Internet of Things as a source of future marketing tools

Author: Ferhat Celik
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT

The rapidly evolving development of Internet of Things and its devices create new opportunities and circumstances that can be monitored and applied for more efficient Marketing. Since marketing units suffer from a lack of knowledge about individual customer and the timeliness of the knowledge Internet of Things is anticipated as a potential tool to overcome the knowledge gap. For this purpose and due to the nature of Internet of Things strategic issues of companies as whole package of all units and partnerships are taken into consideration. Therefore the utilization of Internet of Things is regarded as additional value for Marketing. The main issues are the circumstances of different future developments that illustrate the most relevant aspects of Internet of Things that needs to be considered by the company to grasp the chance of being an early innovator. After a proper comparison of the scientific literature and the case studies those main issues that need to be taken into account to utilize IoT for Marketing are Strategy alignment, R&D in cross functional groups & close partnerships and coping security issues sufficiently.

Supervisors: Dr. Constantinides and Dr. R.P.A. Loohuis

Keywords
Internet of Things, interactive marketing, sensors, strategy alignment, customer patterns

7th IBA Bachelor Thesis Conference, July 1st, 2016, Enschede, The Netherlands.

1. INTRODUCTION

Since the development of Internet of Things led to new inventions it attracted the attention of researcher and several industries. Especially the development of Internet of Things stresses the issue of increased data flow between participants in a interconnected society. So increasing efficiency of procedures motivated companies in recent decades to apply "Strategic Information Management for Competitive Advantage" (Mark Raskino, 2012). Therefore data was used to improve trade, supply chain and sustainability (Duivestein et. al.2014). The recent development of Internet of Things however, is more about "social" data which are among others collected by several sensors and so called "wearables". This new development might be a consequence of the company's need for more personal data about the individual customer. "The opportunity to focus attention on individuals has long been an ardent wish of many organizations. For ages, the strategic plans of the majority of businesses have been all about the customer"(Duivestein et al., 2014). Since this kind of ambition fits to the aim of marketing as well, it might be advisable to consider the utilization of sensing electrical devices in order to make marketing more effective. Recently scientific researcher started to pay more attention to the development of Internet of Things. Since Internet of Things is an upcoming and rapidly growing trend in different industrial sectors it becomes due to the collaborations between universities and industry more important for research and development of future products as well. There is more than one definition of Internet of Things [IoT]. Well several perspectives and vision are aimed to define the nature and direction of Internet of Things. However there is no common final official definition of IoT yet. But according to the European Commission for Information Society and Media, (2008) Internet of Things is defined as: ''Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts". And A. Dunkels and J.P. Vasseur,(2008) stress the idea of: ''a world where things can automatically communicate to computers and each other providing services to the benefit of the human kind". So Dunkels and Vasseur definition attracts the attention of the reader thereby to the aspect of automatically working processes for the satisfaction of humans. Anyway those definitions are just an attempt to define and capture a very broad and rapidly growing development of IoT, which might be crucial for competition according to Porter and Heppelmann (2014). In recent years the aim of measuring the reaction of customer in social media for marketing sake lead to the development of ratios and models to measure or at least to set customers action and reactions in categorical frameworks, which enabled marketing department guide their actions in social media. "Brand engagement" for social networks is such an application, which is used to measure how active social media users are. (Hoffman & Fodor, .2010)Even though this improvement is highly valued in recent research, we should not oversee its limitations. Brand engagement shows how active the users act in social media and therefore indicates what the user pays attention to, but it delivers not a combined set of information about the purchasing history, the context of use and user's specific preferences. This knowledge gap about the customer might keep marketing departments in the position to be forced to rather guess some preferences instead of knowing the specific, individual needs of their customer. So the vague limited knowledge of marketing departments hinders not just the marketing unit to adjust the products and services to the needs of the individual customer, but it could hinder the R&D units to fit the products to the needs of the individual customer. IoT however might has the potential to be the source of developments that close this knowledge gap about individual customers. Hence it is necessary to ask: "What is the value of Internet of Things to marketing and how could IoT help marketing units to close the knowledge gap about their customer?" The new opportunities that Internet of Things might create by linking user's historical social data to the ability of immediate measurement of user appearance in Internet of Things could be source of solutions for the problem. This literature review is therefore aimed to define the nature of Internet of Things and to elaborate the ability of IoT to help companies to close the knowledge gap about individual customers. The evaluation of Internet of Things as a source of competitive value for marketing urges us to take the long-term strategic point of view on Internet of Things. Therefore the term strategy will be defined in the following section.

1.1 Strategy

According to the online dictionary 'business dictionary.com the two definitions of strategy are: "1.A method or plan chosen to bring about a desired future, such as achievement of a goal or solution to a problem.''2. The art and science of planning and marshalling resources for their most efficient and effective use. The term is derived from the Greek word for general ship or leading an army. See also tactics.'' Since data can be used as resources the creation and utilization of value out of customer's data is perceived as a strategic process that helps marketing departments to reach their goals.

1.2 METHODOLOGY

This literature review is built on recent scientific literature about Internet of Things, interactive Marketing, Sensors and new circumstances that might appear in R&D and strategy. In order to search and gather those articles Google scholar, the archive of University of Twente and related articles that were provided by the supervisor were used. The review is conducted to evaluate IoT as potential tool to recognize and predict customer preferences and therefore closing the knowledge gap about individual customers. The search for articles started with the term "Internet of Things" and "Sensors", but since it was aimed to evaluate sensing headsets, the terms "EEG headsets" and "wearables" was noticed and used during the further research in combination with the term "marketing". However EEG headsets are rather used for Neuromarketing instead of IoT. Since Neuromarketing does not fit to IoT yet, EEG headsets were excluded in the further search. Besides that the term empathic computing was identified and used as well. In order to find articles about measuring customer's reactions and predicting their preferences, the terms "social media engagement", "Interactive marketing" and "competitiveness" were used. The publications that were not just depicting the general development of Internet of Things, but rather fitted to the aim of evaluating sensors as a tool to recognise customer patterns and preferences were chosen and used to derive this literature review from. Furthermore case studies are used to check and compare if the findings in the literature review are accurate in the markets as well.

2.0Literature review

2.1 Nature of Internet of Things & its role for marketing

The potential implementations of electrical devices in a diversified field of applications contains tremendous amount of entirely new possibilities. (Swan M.2012). The characteristic features of Internet of Things are among others the creation of new applications, services and electrical devices that serve the needs of customer and companies by the utilization of networks, which enable both parties to produce or use more specific information in the shape of autonomous sensing, machine learning and adjustment to the circumstances or preferences of the user. The variety of potential application includes a wide field of different developments. Internet of Things can be used to increase the efficiency in supply chains of companies, help disabled human to master their daily life, enable user to intensify their experience during the utilization of entertaining services in their private life or rather improve the customer services in stores. (Liao et.al.2012), (Duivestein et al, 2014).Such needs might be indicated by body language, face expressions, user behaviour or purchasing patterns. In this case Internet of Things will be elaborated for new marketing opportunities. But since the definition of IoT is crucial it is suggested to think over the existing definition of IoT. The scientific sources give the reader the impression that IoT is not limited to the barriers of a few departments or function in a company. It rather illustrates, besides the closer relation between customer and department, an even more cross functional trend between the departments through IoT. The definitions however do not stress this issue specifically. So the reason for several numbers of definitions maybe the missing link of Internet of Things to all business units. Instead of focusing just on one specific function or on isolating each department from each other it is suggested that it will be illustrated as connected entities that move closer together to a flexible network by Internet of Things. The Definition of Internet of Things might be perceived as vague or weak if it does not cover at least all departments. Internet of Things nature causes a removal of barriers between the departments and the partners. Since the network of Internet of things is not limited to one or a few business units or companies the definition of IoT cannot be limited to one business unit or one function either but should rather illustrate the cross functional potential of IoT. Therefore the potential development of one department might be dependent on the other departments, such as Marketing, R&D, IT and Supply Chain Management as well. So the effects of Internet of Things on Marketing are not depicted as effects which are isolated and independent from other company departments, but rather are affected by other business units and partner companies as well. Hence are the topics which are concluded as crucial in scientific literature such as Security, Strategy, R&D illustrated in connection to other units to Marketing. An important motivation to utilize IoT for Marketing is to gain a competitive advantage, but in order to achieve it the flow of new relevant information about the customer need to be ensured.

2.2 IMPROVING INFORMATION EXCHANGE FOR MARKETING SAKE

The evaluation of sensing devices for marketing sake requires a consideration of several aspects which might have an impact on the experience with a product or a service of a company. So first of all the context in which the customer uses the product is taken into account. Since the environment and the condition of using the product, the service or simply watching the commercials might affect the perception, the sensed information about customer's reactions seems to be a crucial source of feedback for the companies. The feedback could be used to detect needs, no-go's or simply explore new ways of triggering stimuli that are favourable for a more intense customer experience. "To the degree possible, information should be personalized to have high value and meaning to the individuals or groups viewing it."(Swan M, 2012, p.24). Any kind of adjustment which satisfies the customer even more might be adjusted. It might be the music in the store which can be adjusted to the mood of the customer or a specific set of advertisement or incentives which are created based on the purchasing history of customer. Such information could be gained from the smart phones or the specific purchased items, which would be connected to the companies and keep the R&D and marketing departments up-to-date. Hence the consideration of individual circumstance can be used to create competitive advantages. To enable companies to measure and monitor the emotional state of mind and the context while using the product empathic computing systems can be used in combination with sensors. Those empathic computing systems are defined as: "Empathic computing systems are software or physical context-aware computing systems capable of building user models and provide richer, naturalistic, system-initiated empathic responses with the objective of providing intelligent assistance and support."(Duivestein et al. 2014, p7). One example can be the utilization of sensors in retail stores that primarily are aimed to serve the needs of the user. Those needs might be the desire for a more efficient process, uninterrupted ongoing experience or simply an application that assist the user. The utilizations of sensors that recognise the signals by sensing the user's behaviours could be used to notice the needs of the user before he notices them consciously. That can be implemented by machine learning based on algorithms and stored information about the customer. The data flows from user to companies enable companies to develop new application in order to serve the customer (Swan M., 2012). Now since empathic systems are able to recognise such behavioural patterns, it can be applied in retail stores to enable interactive marketing. Assumed that customers are willing to use their smart phones to share their personal information history and allow utilizing their smart phones as a device in the network in the shop, an interaction process might start between the sensors in the shop and the user's smart phone in order to consider the data pool to apply interactive short-term marketing. That might give marketing departments more insights about the way a consumer experience the product or the commercial, so that it enables the company to adjust it. The result might be a product and an additional experience that fits better to the customer or even a prediction of customer's preferences by recognising patterns in the customer's preferences. "Machine learning algorithms and other techniques can be used to seek patterns in large data sets"(Swan E.2012, p.22). However the sensing process must not be necessarily limited to the time during the visit of the customer in the shop. It can rather be extended. The ongoing exchange between the purchased product and the marketing department of the company who produced the product might give better insights about user patterns and preferences. "Intelligence and connectivity enable an entirely new set of product functions and capabilities, which can be grouped into four areas: monitoring, control, optimization, and autonomy" (Porter et.al, 2014). Provided that the products are online and are updated regularly, the company may even prevent longer lead times if the customer needs additional equipment or entirely new products. "The trend is moving towards multi-sensor platforms that incorporate several sensing elements. For example, the standard for the next-generation of personalized self-tracking products appears to be some mix of an accelerometer, GSR sensor, temperature sensor, and possibly heart rate sensor (from which heart rate variability may be

calculated) "(Swan M., 2012,p.3). Hence all the gathered information and conclusions can be used by the marketing departments to serve the needs of the customer even more efficiently. That information could be exchanged between companies in order to detect needs of the customer and business opportunities for companies, such as new retail stores, which would satisfy customers demand. "Information products for resale to other economic actors: These information products have high value for other economic actors and can be sold to them. For example, through an IoT solution, a company may have market information about a certain area of town that another entity might pay for (e.g. a real-estate company) "(Holler et. al, 2014). Since specific information about customer preferences can be perceived as guidelines for the companies, the ability of adjusting products and services to the preferences of the customer might create competitive advantage for the companies who start to use IoT applications.

2.3 Roles of IoT for companies' competitiveness

First of all it is necessary to illustrate that demand of adequate information about customers are not entirely met yet, companies are still keen to collect more information which enables them to know their customers, so that they can segment them more efficiently. "The producers and retailers are looking for an innovative marketing tools that will help them to identify customers. They want to transfer "marketing message" in an easy and efficient way directly to mobile Consumers." (Nowodzinski et al., 2016)

According to Porter et al. "smart, connected products and the data they generate" becomes crucial for competition. By enabling companies to gain insights of the user's state and condition through the utilization of sensing devices the companies can use the knowledge to apply new marketing strategies and services, which fit better to individual customer. So the consideration of sensing devices in the context of Internet of Things raises the question if and how that would affect the competitiveness of the companies compared to companies who refuse to use such services or simply fail to recognise sensing wearables as a new tool for marketing. According to recent literature about wearables and bio sensing the knowledge about customer's reactions is indeed contemplated as basis to gain competitive advantage. "A consumer's intentions, perceptions, actions and reactions, facial expressions, heart rate – all these personal data are coming within arm's reach of the information society. This provides a new potential in terms of competitiveness," (Duivestein et al, 2014, p5). Even though the evaluation is not set specifically in a marketing context this section is focusing on an assessment of sensors for marketing and how it affects the competitiveness of companies. "It turns out that by combining all the available information, more pointed conclusions can be drawn as to an individual's current and future behaviour."(Duivestein et al, 2014, p.24)(Swan et al, 2012). Since specific information is favourable for targeting in marketing as well, the chance of applying a misleading marketing campaign could be reduced. Besides that the actions of the competition need to be taken into account, from the perspective of the companies, if they use the potential advantages of IoT. Hence might the threat of becoming less competitive if the companies miss the opportunity of IoT be a problem as well. Besides the criteria that needs to be fulfilled to gain the goodwill of the customer, the general changes of the competition caused by the development and adaptation of Internet of Things need to be taken into account on the basis of Porter's 5 forces. Even though the general rules of competition are expected to stay untouched, the causes of several new circumstances which are among others determined through the development of IoT, requires to reconsider the existing circumstances about competition and companies strategy. Hence the five forces "bargaining power of buyers, rivalry among competitors, threat of substitutes, bargaining power of suppliers, threat of new entrance" are taken into account to evaluate the potential circumstances companies need to cope to understand how IoT affects their strategies. So collecting and processing the data is not just important to decide what kind of interactive marketing should be applied, but it also enables the company to satisfy customers. The bargaining power of customers might decrease when the new insights enable the company to segment customer even more efficiently. Changing to a new supplier might lead to a product and service which does not fit to user's individual need as the old product did. Hence would "the costs of switching to a new supplier increase" (Porter et. al.2014). Furthermore would the rivalry among competitors increase, but it also enable the companies, especially marketing departments, who start to utilize interactive marketing through IoT to offer additional service that increase the perceived value of the product for the customer. This kind of "first mover advantage" might force the other companies to adapt IoT as well. The threat of new entrance however would decrease crucially, when new companies had to " build a complete product cloud to securely capture, analyse, and store product data and distribute it both internally and to customers,"(Porter et al. 2014). The implementation of IoT to offer additional service might increase the threat of new substitutes, since other devices do not need to build a new product, but rather might extend their service with a few apps that overlaps with other services easily. Since this kind of software based product would decrease the need to transport physical products the need for and therefore the bargaining power of traditional supplier would decrease. But new supplier who might become even more important, because of their ability to provide the necessary skills to keep an IoT network running, could have even more bargaining power than the traditional suppliers. "The bargaining power of those new suppliers can be high, allowing them to capture a bigger share of overall product value and use manufacturer's' profitability." (Porter et al, 2014) The consequences of IoT implementation and the improved service might benefit the marketing department as a source of information and serves as additional reasons for customers to purchase the product, but the shift in power, naming the increased power of the new supplier might harm the marketing department when the manufacturer gains less profit. The consequence might be a decrease of marketing department's budget or even a high dependency on the marketing department that might cause a cut in the budget of other departments. Hence is it necessary to compare the benefits and the disadvantages of such implementations beforehand deliberately to prevent misleading strategies. The different opportunities might cause a change to the mission of the company. Since the development of innovative IoT products and services could require cross-functional teams from different business units and partners that share the effort and the benefits a development of new IoT product would affect the mission, vision and strategy of all participants. So aligning the strategies of all departments and the partners could be a way to prevent a misleading action of the companies. By aligning the mission, vision and strategy it is also crucial to detect and face the reluctant attitude of customers towards IoT.

2.4 Overcome potential obstacle towards the adaptation of IoT

In order to benefit from IoT the companies need to be aware of potential reluctant reactions on the market and its causes. Now

the evaluation of the implementation of innovative products goes hand in hand with sound rating of customers' willingness to buy and use the product. Hence an evaluation of new products that utilize an IoT network is advisable. In order to make a successful launch more likely the required aspects that would motivate customer or at least prevent a rejection of the product need to be identified and kept in mind to design, market and launch the product according to the requirements. Those requirements are as reported in recent literature among others price, computer capacity, timeliness, battery life, user friendliness (Duivestein et al. 2014).The criteria will be illustrated in detail hereafter. The price needs to fit to the expected experience of the customer about the product. The requirement timeliness is related to the adequate point in time to launch the product. Hence launching the product too early on the market might it lead to high losses. The last two crucial requirements are basically about the product experience of the user. So the battery life and user friendliness need to fulfil the needs of the user. That forces the company to engage in R&D sufficiently in order to avoid a late adaptation or even worse image damage. Besides the above listed factors the "Diffusion of Innovation theory" can be used by companies as a guideline to apply an adequate marketing strategy for the product launch. "Diffusion of Innovation theory: when you listen too much to the fanatics at the initial stage of a market introduction, you will be disappointed.[...]The fact is that 86% of the users (from early adopters to laggards) are motivated by factors unlike what drives the first group. The trick is to bridge the gulf between these groups, and this is the theme of Moore's book, *Crossing the Chasm*." (Duivestein et al. 2014, p.20). Hence it is advisable that the needs and the point of time of the needs of a particular group will be addressed carefully so that the chance of launching sensing devices in the market successfully can be increased. According to the theory the main focus of the company need to be paid to the group early majority, late majority and the laggards. They basically think pragmatically about their benefits, but about the risk of such products as well. Since using sensitive information in a new system can be perceived as risky, the company might become keen to offer a network that ensures sound privacy. Hence Internet of Things has indeed the potential to help marketing units to close the knowledge gap about their individual customer. The literature review showed that new developments of Internet of Things can be utilized to make marketing more efficient and more effective by gathering data about the customer through sensors and using algorithms and machines learning to process and assess it for the provider. That enables companies to react adequately and immediately to the circumstances, since the sensors provide the companies with the necessary knowledge about the context of use. It is according to the scientific literature necessary to fulfil the requirements of strategic alignment, cross-functional teams for R&D and the willingness to overcome obstacles for the adaptation of IoT in order to benefit from IoT devices as marketing tools.

3. CASE STUDIES

The aim of comparing the case studies with the scientific literature about Internet of Things is to illustrate the similarities and differences between the practise and the theory. Therefore the companies who wrote the case studies are introduced briefly in the following section.

PTC is a global technology company that is specialized in helping companies to conduct the transformation process that enables them to meet among others the necessary requirements of utilizing Internet of Things. PTC offers for those purpose softwares, ongoing services such as cloud services and trainings. Its case study is about "IoT Transformation at Carestream: Market Disruption and Improved Customer Relationships". PTC illustrates the improvements in the healthcare information systems and identifies the crucial issues of value of information, cross functional teams and proactive engagement to customer needs by IoT.

Deloitte is a global company specialized among others in consulting, audit, financial advisory and taxes. It has a global network of clients, more than 225.000 employees and it generated 35, 2 billion revenue in 2015. The case study of Deloitte stresses the need of just in time marketing in retail stores. The aim is to create a network within retail stores that recognizes the customer history and needs immediately through sensors and information exchange between customer and the network in the store. This network would enable the store manager and staff to guide their services.

Cisco is an American corporation and a global frontrunner for IT products and services. It has more than 71.000 employees and had a revenue of 49.161 billion in 2015. Especially phones and router for retail stores are just two well-known segments of their products. The white paper "Cisco IoT System Security: Mitigate Risk, Simplify Compliance, and Build Trust" stresses the need to cope the security of IoT networks in order to reduce risk and gain competitive advantage by improving customer experiences. It also illustrates the need of the link between physical security and cyber security in order to face the challenge of maintaining an IoT network which is favourable to companies and customers.

Accenture is global consulting service company which is specialized in strategy, technology and operations. It promotes the utilization of Just-in-time marketing to make marketing more efficient. It had 373.00 employees and a revenue of 31 billion in 2015. The case study "The Internet of Things: Revolutionizing the Retail Industry" promotes the benefits of high connectivity and real time interaction in retail stores to improve customer experience, optimizing supply chain operations and exploring new ways of creating new revenue streams. Therefore it is advised to consider organisational and technological issues such as governance and infrastructure in order to reach a new level of interactive processes for IoT.

3.1. Context

While the usage of conventional marketing was rather reactive the new way of proactive marketing in the context of IoT creates the opportunity to predict the most likely behaviour of retail customer based on their purchasing history and customer behaviour. "Since everything is accurately tracked and recorded, office managers can always look back to understand usage patterns, see a useful record of what has been done to proactively anticipate and head off equipment failures, something that has significantly improved Carestream's relationships with its customers." (PTC, 2015) Improvement of information exchange enables marketing department to gain more knowledge about the context the product or service is used. The information can be used to affect customers' behaviour in short-term and long-term time frames. Some crucial requirements for short-term interaction are: "This can require information with higher frequency, accuracy, and timeliness so that the retailer can influence customer action in real time." (Deloitte, 2013). To cope long-term marketing goals the nature of the interaction between customers and companies changes. It is rather an ongoing process "And the opportunities for IoT-enabled retail continue beyond the day of purchase with "smart" goods that can monitor their own condition and alert the user— and the retailer" (Deloitte, 2013)

3.2 Competitiveness & Obstacles

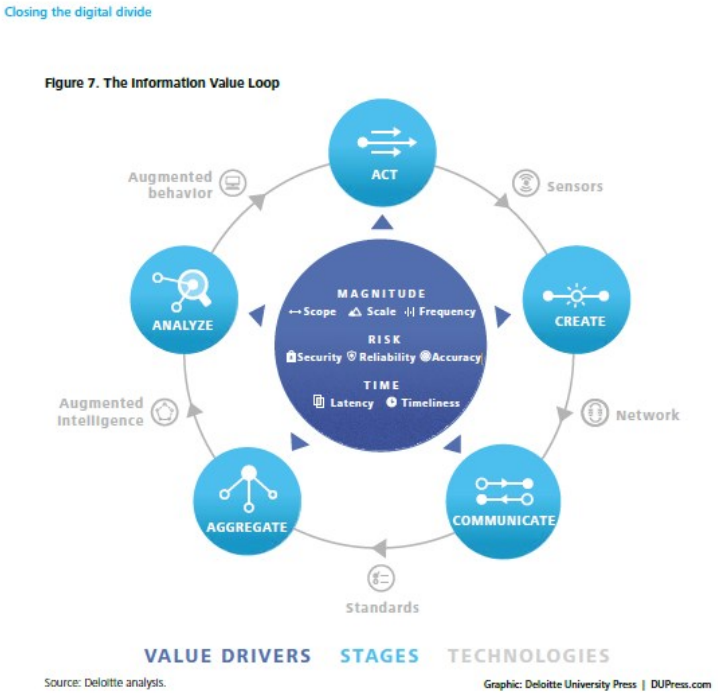
Customer's desire for security is an essential issue when customer decides to purchase a product or a service. It is immediately linked to the perceived risk. Hence companies are forced to offer a network which decreases the risk of data misuse. However besides the perceived customer risk concerning the product, the information about customers create value for companies "As the ability to unlock the full value of data becomes a key source of competitive advantage, the management, governance, analysis, and security of that data is developing into a major new business function" (PTC, 2015). Since cross functional groups enable the business units to evaluate what information is needed it is crucial for the efficient use of the data to collaborate with other business units and partners. "Now continuous collaboration is essential for success." (PTC, 2015). In order to detect and monitor the security gaps simultaneous product development might enable the departments to cope the security issues even better. "Data can no longer be treated separately in functional silos such as product development, service, marketing, sales, or manufacturing." (PTC, 2015) It is rather recommended to avoid the idea of separately working business units. "We see benefits in fraud detection, general safety, marketing improvements, analytic and tracking, price planning, revenue generation, and returns management."(Cisco, 2014). So the companies suggest taking all units into account in order to face all security issues properly.

The new Tesla car fits in the new context of IoT as an example product that is continuously connected to a network of IoT. This simple example doesn't necessarily meet the expectations of future developments in Internet of Things. But my idea of GSR (galvanic skin response) and heart rate sensors at the steering wheel in combination with cameras that detect the eyes of the driver inside Tesla cars could be used to measure and monitor the state of the driver in the cars in order to prevent dangerous situations such as micro sleep, in case of long riding distances. The driver could be assisted by an alarm system to prevent such dangerous situations and the next gas station with special coffee offerings could be displayed as a suggestion on the display in the car.

3.3 R&D

Based on the case studies the R&D departments are urged to engage in the development of IoT for marketing sake. The companies who want to gain competitive advantage need to be aware that information are perceived as crucial resources. Hence will companies who are keen to invest in R&D of IoT and convert the information into useful values, be more likely to benefit from a first mover advantage. "Those who can capitalize on emerging technologies and challenge established ways of doing business will be well positioned to create new value." (Deloitte, 2013). The information value loop from Deloitte might help to achieve the conversion of information into valuable resources. However the companies need to face the choice if and when to apply new IoT marketing methods. "The IoT will be a disruptive force in retail operations. As companies begin to form an IoT strategy, one question must be at the forefront: Do you want to be a disrupter or the disrupted?" (Accenture, 2014). There are direct and indirect applications for retailers. One direct application is the "location-based beacon technology" that enables the retailer to affect the action of the customer directly in the shop through an exchange of information between the customer and the retailer. (Accenture, 2014). The utilization of fixed sensors that detect "customers' paths through a store" gives the retailer the information to adjust his layout in the shop and thereby represents rather one indirect application. (Accenture, 2014)

4.0 The Information Value Loop



5.0 Discussion & Conclusion

Even though it was not possible to measure the exact value of Internet of Things in a specific dimension for Marketing, it was still illustrated that Internet of Things indeed has the potential to help marketing units to close the knowledge gap about their individual customer. The literature review and the case studies showed that new developments of Internet of Things can be utilized to make marketing more efficient and more effective. The comparison of the scientific literature and the case studies revealed similarities and accordance's between theory and practice. It is according to both case studies and scientific literature necessary to fulfil the requirements of strategic alignment, cross-functional teams for R&D, sufficient security and the willingness to overcome obstacles for the implementation of IoT in order to benefit from IoT devices as marketing tools. The "information value tool of Deloitte, might be an adequate guide to convert information, which are gained from the customer into valuable knowledge. The implementation of Internet of Things and sensors as a part of Internet of Things has according to both, case studies and literature reviews an impact on the competitiveness of the companies. It certainly affects the threats of Porter's five forces. Therefore the changing conditions which are caused by Internet

of Things need to be taken into account by the companies to adjust their strategy to the new circumstances. And in order to launch new products that fit to the needs of consumer, the companies need to keep up on the newest opportunities of gathering information about customer and applying it to offer products that satisfy the needs of the customer, so that they are willing to spend their money for the product which fits them the best. A close interaction between the Marketing department and the Research & Development department is according to the case studies close to the reason, since the short-term and long-term interactive marketing relies on the products and software features. In order to use the information about the user efficiently it is necessary to know how the network of sensors, clouds and machine learning algorithms should work in order to gain the desired service. Furthermore it is according to the case studies advisable to create a network with adequate partners to benefit from the shared data flow. The willingness to adapt innovative products by customer needs to be taken into account before a product is launched. According to Rogers's diffusion of innovation theory the customers can be categorized into five groups to illustrate and predict the diffusion of innovative products. So the different characteristics of each group challenge the companies to conduct incremental deliberate approaches that regard the phases of the product in the market. But before the companies start to implement new devices that enable them to utilize IoT as a source of customer information, the companies should make sure to fulfil all necessary requirements. While the scientific literature attracts reader's attention to strategic aspects and competitiveness through potential new developments, case studies are rather illustrating the need to develop cross-functional teams and high security standards. The case studies are however linked to applications in different industries, whereas the scientific literature is rather general. Deloitte for example is basically stressing the functions of IoT in retail stores, but does not mention theoretical aspects such as porter 5 forces. Hence more research is necessary that links the rather practical and specific perspectives of case studies to the theoretical frameworks in scientific research literature. And since sharing sensitive data about customers behaviour would be accessible to several participants in the clouds of IoT might raise doubts and concerns about the security of the IoT networks it could hinder customers to use the products or services. The perceived risk of a potential misuse of the data might create an obstacle for the customer to adopt products and services with IoT sensors. Furthermore hackers could damage the image and the trust of early adopters in the company. Hence companies should follow the appeal of the case studies and develop high security standards in order to avoid reluctant behaviour which affects the adaptation of IoT. So to prevent or at least decrease the risk of such fatal damage, the company needs to invest in his security to adjust his security standards. However both scientific literature and case studies focus on the urgent need of depicting the individual context in which the products are used in order to capture sufficient knowledge about the customers' experiences. But this literature review is limited to the existing scientific sources and to the low number of case studies of the companies about IoT. This review is due to the early stage of the development of Internet of Things limited to the developments and publications of this early stage. However further research about the utilization of Internet of Things for Marketing is needed. The exact measurement and the effect of Internet of Things on marketing needs to be tested for each application in order depict the relation of Internet of Things networks and marketing. Other limitations of this literature review are therefore that neither the specific circumstances in the several industries nor technological functions are tested or taken into account sufficiently. This literature review is a general attempt to capture Internet of Things as a potential source of tools for Marketing. The development of sensors that detect and recognize customer's state of mind or emotions raises the question about an adequate technology that would be able to do so. Therefore further research to test face recognition software or rather EEG headsets that are based on the measurement of cortical activities and Neuromarketing can be conducted. The need for a big common network for all IoT participants in all industries, which is advised in the scientific literature and case studies, instead of several different parallel networks for each industry might motivate to direct further research towards the development of one IoT network for all participants. Besides potential further research about economic and technological issues, ethical and therefore security issues might be good topics for Internet of Things and Marketing, as well. Since the developments of Internet of Things devices have not reached its peak yet and some companies are still hesitating to implement IoT technology into their existing activities, this literature review is limited to case studies that contain just a few cases about companies that want to profit from the first mover advantage.

ACKNOWLEDGMENTS

Hereby I express my gratitude towards my supervisor Dr. Constantinides for his outstanding guidance, the fair feedback and suggestions for my bachelor thesis. His feedback helped me to stay focused and increased my interest in the topic even more. I thank hereby my second supervisor Dr. R.P.A. Loohuis as well. And I also highly appreciate the help and the advices I received from my study advisor Ms. Sanne Spuls.

REFERENCES

Atzori L., Iera A., Morabito G. (2010); *The Internet of Things: A survey* University of Cagliari, Italy, University "Mediterranea" of Reggio Calabria, Italy, University of Catania, Italy

Constantinides E. (2014) Foundations of Social Media Marketing, *Procedia – Social and Behavioral Sciences 148,40-57*. doi:10.1016/j.sbspro.2014.07.016

Domingo M.C. (2012); An overview of the Internet of Things for people with with disabilitie, *UPC-Barcelona Tech University, Journal of Network and ComputerApplications,35,* 584-596. doi:10.1016/j.jnca.2011.10.015

Duce H.(2008) Internet of Things in 2020, *A Roadmap for the future,* EPoSS Workshop Report :http://www.smart-systems-integration.org/public/documents/publications/Internet-of-Things_in_2020_EC-EPoSS_Workshop_Report_2008_v3.pdf

Dunkels A., Vasseur J.P.,(2008) IP for Smart Objects, Internet Protocol for Smart Objects (IPSO) Alliance, White Paper #1, <http://www.ipso-alliance.org>.

Duivestein S., van Manen T., van Ommeren E. (2014); Empathic Things, Intimate Computing from Wearables to Biohacking, VINT 2 (4)

Fan W., Gordon M. D., (2012), How to use, and influence, consumer social communications to improve business performance, reputation, and profit. The Power of Social Media Analytics

Gonchigsumlaa1, K. Jigjidsuren, J. Dorj, E., Erdenebileg E.,(2015)
The Compared Analysis of Wireless Networks for Developing Internet of
Things School of Information and Communication Technology, Mongolian University
of Science and Techology

Hoffman D.L. & Fodor, M.(2010) Can you measure the ROI of Social Media Marketing?, *MIT Sloan Management Review*, 52(1)

Holler & Tsiatsis& Mulligan & Avesand & Karnouskos & Boyle, (2014),M2M to IoT A Market
Perspective, Introduction to a New Age of Intelligence, Elsevier

Liao. L. D., Lin C. T., K. McDowell K.,Wickenden A. E., Gramann K., Jung T.P., Ko L.W.,Chang J. Y.(2012) Biosensor Technologies for Augmented Brain–Computer Interfaces in the Next Decades

Nowodzinski P., prof. PCz. dr hab.Katarzyna Łukasik K., A, Puto A., 2016 Internet Of Things (Iot) In A Retail Environment.The New Strategy For Firm's Development, European Scientific Journal May 2016 /SPECIAL/ edition

Miorandi D. , Sicari S., Pellegrini D. F. , Chlamtac a. I. ,(2012),Internet of things: Vision, applications and research challenges

MIT Technology Review, Business Report,(2014); The Internet of Things, Billions of computers that can sense and communicate from anywhere are coming online. What will it mean for business?

www.businessdictionary.com

Porter M.E., Heppelmann J.E, (2014), "How Smart Connected Products Are Transforming Competition". Spotlight on Managing the Internet of Things, Harvard Business Review

Swan M. (2012), Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0, *Journal of Sensors and Actuator Network, 1(3),217-253.* doi:10.3390/jsan1030217

Weber R. H.,(2010) Internet of Things – New security and privacy challenges
University of Zurich, Zurich, Switzerland, and University of Hong Kong, Hong Kong

INFSO D.4 Networked Enterprise & RFID INFSO G.2 Micro &
Nanosystems(2008), in: Co-operation with the Working Group RFID of
the ETP EPOSS, Internet of Things in 2020, Roadmap for the Future,
1(1)

http://www.smart-systems-integration.org/public/documents/publications/Internet-of-Things_in_2020_EC-EPoSS_Workshop_Report_2008_v3.pdf
http://www.wareable.com/wearable-tech/biometrics-blow-your-mind-sensors-wearable-future-776

Cisco IoT System Security (2015): Mitigate Risk, Simplify Compliance, and Build Trust, White Paper,

Cisco, The vital element of the Internet of Thinks, Security
http://www.cisco.com/c/en/us/products/index.html

Case study PTC(2015), IoT Transformation at Carestream:
Market Disruption and Improved Customer Relationships, 2015
http://www.ptc.com/about

Gregory. J. (2015) The Internet of Things: Revolutionizing the Retail Industry,
Case study Accenture Strategy

Kambies T., Raynor M. E., Pankratz D.M., Wadekar G.(2016) Closing the digital divide IoT in retail's transformative potential, Deloitte University Press
http://www2.deloitte.com/global/en/industries/gx-all-industries-sectors.html?icid=top_gx-all-industries-sectors

Accenture:
https://www.accenture.com/t20160511T022625__w__/nl-en/_acnmedia/PDF-18/Accenture-Waste-or-Win-The-Case-for-Just-in-Time-Marketing-Main2.pdf#zoom=50

https://www.accenture.com/nl-en/company