From Facets to a Universal Definition – An Analysis of IoT Usage in Retail

Clarissa Endress[1], Gregor Friedrich-Baasner[2], and David Heim[2]

[1] University of Wuerzburg, Chair of Business Information Systems, Wuerzburg, Germany
{clarissa.endress}@stud-mail.uni-wuerzburg.de
[2] University of Wuerzburg, Chair of Business Information Systems, Wuerzburg, Germany
{gregor.friedrich-baasner, david.heim}@uni-wuerzburg.de

Abstract. The term Internet of Things (IoT) is widely used and discussed. However, there is still no scientifically generally valid definition and therefore no uniform understanding of the term in practice. To counteract this, we present a possibility to limit the term with the help of applications in the IoT environment. Specifically, we analyze the use of IoT along the value chain of companies by conducting a structured literature analysis.

Keywords: Internet of things, applications, use cases, value chain, retail

1 Introduction

The Internet of Things describes the digitization and internet-capable integration of physical objects into the networked society [1]. In addition, the term includes things that not only collect local information autonomously, but also learn from it, adapt it and use it to interact with the world around them [2-4]. The aim of such devices is to create added value through appropriate services. In this case, the notion of IoT goes back to Kevin Ashton and the Auto-ID Center at the MIT. They designed a company-wide radio frequency identification (RFID) infrastructure in 1999 [5].

Today, there is an increasing number of previously non-digital products (e.g. light bulbs, bikes and watches) being equipped with sensing technology, application logic, and a network connection. Generally referred to as product service systems (PSS), they are defined as a combination of products and services. While these services initially only extended the functionality of a product [6], such systems may have inverse roles nowadays, in which the product is only a vehicle of the service. Their emergence has led to numerous areas of application in sectors like energy, healthcare, or home automation, changing the nature of business models in these industries [3]. IoT is also omnipresent within companies in all areas such as production and logistics. Through 2020, an estimated 26 billion smart objects will be installed, generating a market size of approximately $7.1 trillion [7-9].

Although IoT is omnipresent and a widely discussed multidisciplinary topic in various fields such as computer science and telecommunications, there is still no unified and valid definition of the term in the academic literature [10-12]. According to our

14th International Conference on Wirtschaftsinformatik,
February 24-27, 2019, Siegen, Germany

research, there is currently a different understanding of what is meant by IoT, which in turn makes it difficult to discuss. In order to counteract this situation, we have set ourselves the goal of developing a universally valid definition of IoT in science and practice. In particular, we want to counteract marketing terms such as Industry 4.0 and analyze the technical bases of the terms. From our point of view, IoT is nothing new, but merely the linking of existing technical components with corresponding business models. Some researchers have also noted a clear need for research in this area [1], [11], [12]. In order to define an object, it is necessary to become aware of all facets of it. For this reason, we have conducted an extensive investigation of existing applications of IoT. Since the variety of IoT applications ranges from music events to intelligent devices in the medical field, we have limited ourselves to the business process of value creation in a company in order to be able to make an abstraction on this basis [13], [14]. By identifying all facets of the IoT along the value chain, we try to investigate all similarities and then summarize them into a common definition. The paper on hand aims to present our research idea and the first results of the far-reaching literature analysis.

2 Theoretical Background

2.1 Research Methods

As part of this work and the associated search strategy, the literature analysis process was extended or modified in some places according to vom Brocke et al. [15] (cf. Figure 1). In addition to the aforementioned five-step search process, reference was also made to the information flow diagram of Frost and Lyons [16].

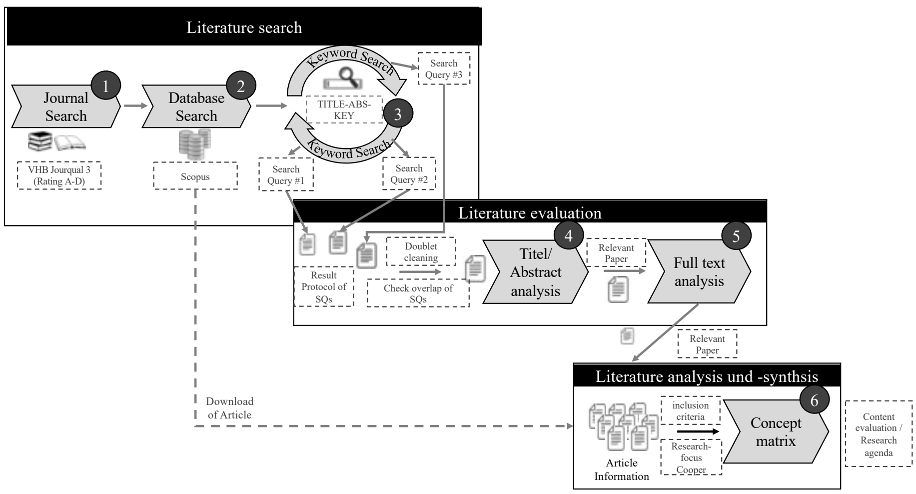


Figure 1. Approach to literature research

The figure illustrates the extended, six-stage search process which was carried out within the framework of this literature search. It should be emphasized that the keyword search consists of several iterations (phase 3). After defining the framework conditions within the first and second phase according to the research question, the actual search process can be started. The basis for this search is the so-called extraction log, in which all the necessary article information for each iteration is stored and which is used at the end for a final concept matrix. The matrix consists of articles, which are filtered out and the final search string can be worked out step by step. After the third phase has been successfully completed, the actual analysis steps (phase 4 & phase 5) can be started, which in this case do not differ from the procedure of vom Brocke et al. [15]. At the end, the result is the final extraction log, which in turn can be used as the basis for the concept matrix. It should also be mentioned that although forward and backward searches are relevant for the classic vom Brocke et al. [15] method, they were not part of the literature search strategy in the context of this work. The results of the individual phase and the number of identified contributions after the various search iterations are explained in more detail in the following chapter and evaluated accordingly.

2.2 Literature Review

As literature addressing definitions of IoT is very limited, we expand the focus of our research goal by looking at every facet of IoT. Due to the huge amount of literature concerning IoT and in line with scholars who recommend focusing on high quality outlets, we only considered articles published in outlets ranked (A+ to D) in the VHB-JOURQUAL3 [17]. For this purpose, the respective sub-ratings of the VHB were used as the basis for the search. We conducted a structured literature review following the methodology explained above. We used a search query consisting of three building blocks. On the one hand, these consisted of the IoT focus and the Value Chain focus with the respective key words following Porter [18], which can be seen in Figure 3, and on the other hand of the scientific outlets mentioned above. The keywords had to appear either in the title, abstract or keywords.

Our search resulted in an initial set of 596 papers. We analyzed the applicability of the cases presented in the papers by their title and abstract. The main reason for the exclusion of papers was that they either did not reveal any facets of IoT or they did not present any abstractable use cases for our research objective. The number of results was already reduced by more than half after this step. This analysis step can already be described as very accurate, because the subsequent full text analysis only classified 32 of the remaining articles as not relevant, leading to 225 articles for the content evaluation.

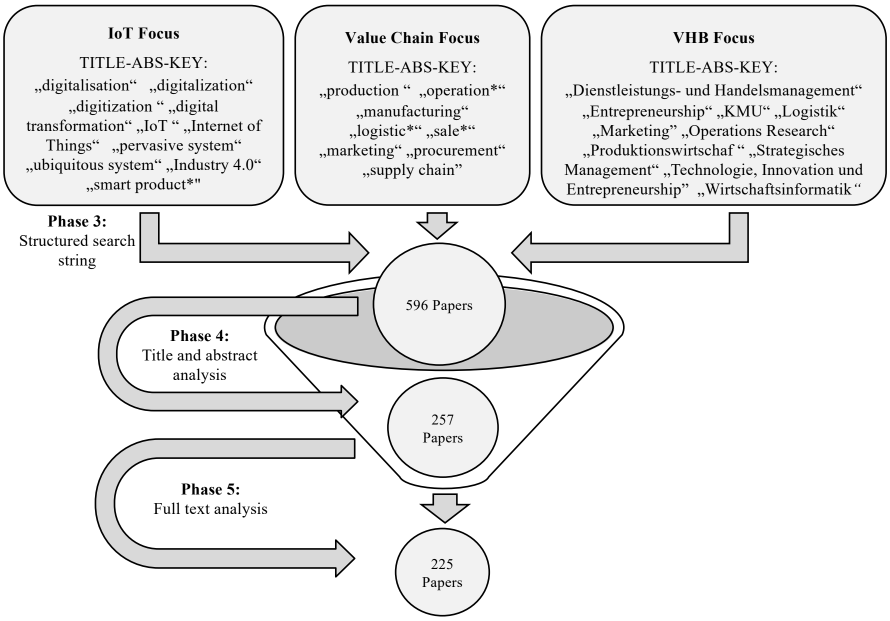
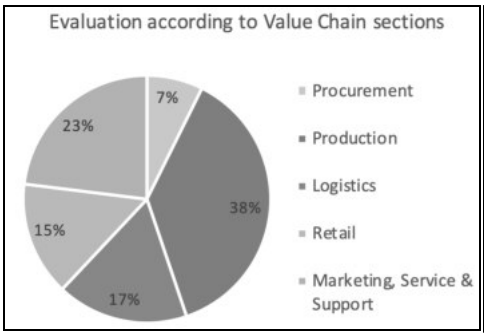


Figure 2. Literature analysis process

3 Evaluation

In this chapter, the content of the literature within the different concepts or business areas of the value chain is examined for concrete application scenarios of IoT. Therefore, the results are first clustered according to their respective value chain areas in order to then graphically analyze the individual technology approaches and their connections to each other. With regard to obtain a compact overview of the literature, we have not looked at each article individually, but have worked out the most frequently occurring application potentials of IoT. The following analysis is therefore based on exemplary IoT scenarios, which should not be regarded as exhaustive, but merely reflect a representative section of the literature. The focus lies on the technology drivers behind the recent transformation wave and their integration approaches among each other, since most technologies do not occur in isolation, but in interaction and therefore, compatibility is of crucial importance. However, before we go into the detailed evaluation, the following illustrations should give a first graphical overview of the article distribution per company division as well as the technology distribution. It might occur that an article deals with several or even all divisions.



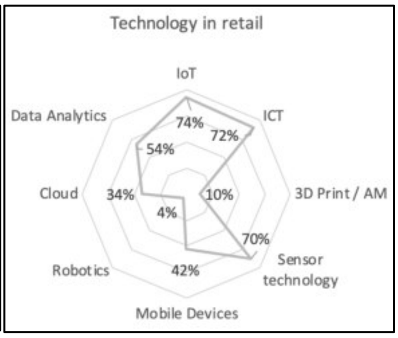


Figure 3. Evaluation by value chain area **Figure 4.** Technology distribution in retail

59 of the 225 identified articles deal with the IoT topic in the sales environment. In this context the concept of "smart retailing" was introduced, which refers to the use of retail IoT technologies to improve the quality of the shopping experience. In this scenario, smart and intelligent technologies are seen as enabling innovation and improving the quality of life of consumers [19]. How these technologies are reflected in the literature identified as relevant can be seen in figure 4.

It should be noted that in the case of sales-related processes, the smartphone is most frequently mentioned as IoT technology – compared to the processes in other value chain areas. Customers usually carry these devices with them and companies have the ability to access the display or payment function of such devices easily and integrate them into their business activities. The authors also see many application potentials for data analytics on the sales floor. For example, the product and customer data can be analyzed to dynamically adjust prices at any time. More details will be explained in the context of the appropriate subchapter. The evaluation of the literature has also shown that sensors and corresponding chips can be used in the retail context on different levels (product, shelves, cash machines, e.g.) or are already actively used. It is not surprising that robotics and additive manufacturing (AM) have a low number of hits because the overall evaluation across all value chain areas has already revealed this trend. In the case of retail processes, information and communications technology (ICT) can be seen as a basic module for all the other technologies because it provides the appropriate network or platform, integrates other IoT technologies and interfaces with other technologies or systems (n = 36).

On the one hand, smart products can provide support during the actual purchasing process (i.e. still on the sales floor), but on the other hand they can also be useful in the after-sales area and thus in the private domestic environment. In an article, the authors Miranda et al. [20] dealt, among other things, with sustainability considerations in the various phases of the life cycle of an intelligent product, and in this context can name some advantages in the area of product use and the end of product life. For example, after-sales maintenance and repair costs can be reduced through the use of e-services and remote diagnostics, thus increasing customer satisfaction [21]. If customers no longer need their products after a certain time, manufacturers can, for example, simply take back the old products, reconfigure them and then reuse or resell them [22]. Such functionalities can of course only be implemented to a limited extent with purely mechanical products, which is why the added value for smart products from the customer and company point of view can be seen in economic, environmental and social aspects [20].

Cloud Computing

Current trends in the Industry 4.0 research environment show cloud computing as one of the key technologies for IoT applications [23]. Especially in the context of sales processes, the provision of digital services requires the combination of cloud content, a physical product with embedded hardware and software, and a link channel to provide the services to the customer [24]. Such a service provision for the customer can be implemented, for example, by a cloud-based smartphone-app like the start-up BEXT360 within the coffee industry [25] or by integrating smart refrigerators into a cloud-based ecosystem [22].

ICT

Companies such as Google, Apple and Microsoft have been competing in the area of Enterprise System Software (ESS) for many years. The shift from ESS to web services, cloud computing and PSS, rather than installed components, provides future researchers new possibilities [26]. In addition to platform strategies, cyber-physical systems (CPS) also play an important role. A mechatronic system that uses CPS is an intelligent product due to its composition that integrates embedded systems and enables communication with other smart products. In general, a product can be smart if it uses ICT to improve its functionality and productivity. This is how the concept of PSS emerged, which integrates products and e-services into individual solutions for customers [20]. In the context of radio-frequency identification (RFID) different information systems or platforms may be used, depending on the industry or technology focus. One article speaks of a so-called EPICS-System (short for electronic product code information service). In this case, a GS1 standard automatically detects the movement of RFID tags and processes events according to predefined policies [27]. The result can be regarded as an RFID-based self-contained information system, which brings enormous advantages on the customer and company side.

Data Analytics

The authors Simchi-Evi and Wu [28] have analyzed the potentials of Big Data analysis in the context of price optimization models and price strategy adjustments, because not until now the retail sector has been in such a complex and competitive environment as in the current digitalization age. For example, based on product images and supplier information, customers in the Netherlands have the opportunity to bid online using a virtual auction watch [29]. Other authors have also focused on pricing strategies and models in the context of Big Data analysis tools. For example, in his article Weber [30] dealt with artificial intelligence systems in connection with sharing markets. By embedding intelligence in products, businesses and individuals, a so-called collaborative consumption arises. These recent developments have also encouraged some players in the automotive industry to develop new sharing solutions for urban mobility. The business initiative ENJOY, which was developed through a joint venture between Fiat Chrysler and ENI, can be shown as an example. With their smartphones, customers can quickly find, book and activate the desired vehicle and pay for the service based on their actual usage [31]. Amazon has tremendous potential to customize the value proposition for its customers. Through intelligent algorithms, Amazon knows where its customers live, what they have bought and what they might be interested in [32]. Nevertheless, companies such as Google or Ebay have also discovered these analytical capabilities and offer intelligent marketplace platforms as a service [33].

Sensor technology

The first study, which was considered relevant in the field of sensor technology, examines the needs of older consumers in the food sector and their implications for the food supply chain in a more holistic demand chain approach [34]. As a central result of this study, the following could be stated: Although the aging society also poses new challenges for the sales process, it can be positively counteracted by the use of IoT technologies. Among other things, the authors mention RFID technology, because RFID can significantly simplify the purchasing process on the customer side. Another author differentiates between two distinct RFID-based product applications on the sales area: (1) RFID as a central feature of the object itself and (2) RFID as a marking for the respective objects. The first group represents a central benefit for the customer, whereas the second option brings significant benefits to producers or companies [35]. Practical examples in the context of the first deployment scenario include a smart mirror, such as one from Panasonic, which is currently on the market, and OAK's smart changing room. Smart shelves, on the other hand, can be assigned to both RFID product applications. For example, Shelf Vending refrigerators are equipped with a system that recognizes and monitors the quantity and type of food being stored, so it automatically detects when consumers or employees remove products from the shelves [22]. No matter whether RFID chips are used on products, shelves or mirrors, the advantages for the authors are always the automation, the clear identification as well as the additional sources of information and the future will enable an easy customer and product profiling.

Mobile computing

Front-end digitization enables completely new types of customer interaction, such as creating self-service touch points with personal digital assistants, tablets or smartphones [36]. The first relevant articles deal with smartphones in the context of mobile coupons [19], [37]. The remaining articles all deal with the same application: smartphones as product information display. Quick response (QR) codes on the products give customers access to product information or product reviews directly on their smartphone display [22], [34]. Most common are applications that are not limited to providing product-related information, but also allow the sharing of product images and experience within a public network [19], [23]. Companies like Tesco and Amazon have taken advantage of the possibility to scan products via QR-codes and install appropriate applications within their business models [22]. Mobile payment systems have also become a hotspot for digital innovations. Smartphone manufacturers, telecommunications operators, payment service provider, software companies and start-ups are increasingly entering the payment market. We are not only talking about well-known companies like Google, Facebook or Apple, but also early-payment entrepreneurs such as Square, Paypal and Izettle [38]. These developments should significantly improve and automate the entire purchasing process – from information provision to payment process – on the customer and company side. Consequently, smartphones can be part of the IoT in various ways and making life easier for customers, companies and manufacturer.

AM

One of the articles considered the methodology of rapid prototyping (RP) as relevant in the context of AM. RP is currently mainly presented in the areas of production or research and development. According to the authors, however, the technology is being used more and more within the sales area. For example, RP can be used for product presentation to demonstrate the products in real. The big advantage is that the technology provides a prototype without long production time and allows to be modified several times, depending on the customers' needs. This deployment scenario is only possible due to the latest developments in machine learning and artificial intelligence techniques [39]. This shift of the product design phase to the customers can be seen as a decentralization approach, which creates a so-called temporarily supply chain. As a result, organizations are able to adopt ever-changing businesses and customer needs, without significant costs and time penalties [23].

Robotics

Robotics, on the other hand, currently has little acceptance in the context of sales processes, as only one article deals with this kind of IoT technology. The authors focus on a special kind of robotics, namely the so-called wearable robotics. Wearable robotics is a new field of research, focused primarily on the development of intelligent assistive devices and exoskeletons, which support human movement or enhance human performance. In this case, the robots consist of a series of actuators and sensors and require the development of advanced software and algorithms to process the data and control the system. Currently smart auxiliary devices (e.g. for arms) are commercially available and used by logistics providers. They can support different kinds of physical tasks, e.g. lifting and picking heavy food packs. Nevertheless, research on exoskeletons is still at an early stage and primarily focuses on military or medical applications [22].

In the context of sales-related business processes, all technology directions could be identified as relevant and explained using a wide variety of practical examples. One the one hand many authors have dealt with same or similar technology approaches and, on the other hand, some niche potentials have been addressed in some articles. As a result, there are smart products that can be found in multiple industries or business sectors – such as the location function of smartphones and corresponding apps – and those that are more specially designed for their use.

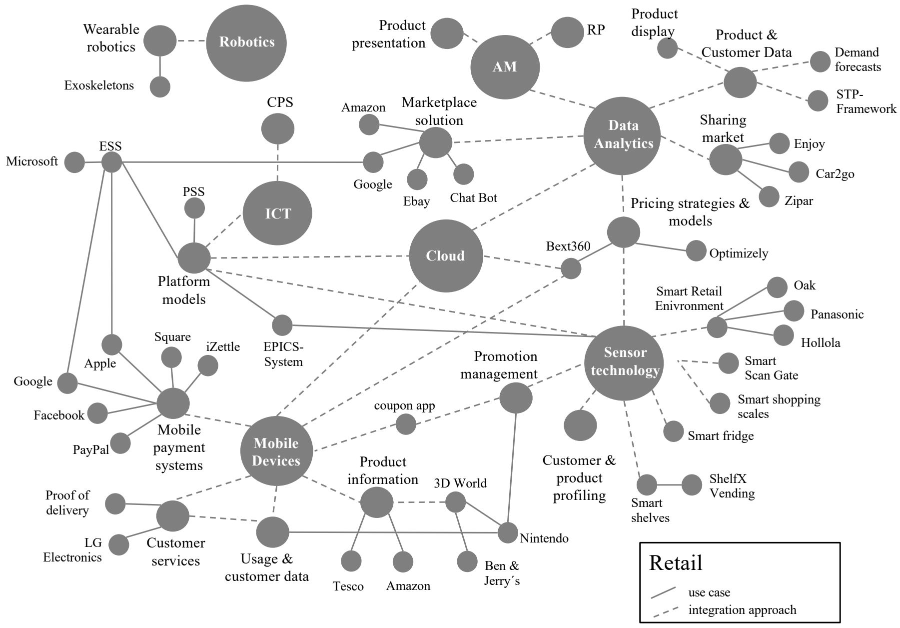


Figure 5. IoT application scenarios in retail

4 Conclusion and Future Work

The paper provides practical insights from manufacturers in various industries who have already had advanced experience with the implementation of IoT technologies. These insights can be seen as a source of learning effects for other companies or researchers, which plan to implement IoT solutions in their value chain.

From the scientific literature a clear mandate for further research of IoT can be derived [11], [12]. This also serves as motivation for the research approach presented below.

The results of the literature analysis presented here serve as an impetus for the research project. Use cases were extracted from the multitude of literature. Furthermore, on the basis of these, properties and facets of IoT can be subsumed. The far-reaching literature base then also serves further to create a taxonomy, if one follows Nickerson et al. [40].

The methodological approach by Nickerson et al. [40] can be used to structure IoT services based on conceptual and empirical observations. A taxonomy is defined as a set of dimensions, each consisting of different, mutually exclusive, and collectively exhaustive characteristics such that each object under consideration has one characteristic for each dimension [40]. Taxonomies play an important role in structuring novel terms and technologies to provide a deeper understanding of emerging fields of research and application [41]. Haas et al. [42] for example developed an empirical taxonomy in the field of crowdfunding intermediaries. Through the development of this taxonomy and the subsequent analysis of the collected data, they identified three archetypes of crowdfunding intermediaries.

Through collecting empirical and conceptual data in the area of IoT, common characteristics and dimensions can be identified. Subsequently, a common definition can be derived from the general characteristics.

Despite the fact that the literature analysis was conducted with a methodical rigor to improve the representativeness, the results should not be generalized to other empirical areas. There are still the natural limitations: (1) restriction on German and English language, (2) selected keywords search, (3) the selected database and the number of articles that it contains, and (4) the geographic and content characteristics of the articles identified as relevant, making it difficult to generalize to all sectors and countries.

As future work we will employ a seven-step method as proposed by Nickerson et al. [40]. For this purpose, we will collect a unique empirical data set of IoT applications and define meta-characteristics. These characteristics serve as a reference point for the dimensions and characteristics which are to be identified. Furthermore, we use the suggested subjective and objective ending conditions to determine when the taxonomy is robust. At this stage, we are able to derive a common definition of the term IoT.

Through the above-mentioned process, we are seeking for successful results within our future research.

References

1. Rosemann M.: The Internet of Things: new digital capital in the hands of customers. In: Business Transformation Journal, Vol. 9, pp. 6-15 (2014)
2. Ashton, K.: That "Internet of Things" Thing. RFID Journal (2011)
3. Atzori, L., Iera, A., & Morabito, G.. The Internet of Things: A survey. Computer Networks, 54(15), 2787–2805 (2010)
4. Weiser, M.: The computer for the 21 st century. ACM SIGMOBILE Mobile Computing and Communications Review, 3(3), pp. 3–11 (1999)
5. Hsu C.-W.; Yeh C.-C.: Understanding the factors affecting the adoption of the Internet of Things. In: Technology Analysis and Strategic Management, Vol. 29, No. 9, 1089-1102 (2017)
6. Baines, T. S., Lightfoot, H. W., Evans, S., Neely, A., Greenough, R., Peppard, J., … Wilson, H.: State-of-the-art in product-service systems. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 221(10), pp. 1543–1552 (2007)
7. Fleisch, E.: What is the Internet of Things? An Economic Perspective. Economics, Management & Financial Markets, 5(2), pp. 125–157 (2010)
8. Macaulay, J., & Kückelhaus, M.: Internet of Things in Logistics - A collaborative report by DHL and Cisco on implications and use cases for the logistics industry. DHL Trend Research / CISCO Consulting Services (2015)
9. Wortmann, F., & Flüchter, K.: Internet of Things: Technology and Value Added. Business & Information Systems Engineering, 57(3), pp. 221–224 (2015)
10. Bandyopadhyay, D., & Sen, J.: Internet of Things: Applications and Challenges in Technology and Standardization. Wireless Personal Communications, 58(1), pp. 49–69 (2011)

11. Boos, D.; Guenter, H.; Grote, G.; Kinder, K.: Controllable accountabilites: the Internet of Things and its challenges for organisations. In: Behaviour & Information Technology, 32(5), pp. 449-467 (2012)
12. Kees, A., Oberländer, A. M., Röglinger, M., & Rosemann, M.: Understanding the Internet of Things: A Conceptualisation of Business-to-Thing (B2T) Interactions. In 23rd European Conference on Information Systems (ECIS) (2015)
13. Friedrich-Baasner, G.; Heim, D.; Hauser, M.; Gramer, W. & Winkelmann, A.: Improving the processes of music events with radio frequency identification. In: IEEE International Conference on RFID Technology & Application (RFID-TA), Warsaw, pp. 119-124 (2017)
14. Angst, C. M., and Ritu, A.: Adoption of Electronic Health Records in the Presence of Privacy Concerns: The Elaboration Likelihood Model and Individual Persuasion. In: MIS Quarterly. Vol. 33, No. 2, pp. 339-70 (2009)
15. Vom Brocke, J.; Simons, A.; Niehaves, B.; Riemer, K.; Plattfaut, R.; Cleven, A.: Reconstruction the Giant: On the Importance of Rigour in Documenting the Literature Search Process. In: Proceedings of the 17. European Conference on Information Systems (ECIS), Verona, pp. 1-12 (2009)
16. Frost R.; Lyons K.: Service Systems Analysis Methods and Components: A Systematic Literature Review. In: Service Science, Vol. 9, No. 3, pp. 2019-234 (2017)
17. Rowley J.; Slack F.: Conducting a literature review. In: Management research news (27:6), pp. 31–39 (2004)
18. Porter M.: Competitive advantage – Creating and Sustaining Superior Performance. In: The Free Press, New York, pp. 36-43 (1985)
19. Willems K.; Smolders A.; Brengman M.; Luyten K.; Schöning J.: The path-to-purchase is paved with digital opportunities: An inventory of shopper-oriented retail technologies. In: Technological Forecasting and Social Change, Vol. 124, pp. 228-242 (2017)
20. Miranda J.; Pérez-Rodríguez R.; Borja V.; Wright P.K.; Molina A.: Sensing, smart and sustainable product development (S3 product) reference framework. In: International Journal of Production Research, pp. 1-22 (2017)
21. Lee J.: Smart products and service systems for e-business transformation. In: International Journal of Technology Management, pp. 33-38 (2003)
22. Vanderroost M.; Ragaert P.; Verwaeren J.; De Meulenaer B.; De Baets B.; Devlieghere F.: The digitization of a food package's life cycle: Existing and emerging computer systems in the logistics and post-logistics phase. In: Computers in Industry 87, pp. 15-30 (2017)
23. Barata J.; Rupino Da Cunha P.; Stal J.: Mobile supply chain management in the Industry 4.0 era: An annotated bibliography and guide for future research. In: Journal of Enterprise Information Management, Vo. 31, No.1, pp. 173-193 (2018)
24. Vendrell-Herrero F.; Bustinza O.F.; Parry G.; Georgantzis N.: Servitization, digitization and supply chain interdependency. In: Industrial Marketing Management, pp. 1-13 (2017)
25. Kshetri N.: 1 Blockchain's roles in meeting key supply chain management objectives. In: International Journal of Information Management 39, pp. 80-86 (2018)
26. Chellappa R.K.; Sambamurthy V.; Saraf N.: Competing in crowded markets: Multimarket contact and the nature of competition in the enterprise systems software industry. In: Information Systems Research 21, pp. 614-630 (2010)
27. Han W.; Gu Y.; Wang W.; Zhang Y.; Yin Y.; Wang J.; Zheng L.-R.: The design of an electronic pedigree system for food safety. In: Information Systems Frontiers 17, pp. 275-287 (2015)
28. Simchi-Levi D.; Wu M. X.: Powering retailers' digitization through analytics and automation. In: International Journal of Production Research, Vol. 56, pp. 809-816 (2017)

29. Verdouw C.N.; Beulens A.J.M.; Reijers H.A.; Van Der Vorst J.G.A.J.: A control model for object virtualization in supply chain management. In: Computers in Industry, pp. 1-16 (2015)
30. Weber T. A.: Smart Products for Sharing. In: Journal of Management Information Systems, Vol. 34, No. 2, pp. 341-368 (2017)
31. Ardolino M., Rapaccini M., Saccani N., Gaiardelli P., Crespi G., Ruggeri C.: The role of digital technologies for the service transformation of industrial companies. In: International Journal of Production Research, Vol. 56, No. 6, pp. 2116-2132 (2018)
32. Balmer und Yen D.A.: The Internet of total corporate communications, quaternary corporate communications and the corporate marketing Internet revolution. In: Journal of Marketing Management, Vol. 33, No. 1/2, pp. 131-144 (2017)
33. Varadarajan R.; Yadav M.S.: Marketing Strategy in an Internet-Enabled Environment: A Retrospective on the First Ten Years of JIM and a Prospective on the Next Ten Years. In: Journal of Interactive Marketing, Vol. 23, pp.11-22 (2009)
34. Oeser G.; Aygün T.; Balan C.-L.; Corsten T.; Dechêne C.; Ibald R.; Paffrath R.; Schuckel M.T.: Implications of the ageing population for the food demand chain in Germany. In: International Journal of Retail and Distribution Management, Vol. 46, No. 2, pp. 163-193 (2018)
35. Slettemeås D.: RFID - The next step in consumer-product relations or orwellian nightmare? Challenges for research and policy. In: Journal of Consumer Policy 32, pp. 219-244 (2009)
36. Coreynen W.; Matthyssens P.; Van Bockhaven W.: Boosting servitization through digitization: Pathways and dynamic resource configurations for manufacturers. In: Industrial Marketing Management, Vol. 60, pp. 42-53 (2017)
37. Beeck I.; Toporowski W.: When location and content matter: effects of mobile messages on intention to redeem. In: International Journal of Retail and Distribution Management, Vol. 45, No. 7/8, pp. 826-843 (2017)
38. Graupner E.; Maedche A.: Process digitisation in retail banking: An empirical examination of process virtualization theory. In: International Journal of Electronic Business, Vol. 12, No.4 , pp. 364-379 (2015)
39. Syam N.; Sharma A.: Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice. In: Industrial Marketing Management, Vol. 39, pp. 80-92 (2018)
40. Nickerson, R. C., Varshney, U., & Muntermann, J.: A method for taxonomy development and its application in information systems. European Journal of Information Systems, 22(3), pp. 336–359 (2013)
41. Bühler, R.: Standards in Disruptive Innovation: Assessment Method and Application to Cloud Computing (2015)
42. Haas, P., Blohm, I., & Leimeister, J. M.: An Empirical Taxonomy of Crowdfunding Intermediaries. In: Proceedings of the 35. International Conference on Information Systems (ICIS), Auckland, pp. 1-18 (2014)