention was always present in the back of individual's mind (Masini, 2006). Futures research involves active learning and participation, timing of intervention, and deconstruction of reality in order to construct a preferred future (Inayatullah, 2000). It also enables us to consume surprise as an element and design alternative scenarios towards a vision (Masini, 2006). Foresighting gives managers and strategizers a tool for looking for alternative and probable outcomes of a given situation and act on the result they get using foresighting (Inayatullah, 2008).

In learning the potential business opportunities of the IoT enabled health care sector and probable business model elements, we applied CLA which is one of the most widely appreciated futures research methodologies. CLA involves integrating empiricist, interpretive, critical and action learning modes of knowing to unleash the future (Inayatullah, 2004). Unlike other foresight/futures methodologies, CLA involves less of predicting the future rather it focuses on creating transformative conceptual spaces to create preferable and alternative futures. CLA is usually applied to go into the deeper future as one of its specialty and longer term policy change feature (Inayatullah, 1998).

There are four layers in CLA. The first layer is known as "Litany"; here it starts from the surface level of the problem with empirical data and then it moves to a deeper level to find the reasons for the problems detected from the surface layer and analyze them; this layer is entitled as "Systemic/ Social Causes". Further down it moves to look for the causes and the developments in the worldviews and discourse of the society, known as "Worldviews". Finally, to uncover deepest logic of a problem, CLA uses "Myths and Metaphors" to translate problems often in an artistic or poetic language (Inayatullah, 2000), figure 1 illustrates these layers. We can delve into the different layers of business models of the IoT enabled healthcare sector to understand a space for future growth and sustainability.

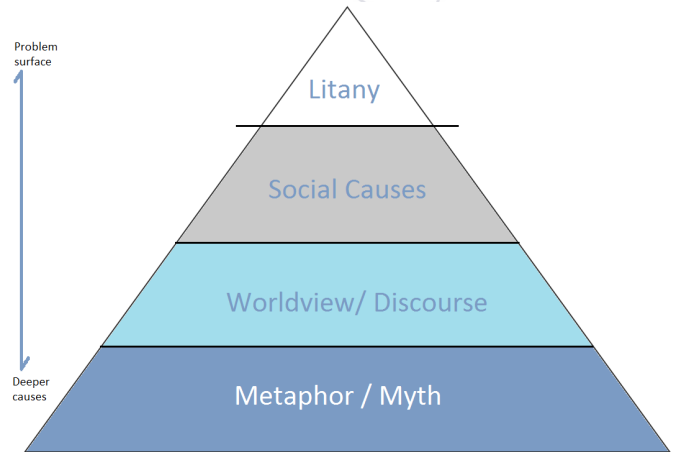


Figure 1: 4 Layers of CLA (Adapted from Inayatullah 2005)

### Research design and data collection

Since the future is elusive and business opportunities are also difficult to identify sometimes, this study realizes that the most suitable methodology for conducting this research is to use qualitative approaches. To delve into deeper layers with CLA, empirical dataset should be translatable in a qualitative manner for wider and in-depth understanding. Qualitative methods provide researchers with flexibility and sensitivity to the context that has been less explored, and it can help understand how things work in a particularly complex setting (Mason 2002). Realizing the fact that the interest of this study is the near and far future of a specific sector, single qualitative case study is observed as the most suitable strategy. Additionally, as we consider the findings of previous studies on business models for IoT and business model for healthcare, we tend to look for ecosystemic developments. Thus, by not focusing on a specific company case, this study tempts to organize an industry-wide single case by accumulating different stakeholders to understand the future market.

This study deals with the contextual setting of an IoT enabled healthcare sector from an industrial/managerial perspective, besides the academic interest of this study is to find a deployment logic of business models as a futures technique. Thus it was central for the aims of the research that a network of relevant actors is located to have deep insight of the sector regarding current status and also the futures business model logics of an IoT enabled healthcare sector. The case network was chosen with the support from the extended network actors of the DIGILE Internet of Things project,



where different stakeholders from the futures industry could be interviewed.

Based on the results of the literature review conducted for this research, we focused on collecting primary data. From the case network we communicated to several specialists from the industry coming from different stakeholder background. Five face-to-face one-on-one interviews were conducted for the purposes of this research during May, 2015 and June, 2015. Each interviewee was in a leading role in their organizations and has deep understanding of the industry and its stakeholders. The interview framework was developed as a two-axis matrix, having business model components in one axis and the layers of CLA on the other. A semi-structured and themed framework was employed with a qualitative stance for the interviews. The basic framework (Appendix 1) for all of the interviews were same except for the future time horizon. While questioning about the future, respondents were given either short term, or medium term, or long term in the future. A summary of the interviews and the participants are presented in the following table.

Table 1: Interviews conducted for the research

Interviewee	Role of the interviewee	Date	Duration
NV	CEO of a Wellness Startup company	26/05/2015	75:26
TK	MD of a Health Tech Association	27/05/2015	88:14
SH	MD of a medical research organization	29/05/2015	43:50
JH	Innovation and business architect, New business development, Leading network & telecommunications company	03/06/2015	67:36
EK	CEO of Health Innovation Academy	30/06/2015	74:37

same interviewer. Altogether 350 minutes of primary data was recorded and transcribed. Data collection through semi-structured interviews was followed by qualitative content analysis to create congruency within the whole data set and to construct three linear futures scenarios. Upon transcription and analysis from a CLA perspective, each interviewees were shared with interview transcription and analysis, so that the validity of the analysis is maintained as superior future. These scenarios provide us with a holistic picture of the industry including different business model elements, how they evolve and change in the future from a business model perspective.

## Findings and future scenarios

In this chapter, three futures scenario with a CLA perspective is illustrated. First, the surface level of each scenario is presented, then it is attempted to figure out underlying logics and relations between them in order to understand the feasibility of reaching different futures. In the created scenarios, the short-term scenario represents the business as usual future for five (5) years from now as “the ploughed field”. The medium-term scenario indicates the probable future for ten (10) years in the future from now is titled as “the breaking dawn”. Finally, the long-term future scenario is considered as the preferable future called “the ant super-colony” which indicates developments in the market for fifteen (15) years from now. On the litany layer, we tend to identify the business model elements in each scenario and then move deeper to understand the social causes and worldviews. Finally, we summarize each scenario with relevant metaphors. As a part of the semi-structured interviews, interviewees were asked for metaphorizing specific future. Once the overall dataset was combined, we deduced the three mentioned metaphors which reflects the respective futures based on the previous layers.

The BM-CLA combo aided interview framework enabled the data collection to ask questions focusing on the future. Interview outcomes were compiled and analyzed with an exploratory approach based on each time frame. Each scenario presents the futures industrial elements with four different layers of CLA to argue deeper causes and to justify feasibility of elements discussed in the litany layer.

**Short-term future:  
“The ploughed field” scenario**

Litany: A lot of newly introduced technology enabled health services/ solutions will be offered besides conventional services. As an emerging technology, IoT will start marking its footprint in patient care industry, wellness and health tech in one way or another during the short term future. This is because we are spectating cuts in the social sector, thus healthcare expense will rise and an obvious way of saving is through using efficient technology. The business opportunity for the short term is more likely to come from assisted living and elderly care. To grab that, companies need to be ready with proper services through a connected society in a digital way which is easily usable by the targeted customer group.

Though there will be cuts in health benefits, Public sector as customers will still be the major payer of services in this industry for the short term future. However, different wellness services empowered by IoT will gain revenue mostly from the private consumers. Many startups are now designing health related solutions and waiting for medical acceptance for their services. Digital health information services like MyData and Kanta will gain more visibility and acceptance in the society in the short term future. Though the question of transparency and data privacy will remain high as to how the data will be used. It is being promised that the

users will own their own data and have the authority to allow access to others.

The startup scene in Finland stays active and operates within the healthcare sector and thus the search for funding will be consistent. Finding sustainable funding solutions will be one of the major operations besides innovation. Product lifetime has already shortened compared with a business context of 20-30 years earlier; companies will understand it better and start designing innovative service based offers to some extent. Basis of pricing for different services will accordingly start changing; a lot of new pricing models will appear for testing in this short-term period. In one of the interviews, TK mentioned, “Pricing will be based on the benefit we provide to customers. So, the value that customer gets from using our services, solutions and products”. It means pricing models for this sector should be well thought and value adjusted.

Wellness sector will help in gamifying individual's health and getting healthy by looking at statistics with their value proposition. The patient care sector will be offering more digital services for the young digital natives; and this will take place because of the pull from consumer need. The mentality for competing will start changing. Organizations in this sector will realize the need for partnering and taking part in a network that complements each other's need. To keep up and gain



**Figure 2: Summary of the Short term future “The ploughed field” scenario**

competitive advantage, companies need to evolve all the time regardless of their size and functions.

Major cost drivers for this industry on the short run will be R&D for device innovation itself and the network & infrastructure cost. JH and NV, both admits that R&D costs for health IoT solutions are probably going to be much higher compared to other industries because most of the products will need medical acceptance. Perpetual sustainability is not an option for any product in a highly competitive market. Product development becomes even more vital when it is supposed to serve for human health. Additionally, there is currently a blind spot in the health industry in understanding the extent of network cost, which might come as a surprise to many smaller companies according to JH. There are network providers in the market with proper readiness for the industry but small companies might find it challenging to meet the expenses at first for a perfect connected solution with limited resources.

**Social causes:** The online social networking paradigm has changed the social practices to a great extent in the recent past. The concept of being connected has evolved over the past few years. Despite more and more individuals are adapting digital services more than ever but still there is a group that will stay vigilant about matters like privacy and security. On top of that, we also have the technology available, which is improving fast, that will enable companies offer more digital services and offer more jobs in Finland.

**Worldview:** Economic conditions of individuals, societies and countries have major impact when it comes to healthcare. Depending on location and economic condition, a person's choice of healthcare remedies varies. Access to Internet will play a vital role in the expansion of IoT healthcare services as well.

**Metaphor:** One of the interviewees, JH, metaphorized the short term future of the IoT enabled healthcare sector in Finland as a field that has been recently ploughed. Seeds were not planted but wind and birds brought different types of seeds to the field which has started sprouting. There are also some very old and big trees to provide shadow for smaller sprouts. Besides that, these big old trees will also need to fight for their own sustainability. Good symbiosis is needed

among the new sprouts and the older trees. Some of the sprouts will live longer term and some of them will die out. There are also a lot of good insects in the field to help trees grow faster and be fruitful. In time, this field of sprouts will be an orchard of various kinds of tasty fruits.

Thus, for the short-term future, we anticipate numbers of enthusiastic startups and SMEs coming in to the IoT enabled healthcare sector. Having global corporations thriving for similar goals, these smaller companies take lessons and reuse channels as well. For a sustainable future and profitable growth, this sector will need cooperation among participants.

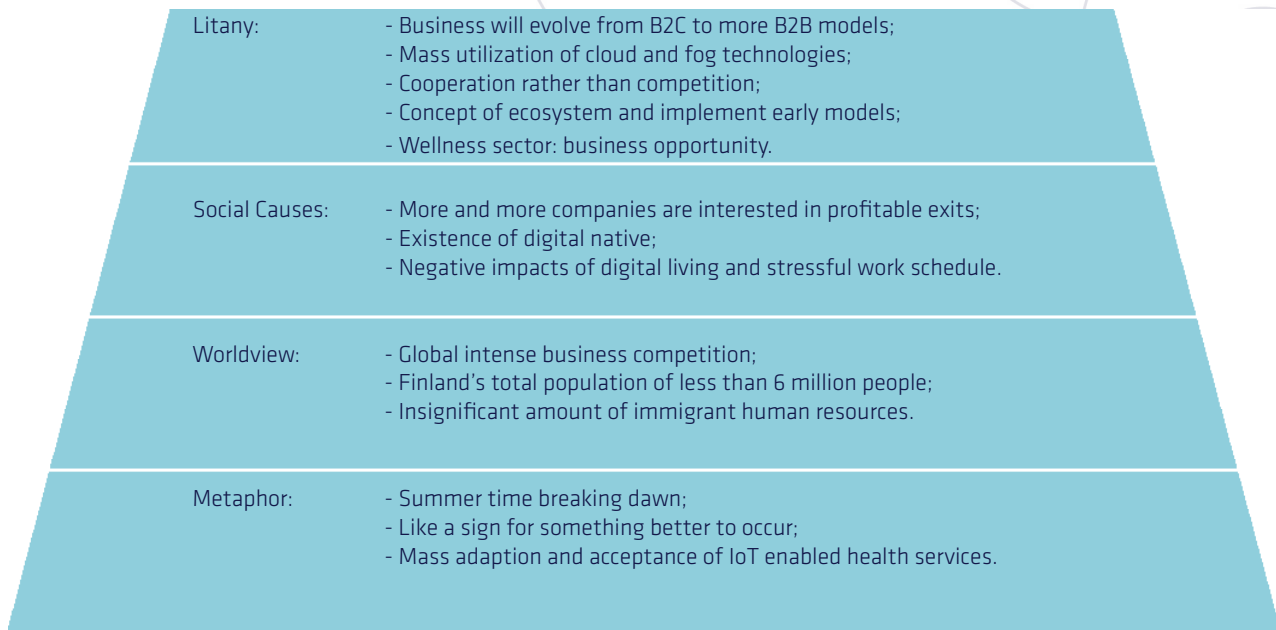
### **Medium-term future: “The breaking dawn” scenario**

**Litany:** IoT as a technology to boost the healthcare sector has made its mark real in this medium term future. There will be numbers of business networks working within healthcare, wellness and health tech arena. Health IoT device producers will start selling to more business entities besides actual end users. A great number of products and services which were technology based previously, but did not utilize the real power of cloud & fog technologies and Internet, will start realizing the benefits. Many services will be enabled by different software and applications where we do not see them now. Also, we will see more cooperation among companies who has medical certification for their products and hospitals.

Cooperation among companies instead of neck and neck competition will be higher in the domestic market, thus, networks will perform better. However, the stride towards something bigger than networks will be taken, which can be referred to as ecosystems. SH, another expert stated during an interview, “We have competitors working together in research projects because we do pre-commercial research. The companies believe they can build joint knowledge which they all can use in their own way. I also believe in ecosystems, not only networks. Because companies only participate in networks when they need something. But in the ecosystem they will do something together.”

The evidence indicates that at the moment, the concept of an ecosystem is still somewhat abstract. By the





**Figure 3: Summary of the Medium term future: "The breaking dawn" scenario**

medium term future, market players and researchers will develop scientific knowledge to define an ecosystem and how to converge more companies in networks and networks into an effective ecosystem.

Since Finland's strongest link is its technology development, companies will focus more to that. Some major business activities will be outsourced to third party service providers. Companies in Finland realize the domestic market size is not enough for globally competitive business. Thus, they will start internationalizing more in numbers with their high quality certified IoT healthcare solutions. Service quality, accuracy, reliability and trust will be the major issues in gaining competitive advantage than fighting with price of other products in the western market. There will be some companies that will differentiate their products by pricing too. Companies differentiating with price are more likely to expand in some Asian and African markets. Companies that are differentiating with accuracy and reliability are likely to expand in the North American markets with higher price margin.

Marketing and sales alongside human resources will likely incur the major share of expenses due to outsourcing of activities. Business opportunities in this era will be endless for IoT enabled healthcare solutions due to the fact that the digital natives will be the drivers of the society. This group of people will be everywhere,

they will be the consumers, and they will be researchers, innovators and legislators. SH marked, "For the wellbeing business, it is private business and I believe that in future consumers will be more interested to buy different kinds of services". The digital natives' understanding of technology will boost the acceptance and mass adaption of such services. The wellness sector will see a massive boom in this medium term future due to the mass adaption.

Social causes: Numbers of companies look for profitable exits from the market; thus, the decision for outsourced solutions seems legitimate. Digital natives will obviously have impact on the mass adaption of more digital services. Additionally, digital living makes people lazy and leads to an unhealthy life. That will also encourage people adapting IoT enabled wellness solutions. Working people will be working more than regular shifts to keep up with the global competition which also increases the need for additional health attention.

Worldview: Global business competition will have direct impact on how the country's industries will operate. Golden days of the Western world are now past. A country with a population of less than 6 million and not a significant group of immigrants will have to work more than ever to keep up with highly volatile global competition in each sector. At the same time, the recent trend in Finland's winding down and minimalistic

lifestyle in one's retirement age will also offer some opportunities that introduce simplified multipurpose solutions.

Metaphor: We compare this medium term future with the summer time breaking dawn. When the dawn breaks roosters crow, birds chirp, birds flap together in groups and we as human beings wake up for another beautiful day. The time of breaking dawn is like a calling or a sign for something good to come. The sense of ecosystem building and stride towards that are such signs. Similarly, mass adaption and acceptance of digital services in this era will signify as the dawn for a better day.

By this medium-term future, participants in this sector will realize the benefits of working in clusters and early examples of ecosystems will also surface. The medium-term future is vital to show positive remarks on internationalization, working in networks and ecosystems for the organizations in this sector. Based on the results during this period, the long-term future will be shaped.

### **Long-term future: "The Ant Super-colony" scenario**

Litany: On the long run with better understanding of ecosystems and how it operates, we will see multiple ecosystems working simultaneously in a complementing manner. However, by this time many ecosystems have been created and perished due to early trial issues. Preventive care and rehabilitation sector is likely to pose the bigger business opportunities alongside the need to create a single global platform for healthcare services. Different streams of technological advancements in different countries will offer opportunities.

Finnish IoT enabled healthcare industry as a whole will be a big export-based industry. The role of insurance companies will change significantly; they can even offer health care solutions to citizens and not only partner with healthcare providers. We will be spectating better cooperation between public and private sector. Public sector as client who pays for health services will regain its strength.

A lot of startups from the shorter term will die by then, but on the other hand the surviving ones will become good sized SMEs. As there will be better working eco-

systems in act, value propositions offered by companies will complement other companies to provide total solutions for citizens. There will be countless products and services for healthcare/wellness empowered by IoT, but how many of them will be of the desired quality? Consequently, the real value for money will bring competitive advantage for companies. Almost all of the

The earlier blind spot for technology & network cost in healthcare will be better absorbed by then. The cost for R&D will be relatively lower because most device innovation will reach maturity. However, the cost of human resources is going to drive the biggest share of costs. Finnish companies will find their place in global value chains. This industry will have a good impact on the overall economy of Finland. Thus the leaders from the industry will be better heard by the politicians and policy changes will be possible in a comparatively easier way than now.

Social causes: At this moment there is no global giant originated from Finland in the global business picture. There are a lot of tech based health service startups in the present market. Some of them will survive for a longer period and many more will be created. To make Finland's economy sustainable, there will be a need for jobs and a good portion can be created in this sector. The country needs a constant balance between taxation, regulation and business in this sector for continuous prosperity. For that, the industry first needs to reflect smart gross production by contributing to the national economy and then can be heard by the politicians for policy changes. All in all, Finland needs a healthy workforce that can work its way out with the limited population of the country.

Worldview: A large group of aged population added to a consistently very low population growth rate puts the faster economic growth in question. At the same time, all the countries in the world are greedy for power, assets and talents. Finland needs to be competent in these fights to retain local talents and assets. Global competition is multifold; companies need to compete with quality, price or accessibility and trust on a global level. Global competition will surely come from both developed and developing countries. Constant balance is thus required to maintain market position.



**Figure 4: Summary of the Long term future: “The Ant Super-Colony” scenario**

Metaphor: We call it the ant super-colony. According to BBC (Walker 2009) earth news in 2009 scientists discovered an ant super-colony in Southern Europe stretching over 6,000 kilometers and populating several billion ants together happily. Altogether this super-colony nested 33 different populations living in a connected system. We are aware of the team work ability of ants. When that is added to the ecosystem idea, it seems like a justified comparison to be encouraged for global dominance. The overall healthcare sector in Finland will have multiple ecosystems simultaneously. We see a substantial role of IoT in those ecosystems' building and growth.

## Discussion & conclusions

### Futures business models of IoT enabled health-care sector

At a glance, the business model changes for the future IoT health arena might seem pretty predictable if we consider each scenario in isolation. However, if the scenarios are considered as a broader picture, we can find a story underlying. Authors observe the role of the public sector as customer, being changed over time and again is becoming stronger on the long run, which is an exciting stream. Also, the role of R&D as a key operation is going to change in different time frames. Additionally, the prospect of IoT being an enabler in the health sector across wellness, care and health tech seems evident and is growing over time. Table 2 summarizes the prob-

able business model elements for each scenario and each time frame.

Healthcare companies in Finland currently lack somewhat of marketing and sales styles that reflect in the future as well. It is time that organizations start learning the art of creative marketing and selling. Similarly, on the short run future for better business results for IoT health solutions, Finnish companies need to work on better user experience and the usability of services. These early improvements should provide the sector with traction for a longer lasting globally sustainable competition. Having a small population, Finland will need the industry to be export-oriented and operate globally. This research foresees, more and more successful internationalization of firms from this sector during the medium-term future and beyond.

We approached the study with a linear sight towards the future and tended to understand the logics that will emerge and evolve. Some congruent trends that came up from professionals' viewpoint highlight, that, Finland should work for ecosystem environments in the healthcare as a whole, where IoT is a definite part, for the future. One of the interviewees marked that currently messages from industry players are too fragmented. This fragmentation needs to be reduced and that can be done when companies become part of a bigger cluster, larger networks and finally an ecosys-

**Table 2: Probable business models of an IoT enabled healthcare sector in Finland**

	BM element	Short term	Medium term	Long term
	Business opportunity	Assisted living, Elderly care through connected services	Mass market for the digital natives, Pull from consumer side, Wellness sector	Preventive care, Rehabilitation sector, Global business expansion
<b>What</b>	Customer groups	Public sector as major payer, Private consumers for wellness business	More B2B customers, Private consumers for wellness business	Export based industry, B2B customers, Public sector as major payer again
	Value proposition	Gamifying health with statistics, Digital services for digital natives, Different points of care	Digital services at all levels	Total solution, Complement other companies' value promises
	Product offerings	Service based solutions	Software and application enabled services	Endless types and numbers of offers and digital services
	Competition and partnering	Traditional competition, Cooperation with others when needed	Networks will emerge in numbers in the sector	Efficiently working ecosystems
<b>How</b>	Competitive advantage	Companies need to evolve and keep up with changes	Service quality, accuracy, reliability and price	Better partnering, networking, agility
	Marketing and sales	More like as it is now, Niche marketing for niche products	Outsourced, Brand marketing	Private product/services sold through public channels
	Key resources	Technological readiness, Network and connectivity, Sales channels	Medical acceptance of many services, Strong technology infrastructure	Global value chains, Science based knowledge, Efficient working ecosystems.
	Key operations	R&D, create science based knowledge, improve usability and user experience	R&D about ecosystems, Internationalization	Internationalization, Attract international investment
<b>Why</b>	Basis of pricing	Service oriented pricing will emerge	Market competitive prices, Prices will come down due to R&D maturity	Service oriented pricing throughout the market, Better value adjusted
	Cost drivers and elements	R&D, Network and connectivity	Marketing & sales, Human resources	Human resources

tem. Another respondent thinks there will be working ecosystems in the industry by the medium term future; however she expressed her doubts of seeing a single ecosystem lasting for longer period without wisdom, leadership, navigation, change management and adaptation.

One more major observation of this study is that Finnish companies in this sector are already realizing the needs and benefits of working in cooperation rather than competing while the major competitors are waiting outside the national border. This understanding about cooperated international competition will help approach many challenges which would be more difficult if the task was left for an individual company. The startup scene in Finland has played a vital role in this course. Some products and services that are being developed now are breathtaking according to another interviewee. These services need a global market for longer sustainability. However, global digital literacy and connectivity issues stand as obstacles now. Given enough time and simplifying these innovations, it is possible to deliver them to any part of the globe, whether to more advanced North American markets or comparatively less advanced Sub-Saharan Africa. The challenge for companies is to anticipate proper timing for expansion in the proper direction depending on their own readiness and the market's readiness in regard to economic condition, digital literacy, network and connectivity standards.

As stated earlier, this research considers business opportunities to lie at the heart of the business model. So, for each time frame some potential key business opportunities are identified. Finland has a huge group of ageing population who needs proper care. For the short term future elderly care and assisted living seems to be the most prospective business opportunities. In a few years, we will have a society full of digital natives who never saw a society without computers, mobile phones and the Internet. Thus a huge market full of digital natives will offer wider opportunities for many companies to experiment and offer. During the medium-term future, we will see extensive adaptation of wellness products and applications aided by IoT. For the long-term future, this research identifies preventive care and rehabilitation sector to be the potential flourishes for IoT interventions. Besides, by the long-

term future companies in Finland will gain better understanding about global markets. Internationalization will be another aspect of business opportunity during the medium to the long term future.

The table provides a conceptual space by depicting different business model elements, as what it could be at that time frame but not exact prediction. This accumulation of business model elements can serve industry players to better model their own business model as a part of the industry.

### **Business model and CLA**

Recently, the attention has been focused on the evolution and transformation of the business models as a method of researching the futures (Ahokangas & Myllykoski, 2014). This change is due to the characteristics of today's world market where a growing number of small companies with new and alternative business models and fast innovation progress that challenges the incumbents (Rohrbeck, Döhler & Arnold, 2009) are emerging. As a result, a successful reinvention of business models to respond to environmental shifts is substantially influencing the possible future success of an enterprise (Wirtz, Schilke & Ullrich, 2010). It is arguable that from an industry point of view, similar successes are achievable if industry business models can be mapped by creating a wholesome picture.

Using the future as a setting where transformation will happen is about the habits and world views (Inayatullah, 2007); however, the notion of business model reflects the realized strategy of the firm (Masanell & Ricart, 2009) which includes the logic of the value creation and capture as well as the architecture of the business. Thus, the combination of these two concepts provides a firm tool for researching and creating sustainable prospective business models.

CLA is a future-oriented method that can be utilized in many circumstances. It leads to creating transformative spaces for generating alternative futures by questioning the past, present and future. It is grounded on the premise that the way a problem or an issue is formulated and framed influences how it is perceived and changes the actors who are responsible for solving them. CLA applies deconstructed linguistics to elicit knowledge and experience on the whole context



by moving up and down in these four layers/ways of knowing. The litany view point is simplistic and rule-oriented. The social causes view is able to analyze the world complications subtly. The discourse/worldview layer is concerned with rather profound analysis of complications. (Inayatullah & Milojević, 2015).

At the abstract level, business models are complex entities that are embedded in the organizations (Casadesus-Masanell and Ricart, 2010). However, they are socially constructed and representable using words or meta-models. Understanding the construction of the business models is influenced by our perception of a model which might range from "ideographic understandings to general and perceptive (nomothetic)". Therefore, business models can be static or dynamic entities which contain elements of learning based on the understanding the linkages and the causal relationships among the building blocks of the model (Jensen, 2013).

The horizontal analysis of CLA investigates alternative ways of knowing within a certain layer through scenarios. It originally occurs in social causes and discourse/worldview layers. Social causes questioning discloses multiple understanding of an issue which can be corresponded to the horizontal dimension of the business model concept. Discourse/world view asks about values, perspectives, viewpoints and their effects. Finally, the metaphor layer can help build and choose a future instead of only foreseeing. In that sense, business models can be transformed based on available resources, relations and logic. These are also associated with actors, processes and outcomes. Therefore, they are connected to the future market.

This paper attempted to display a way of using the business model-CLA combo to understand and analyze the future of Finnish IoT enabled healthcare sector. Unlike other foresight methodologies, CLA professes less of predicting the actual future rather opening up transformational conceptual space for practitioners. We argue that the combination of Business Model Wheel (BMW) as a tool and CLA offers additional structure to look at the industry future. This BM-CLA structured lens provides us the tool to create a wholesome picture. Then we can break it down into smaller parts and find out probable future business model elements for

the industry.

For this study, first, we designed the interview framework combining business models and CLA by creating a two-axis matrix. This matrix helped us to develop a focused but wide enough question set, so that we could collect the required data that eventually enabled us to create a wide and holistic picture of the sector. To succeed in looking at the future of an industry by using business models, it is necessary to understand the overall market opportunities, market context, market participants, competitors, partners, customer groups, different value streams, basis of pricing, different product offerings and financial aspects as a whole.

While looking at the future of an industry instead of a certain company we utilize some steps from the Bouwman et al (2012) tools like identifying desired changes, analyzing the impact of desired changes, translating BM changes and identifying uncertainties. Also, as Bouwman et al suggests in their discussion that all these should be translated to specific activities. However, because we focus on industry level, the findings of this study thus can be a guide for individual organizations for developing their business models and identify specific activities for alternation. This also complements the claim from CLA perspective by not predicting exact future of an entity, rather offering transformative conceptual space for development. Business model wheel in this case offers additional space for conceptualizing by emphasizing market opportunities unlike other prominent tools.

Based on the interview outcomes three linear progressive future business scenarios were constructed for the context of the study. Scenario planning is virtually applicable to any situation where the intension is to imagine how the future might unfold (Schoemaker, 1995; Jetter & Kok, 2014). Schoemaker (1995) also stated "scenario planning simplifies the avalanche of data into a limited number of possible states (pp. 27)" to open a space for better strategic planning. Empirical evidence supported the feasibility of the created scenarios which tell a whole story about the market for three different time horizons. For this study, the short-term future is considered as 5 years in the future, the medium-term future as 10 years ahead and the long-term future is considered as 15 years from now. The use

of CLA layers in scenario writing expands the range and richness of each scenario and helps to analyze feasibility (Inayatullah, 2004). Finally, we further analyze the CLA translated qualitative scenarios to concretize the list of probable futures business model.

## Conclusion

Ahokangas et al (2015) argued for future centricism in the next generation of business modeling research. Bouwman et al (2012) offered different tools for organization specific approach to handle business model development for the future. Building on futures thinking and Amit & Zott's (2001) note, we consider it is just to use the business model as the basis of analyzing the industry future and open up space for thinking for the practitioners. Thus, in this paper we display a way of applying the business model concept to analyze an industry and industry opportunities.

With theoretical understanding coupled with qualitative empirical data, we developed and translated three linear continuous future scenarios using the business model-CLA combo. We presented a holistic conceptual space of the future for the context of the study. We have analyzed the empirical data to create futures scenarios and derived different business models. We explicated some probable future trends in business models and how they might evolve. We have identified major business models elements including opportunity, revenue, cost perspective, value proposition, customer, competencies and competition perspective. The interview framework that we developed was a balance between business model wheel framework and CLA. Finally, using the concept of busing models alongside CLA, we have created the futures business picture of an industry. The series of congruent scenarios was created based on different time frames to understand the future more profoundly. Besides, the created approach could have helped identifying business model elements and lifecycles (i.e. 5, 10 and 15 years ahead) as a guide for the future market over time.

The concept of ecosystem is elusive, complex and very little understood till now. There is need for more research in that perspective, in order to understand what can be called an ecosystem and how to organize such a setup. The healthcare industry in Finland is growing fast and IoT is surely going to play an outstanding role

in its development. The interest lies in finding out how much IoT will foster the speed of growth in this sector. Change is complex, and necessary, when we think about the future. Instead of disregarding the future, we illustrated three future scenarios out of many other possible ones with an attempt to create a more harmonized long-term real future where Finnish companies take lead globally and operate in an ecosystem that complements local entities in order to provide a total solution for public health.

Besides the CLA-BM combo, we perceive additional theoretical contributions of the paper for the business model literature. This study shows how business models are going to be transformed over a longer period of time in the future for the industry. Further studies can also hence explore strategic transformations that are needed for policy developments (Ivori, 2015). Our findings suggest the need for new service concepts and pricing models which resembles the notion on how these can help companies gain competitive advantage (Petri, 2014). Furthermore, we point out the existing interest on ecosystem ideation and building for the industry. To do so, we observe a potential to apply concepts like network-based business models (Lund & Nielsen, 2014).

There are few limitations in this current study to mention. First, because we adapted a futures research methodology and applied it to look at far future, we needed to draw conclusions based on logical assumptions and not exact predictions about the future. Second, this research presents empirical analysis of the IoT enabled healthcare sector from a futures perspective, which is one of many industries which might benefit from the use of business model- CLA combo to look at the future. Since this study proposes a novel way to combine business model and CLA, it is arguable that the exploratory approach is applicable to other industries as well. Additionally, because this is the first attempt to combine business models and a futures research methodology to look at industry's future, there were no existing literature to reflect and compare the findings' application.

Despite the limitations, this research opens the way for further research in the futures avenue for business problems. One possibility can be employ the explorato-

ry approach of business model-CLA combo in researching other industries. In addition, further research with similar approach can result in a standardized futures business research technique. From a contextual point

of view, it is evident that the IoT/healthcare industry calls for further research on the concept of business ecosystems from the network-based business models perspective.

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## Appendix 1: Interview framework

This framework was used a guide for the interviews. In most cases questions were rephrased and adjusted to the progression of discussion.

	<b>What:</b> Customers, offering, Value proposition, value networks, competition	<b>How:</b> Selling & Marketing, service delivery, competitive advantage, key operation	<b>Why:</b> Pricing, charging, cost elements, cost drivers	<b>Where:</b> Organizational environment (Internal), External organizational environment	<b>Opportunity</b>
<b>Litany:</b>	1. How do you think customers groups can be identified and segmented in the future	7. How do you think the selling and marketing activities will change in the future from now	13. How might the pricing model and basis of pricing be changed in the future	19. How do you think the impact of organizational environment on business performances will change over time in the future	23. What could be the business opportunity for in the future in your opinion?
	2. What might be the different value propositions designed in in the future your opinion	8. What mode of service delivery can take lead in your opinion	14. What sort of current cost elements could be there in the future	20. How do you think the impact of external business environment on business performance will change over time in the future	
	3. Do you think business networks and competition will be different in the future compared to current markets? If yes, how?	9. How can companies gain competitive advantages in this industry	15. What sort of new cost elements might come up in the future	16. What will be the major cost drivers for the health IoT business	
	4. What sort of product/service offerings can be there in the future in the health IoT business	10. What will be the key operations and resources in the future in your opinion	17. What could cause such pricing and cost structure changes in the way you mentioned	21. What might encourage such changes in impact of organizational and external environments on business performance will change over time	
<b>Social Causes:</b>	5. Why do you think companies would be interested to act like this in the future	11. Why would companies design such campaigns in future in your opinion	18. Why do you think such cause will take place	22. Why do you think such encouragements arise	24. Why do you think the business opportunity might come from that specific source or in that form
<b>World-views:</b>	6. What deeper reason could be causing the social changes that is likely to interest companies in such a way	12. Why do you think such social changes will take place	25. What global issues might have an impact on such opportunity being generated or identified		
<b>Meta-phor:</b>	26. If you are asked to compare the overall structure of the futures business model of an IoT enabled business model, how would compare it to a metaphorical setting				

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