

# SMART SERVICE SYSTEMS IN MEXICO: IMPLICATIONS OF THE SOCIO-ECONOMIC CONTEXT ON THE WILLINGNESS TO CO-CREATE

*Research Paper*

Emanuel Marx, Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg, Germany, emanuel.marx@fau.de

Francisco Horacio Valdés Juárez, Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg, Germany, francisco.valdes@fau.de

Willi Tang, Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg, Germany, willi.tang@fau.de

Martin Matzner, Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg, Germany, martin.matzner@fau.de

## Abstract

*IoT generates an enormous amount of data during their operation, which can be analysed and interpreted to discover useful knowledge and ultimately to support or make decisions. Smart service systems constitute networks of multiple actors that co-create value based on this potential of IoT. The intention to adopt IoT is positively related to the willingness of the actors to co-create. As smart service systems are embedded in an overarching social system, the socio-economic context significantly influences this willingness to co-create. In this article, we argue that this systemic perception of value co-creation is an alternative approach to study IT adoption by broadening the focus to all actors involved and to the macro context. We collected interview and secondary data from six firms that offer or participate in IoT applications in Mexico. We identified several factors that motivate and inhibit the company's willingness to co-create. Our study extends research on smart service systems design and provides empirical data of a specific socio-economic context.*

*Keywords: Smart service systems, IoT adoption, Context, S-D logic, Case study.*

## 1 Introduction

The Internet of Things (IoT) generally refers to physical objects that are equipped with electronics, software, sensors, actuators, and connectivity (Chatterjee et al., 2018) and are integrated into a networked society (Rosemann, 2014). These smart things generate an enormous amount of data during their operation, which can be analysed and interpreted to discover useful knowledge (Kim et al., 2018) and ultimately to support or make decisions (Runkler, 2015). The increasing availability and exploitation of data open the door for new opportunities to create and deliver value (Wang et al., 2018; Urbach et al., 2017; Barrett et al., 2015). The value of IoT as a ubiquitous technology is not confined to use cases within organisations but can also bring along broader societal benefits. To capture the value achieved through smart things, the term smart services was introduced (Beverungen et al., 2019b; Allmendinger and Lombreglia, 2005). The technological advancements in IoT have allowed the technology to permeate different aspects of society increasingly. Simultaneously, IoT technologies get more and more complex and start to involve a growing number of stakeholders. This growth in ubiquity and complexity has drawn attention from various disciplines, e.g., marketing (Chandler and Vargo, 2011; Edvardsson et al., 2011), or mainstream information systems (Hsu et al., 2014; Nielsen et al., 2014).

One research discipline that studies such smart services is service sciences (Wessel et al., 2019), which has originated in service marketing and service management (Dodson et al., 2012). A central guiding philosophy in service science is the service-dominant (S-D) logic (Brust et al. 2017; Beverungen 2011). According to S-D logic, value is co-created by several actors, which can be individuals or collectives that share their resources, thus creating complex service exchange networks (Badinelli et al., 2012; Lusch and Nambisan, 2015). Service sciences adds to the discourse on IoT by introducing S-D logic principles to integrate both the IoT technologies and their stakeholder into the concept of "service systems" as a layer of abstraction. Using service systems as unit of analysis, service science shifts the attention from technological intricacies to how IoT embedded in a social context relates to its stakeholders to create value in a joint process. Analysing IoT using the concept of service systems, therefore, goes beyond discussions around "static" IT design and "passive" (individual) IT use as disjoint aspects of IT and sets the focus on exploring how customers should be viewed and treated as "active" participants in a co-creation process involving IoT. Likewise, not an individual user and a unique technology alone create value. Instead, value is created by all involved actors in connection to the technology together.

From a company perspective, the involvement of customers and third-party actors is highly beneficial. Involving them in the development and delivery of goods and services can positively influence customer satisfaction and loyalty (Balaji and Roy, 2017) and allows for a more efficient service provision (Voorberg et al., 2015). IoT technologies, which require a broad set of skills and knowledge due to their high level of complexity, will increasingly turn into smart service systems – a trend that will deepen the need for a "service-dominant" perspective on IoT. To build an effective and sustainable service system it is vital to ensure both the companies' (Jouny-Rivier and Ngobo, 2016) and customers' (Heidenreich and Handrich, 2015) willingness to co-create alike. The customers' willingness to co-create has been already studied by several researchers and has been shown to be contingent on the (cultural) context and to influence adoption intentions (Heidenreich and Handrich, 2015; Chan et al., 2010; Handrich and Heidenreich, 2013). The provider's willingness to co-create, however, has garnered less attention. In this article, we focus on the provider's (including third-party companies) willingness to co-create and its contingency on context.

Most studies consider the context predominantly from a theoretical perspective. The few that study specific contexts set their focus instead on developed or emerging countries. Nevertheless, the developing economy context, such as Mexico, significantly differs from the developed one (Avgerou, 2019), primarily due to severe resource constraints, infrastructure deficiencies and an unpredictable political, economic, and social environment (Barrett et al., 2015). Our study investigates the influence of the Mexican context on value co-creation in smart service systems. An exploratory case study focused on six companies engaged in IoT-driven smart service systems was conducted (Yin, 2018). We analysed how their efforts and activities are influenced by being embedded in the context of Mexico. Our guiding research question is as follows: *"How does the socio-economic context motivate and inhibit the company's willingness to co-create in Mexico?"* To answer this question, we performed semi-structured interviews with nine experts on IoT applications in Mexico, whereby we cover both local and foreign companies in this market as well as public officials.

The contribution of the research at hand is threefold: first, we identify and study how IoT can specifically help reduce infrastructure gaps, incentivise productivity, increase economic growth and, to a certain extent, improve the standards of living of marginalised communities in Mexico. Second, numerous articles in service science theoretically attribute great importance to the influence of the socio-economic context. Still, only a few studies investigate an actual socio-economic context and its concrete relevance to the smart service system. We strengthen the discussion on smart service systems design and provide empirical data of a specific context. We examine the prohibitive Mexican socio-economic context and reveal latent factors that influence value co-creation in a smart service system. Third, we contribute to IS research's theoretical diversity by adopting the mechanisms of S-D logic to investigate a contextualised IT phenomenon, i.e., the design of smart service systems in the Mexican context. We

propose that adopting the S-D logic with its innate focus on the underlying value of any economic and social exchange and how value is co-created in systems, offers an option to investigate IT adoption.

The paper is structured as follows: chapter two presents relevant theoretical foundations regarding smart service systems and the Mexican context. Chapter three presents the applied methodological approach. In chapter four, we offer our case study's empirical findings, which we then discuss in chapter five. The last chapter provides conclusions and proposes future work in research.

## 2 Research Background

### 2.1 The application of IoT in smart service systems

The service-dominant (S-D) logic is an emerging school of thought within marketing and management that shifts the philosophical understanding of market exchange (Maglio et al., 2009). While the preceding perspective, referred to as goods-dominant logic, considers economic exchange primarily as the exchange of goods, S-D logic broadens the view and focuses on the underlying value inherent in every economic and social exchange (Vargo and Lusch, 2004). Service exchange, as the basis for economic interaction, takes place in complex networks of multiple actors (Badinelli et al., 2012; Blau et al., 2009; Böhmman et al., 2014), moving away from the previous perception of value provision as a simple dyad of a supplier doing something to a consumer as a passive recipient (Lusch and Nambisan, 2015). Actors in such networks co-create value by agreeing on the value of an exchange and providing the necessary resources (Vargo and Lusch, 2011). Accordingly, a service system is defined as a *"value co-creation configuration of resources, including people, organisations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions"* (Maglio et al., 2009, p. 5).

In such service systems, the providing participation or the willingness to co-create is contingent on the (cultural) context and influence adoption intentions (Chan et al., 2010; Handrich and Heidenreich, 2013). According to the S-D logic, not only the customer but all actors are considered as beneficiaries. For this reason, each actor in a service system must be taken into account when discussing the willingness to co-create (Maglio and Spohrer, 2013), including the companies' willingness (Jouny-Rivier and Ngobo, 2016; Jouny-Rivier et al., 2017). The willingness to co-create represents the state in which an actor is prepared to engage in value creation actively and consumption and provide the necessary resources for this purpose (Heidenreich and Handrich, 2015; Prahalad and Ramaswamy, 2004).

Alongside the shifting understanding of service exchange, technological advancements are of particular interest (Archpru Akaka and Vargo, 2014) as this allows service providers to gain a competitive advantage (Bitner et al., 2000). Currently, the internet of things (IoT) and the availability of new sources of data are at the focus of numerous articles, most of which examine their role in service systems theoretically and practically (Beverungen et al., 2018; Böhmman et al., 2014). Data application can either be bundled with existing products or services, enhancing the efficiency ("data-enriched products and services"), or create new opportunities for delivering and creating value ("data-driven services") (Schüritz et al., 2019). To describe this new phenomenon, Allmendinger and Lombreglia coined the term smart services (Allmendinger and Lombreglia, 2005), which was later conceptualised as *"the application of specialised competences, through deeds, processes, and performances that are enabled by smart products"* (Beverungen et al., 2019b, p. 12). The integration of IoT technologies into service systems leads to smart service systems, which are defined as *"service systems in which smart products are boundary objects that integrate resources and activities of the involved actors for mutual benefit"* (Beverungen et al., 2019b, p. 12). Following this definition, IoT technologies have a significant impact on smart service systems design and, thus, are the primary unit of analysis.

## 2.2 The socio-economic context of smart service systems

Whether and how value is created in such a smart service system is contingent on the context (e.g. time, place, social environment) (Archpru Akaka and Vargo, 2014). Depending on the subject, this context can be perceived as either static or dynamic. The scope of the investigation for the former tends to focus on the "immediate" environment of individual performance exchange and value co-creation (Beverungen et al., 2019b). It is, therefore, more likely to be located in a micro-context (Wessel et al., 2019). Such a static perspective is useful when focusing on individual resources and their interactions in the smart services system. However, smart service systems are also embedded in a complex, dynamic and evolutionary social and business environment (Beverungen et al., 2019a), which could not be adequately investigated with a solely static perspective. In response to human activity, access to and the valuation of resources by actors regularly expands or diminishes (Constantin and Lusch, 1994). The resulting constant change influences value co-creation (Edvardsson et al., 2011; Maglio et al., 2009) and leads to complex, multidimensional evolution of smart service systems (Chandler and Vargo, 2011). Although smart service systems are dynamic socio-technical systems by nature (Beverungen et al., 2019a), some researchers prefer to use the term ecosystems to address this "time dependency" explicitly and the influence of large-scale social structures on the development of smart service systems (Archpru Akaka and Vargo, 2014).

The concept of ecosystems was initially transferred from biology to business by Moore (1996) and later included in S-D logic (Vargo and Lusch, 2011). While the increasing proliferation of the term has initially somewhat been accompanied by a lack of theoretical backing (Tsujiimoto et al., 2018), ecosystems have since moved on to become a valuable concept for the analysis of collections of interdependent actors connected through non-hierarchical relationships (Jacobides et al., 2018). Accordingly, service ecosystems are "*relatively self-contained, self-adjusting systems of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange*" (Lusch and Vargo, 2014, p. 24). This definition has two main implications for the design and management of ecosystems: (1) as ecosystems are self-adjusting, managers' traditional command and control logic cannot be applied (Barile et al., 2016). New organisational capabilities, structures, processes, and mindsets (Benkenstein et al., 2017) are required; additionally, (2) the socio-economic context determines how resources could be used and how these resources are integrated by the system's actors (Archpru Akaka et al., 2012; Archpru Akaka and Vargo, 2014; Chandler and Vargo, 2011).

Even though the influence of the socio-economic context on service exchange and value co-creation is accepted and theoretically discussed by numerous authors, only a few publications deal with the specific impact of the socio-economic context on smart service systems in certain contexts. The conceptual discussion has indeed brought essential insights, but a more narrow analysis level can provide supplementary results (Adner and Kapoor, 2010).

## 2.3 The Mexican context

Many Latin American countries, including Mexico, can be characterised as developing countries amidst constant change and structural instability. The environment in these less developed countries tends to be more challenging than in a more advanced economy. They suffer from resource constraints and lack of infrastructure and institutions, which inhibits the implementation of smart service systems (Barrett et al., 2015). While Mexico, for example, has had a strong track record of establishing solid macroeconomic institutions and structural reforms, the country has still underperformed in areas concerning growth, inclusion and poverty reduction when compared to similar countries (World Bank, 2018; Jarvenpaa and Leidner, 1998). The World Bank especially highlights several key microeconomic or *structural impediments* that have hindered the country in performing better concerning those metrics. Examples are misallocation and -utilisation of public resources, labour market rigidities and informalities, limited access to finance, regional inequalities in service delivery, limited coordination among public entities and between the public and private sector, or infrastructure bottlenecks (World

Bank, 2018). These structural impediments determine the extent to which information technologies (IT) can be implemented and used in such economies. Deficiencies in electricity and telecommunication prevent network-based IT operations and hamper private sector growth, and labour market and financial resource shortcomings hinder the implementation of IT innovations (cf. Jarvenpaa and Leidner, 1998).

In addition to these structural impediments, social and cultural structures also complicate smart service systems' adoption. In Mexico's case, three concepts, in particular, can affect the extent to how IT artefacts can impact economic development: *confianza*, *caciquismo* and *fatalismo* (Dobson and Nicholson, 2017). *Confianza* characterises the strong imperative of mutual trust (or rather the absence of distrust) between actors. *Confianza* is associated with fairness and honesty, which are prerequisites for an informal sector exchange (Félix-Brasdefer, 2008). Trust must be cultivated continuously, as it can diminish over time. For transactions to take place, it is, therefore, necessary to build relationships. According to *Caciquismo*, local patronage networks, i.e., structures formed by politically connected individuals for mutual economic benefit, are common in Mexico (Dobson and Nicholson, 2017). These networks are formed around a local leader (the *cacique*) who holds power based on unequal exchange relationships as well as on coercion (i.e., violence) (Howell et al., 2007). The *cacique* can serve as an economic and political intermediary, and its legitimacy derives from its ability to "*represent the interests of the community at higher levels of the political system*" (Villarreal, 2002, p. 480). Changes in power dynamics due to new technologies (e.g., the possible rise of a new *cacique*) could be seen as a threat by certain actors, harming IoT projects' results (Dobson and Nicholson, 2017). Finally, *Fatalismo* refers to the belief that a higher force dominates various aspects of everyday life. Mexicans, therefore, frequently accept that they are either an individual who betrays others (a *chingon*) or one that is crossed by others (a *la chingada*). As a result, they often have the feeling that they are not in control of their fate and accept situations "as they are" (Dobson and Nicholson, 2017).

### 3 Research Design

**Case Description.** Given that the impact of the socio-economic context on the IoT as an innovative technology has hardly been the subject of smart service system research to date, we conducted an exploratory case study focused on the IoT-related activities of different firms in Mexico. As we seek an understanding of a real-world phenomenon "*and assume[s] that such an understanding is likely to involve important contextual conditions*" (Yin, 2018, p. 15), we identified case study research as an appropriate approach. We observed how the efforts and activities of six firms are influenced by being embedded in Mexico's context. Our case study resembles a single case design with several embedded units of analysis (Yin, 2018). The units of analysis were not the firms per se, but instead the smart service systems as subunits within the case. These smart service systems enable solutions such as remote monitoring of critical infrastructure, detection and prediction of natural disasters, or smart factory solutions to improve production processes. For case selection, we followed a theoretical sampling approach (Glaser and Strauss, 1967; Eisenhardt, 1989). The selected firms needed to be part of at least one smart service system in Mexico in which they cooperate with other actors while developing or applying an IoT technology. This approach allowed us to embrace the nuances of the socio-economic context, as well as the challenges and capabilities offered by IoT solutions. Studying several smart service systems offered by the firms allowed us also to determine the socio-economic context as the common denominators more efficiently. To ensure validity and reliability during the case study process, we applied the framework of Gibbert et al. (2008) that provides measures for internal validity, construct validity, external validity, and reliability.

**Data Collection.** To explore the smart service systems in conjunction with their socio-economic context, we interviewed experts from six firms in the IoT domain. In total, we conducted nine interviews with an average duration of 57 minutes (see Table 1). Interviewing followed a semi-structured approach with the interview guideline including questions (1) about the IoT-based smart services offered in Mexico by the companies surveyed in terms of motivation, value creation, customer groups, and experiences with the implementation, (2) about their experiences with co-creation in terms of working

together in open ecosystems, and benefits and challenges of working in open ecosystems, (3) and about application scenarios of IoT in Mexico in general in terms of the potential to develop the country, possible applications and sectors, and challenges. In specific, our unit of analysis was Low Power Wide Area Network (LPWAN) as a representative of IoT technologies. The interviews were recorded, transcribed and, in the case of those conducted in Spanish, translated into English for further analysis.

#	Location	Position	Firm	Main business focus of the firm	Duration
1	Germany	Product Manager	A	(IoT) network monitoring solutions	65 min
2	Germany	Senior Systems Engineer & Business Development Manager	A	(IoT) network monitoring solutions	55 min
3	Germany	Alliances Manager	A	(IoT) network monitoring solutions	53 min
4	Mexico	Regional Manager Americas	A	(IoT) network monitoring solutions	81 min
5	Mexico	Country Director Mexico, Central America, and the Caribbean	B	Large-scale, low-power wireless networks	65 min
6	Mexico	Commercial and Ecosystem Director Mexico	C	General IoT connectivity solutions	82 min
7	Mexico	Executive Secretary	D	Support for advancing the development of smart cities	50 min
8	Colombia	Founder & CEO	E	Monitoring solutions for electrical energy systems	26 min
9	Mexico	CTO	F	Sustainable and clean energy systems for rural areas	38 min

Table 1. Study participants, affiliation, and interview durations

Additionally, we had access to secondary data (Yin, 2018) in the form of documents such as business reports, internal market surveys on the global IoT and digital platform market conducted by firm A, market studies by Gartner, case studies by leading IoT hardware manufacturers, and NGO papers. Further unstructured interviews were also conducted with product developers of firm A. These additional data gave insights into the global trends of IoT in different sectors (e.g., smart infrastructure) and the technological, economic, and infrastructural possibilities and constraints. The information was used to understand the resources required for a service system and its integrating actors to implement IoT solutions. Furthermore, this additional data gave us a deeper insight into the way and extent to which the use of IoT can develop the context of Mexico and what typical challenges can occur during implementation. With our interviews as primary data, these different kinds of secondary data sources ensured a necessary degree of triangulation as proposed by Flick (2014) and Yin (2018).

**Data Analysis.** Our coding approach was inspired by the approach as proposed by Glaser & Strauss (1967, 1998) to inductively analyse the material, moving from description to interpretation (Urquhart et al., 2010). Consequently, the interview transcripts were analysed in three subsequent steps. First, during open coding, we checked the transcripts line-by-line for statements on IoT technologies' context-dependent usage. We inductively created new codes based on the material if necessary and assigned suitable text passages to already existing codes during this step. Following the principle of constant comparison, we constantly compare the new materials we have screened with the previous findings (Corbin and Strauss, 2015). At the end of this cycle, we had a list of manifestations that describe how the context influenced the IoT applications and their implementation, e.g., *enhanced product quality through error avoidance and documentation* (see Table 2). Second, in an axial coding cycle, we assign the developed codes to broader categories by establishing relationships between the codes (Corbin and

Strauss, 2015). This cycle's result were categories such as *product and factor markets* (see Table 2) that group several manifestations. Whenever we discovered new categories, we returned and refined the existing categories to eliminate redundancies and overlap. Finally, during selective coding, we reanalysed all categories in light of our research questions to create a consistent story as a foundation for further theories (Corbin and Strauss, 2015). As often as necessary, we went back to the material itself. Most important during this step was the identification of cross-case patterns across the different subunits within our case (Eisenhardt, 1989). In this cycle, we assigned the categories *expected benefits* or *challenges* as the main themes identified throughout the data.

## 4 Results

The interviews of the IoT industry experts in this study have highlighted that context frames the expectations all actors have on what benefits IoT can provide and how the context inhibits IoT implementation. Both the expected benefits and the challenges resulting from context influenced the companies' willingness to co-create. IoT applications associated with high (socio-economic) benefits motivated the companies' willingness to co-create, while expected or experienced challenges inhibited their willingness.

### 4.1 Expected benefits of IoT applications in Mexico

Generally, IoT in Mexico's context was strongly related to remedies to structural impediments in the country. Understanding the expected benefits aids the understanding of what drives a company's willingness to co-create. E.g., IoT can evoke improved policies across many of the region's institutions. Table 2 gives an overview of such IoT applications.

Regarding product and factor markets, both Mexican and European experts converge on the idea that IoT can contribute to regional efficiency by improving workflows, processes, and resource utilisation through transparency and scenario simulation. Furthermore, employing smart and automated mechanisms aids in avoiding human mistakes and improves documentation processes, which leads to greater efficiency and enhanced product quality. In a region plagued by corruption, IoT has the potential to enhance efficiency in public administrations. Continuous monitoring and remote control allow for fraud prevention. Additionally, light is shed on the existing cunning use of public resources and unlawful political practices. On a similar note, the rule of law across Mexican institutions can undoubtedly benefit from IoT-enabled processes. In terms of public safety, both commercial property protection and crime prevention are significant areas in which new workflows are starting to make a difference. Firm B's commercial director for the region emphasised, "*security in transportation, particularly big in the case of Mexico, where there is a lot of cargo theft, and the technologies are not so efficient anymore, because the thieves have found a way around by using signal blockers which isolate the trucks so they can steal all the cargo*" (expert 5). On top of having traditional GSM/GPS tracking, pilot projects in Mexico are testing the use of Firm B-ready devices "*as a complementary system for additional security*" (expert 5).

Likewise, the allocation of resources and coordination of institutional policies can be made more efficient with optimising goods distribution by integrating all producing units on a central platform. Such is the case of firm E's IoT cold-chain monitoring services, which are transforming the way Colombian agricultural and medical transporters move their delicate products. Firm B-ready sensors enable the company's IoT devices to survive hot and long-distance trips while sending data on drastic temperature changes to a central platform in real-time. This subsequently triggers automated temperature adjustments to avoid delivering spoiled foods and vaccines.

The possibilities to tackle structural constraints limiting growth, inclusion and sustainability in Mexico are becoming more viable thanks to IoT. Infrastructure development through IoT-enabled smart service systems can be considered one of the most significant areas of opportunity. In Mexico, the Federal Electricity Commission estimated that around "40% of electricity is stolen" in densely populated areas surrounding Mexico City, mainly due to the Comisión Federal de Electricidad's (CFE) operational

inability to monitor a vast and outdated electrical grid. To counter these effects in a cost-effective and timely manner, the CFE is deploying Firm B-ready smart electric meters to produce more reliable and readily available data, which then translates into more efficient and fair use of the existing grid. Ultimately, people pay for what they consume, and the CFE improves its operational revenue, directly reducing its strong dependency on governmental subsidies. This improved utilisation of the existing infrastructure through usage analysis can also be observed across other lagging utilities such as natural gas and potable water; markets in which IoT technologies can also enhance infrastructure maintenance through continuous monitoring. In El Salvador, the government is funding the implementation of maintenance mechanisms using LPWAN smart water meters, hoping to reduce the loss of the resource to the subsoil or clandestine water intakes. Evidence also demonstrates that IoT can contribute to improved infrastructure planning with the use of decision support systems. This becomes particularly interesting for a region where large cities with poorly designed roads are becoming very chaotic as urbanisation continues its relentless path. Such was the case in Puebla, Mexico's fourth most populous city, where a CCTV/IoT/AI traffic simulation system recommended simple signalling changes for very problematic road intersections. Post-implementation, the suggestions turned out to be a success, saving local officials valuable time, budgetary resources, and plenty of decision-making headaches.

Due to their low-cost nature, IoT LPWAN smart service systems are demonstrating an increasing potential to create sustainable infrastructure alternatives that can connect rural and isolated areas with the deployment of low consuming technologies. A clear example is Firm F, a socially responsible company that has electrified over 20 thousand rural homes across Mexico, striving to bring development through light to poor and marginalised communities. After ten years of struggling with limited rural connectivity and labour-intensive servicing operations, the company has found its own light through Firm B's expanding LPWA terrestrial and satellite networks. Firm F is renovating its operations by relying on 2 to 3 messages per day through its newly integrated firm B-ready solar stations. On the one hand, the integrated low-energy sensors provide accurate data that can be promptly analysed to improve predictive maintenance processes and significantly reduce servicing costs. On the other hand, the devices enable an affordable pre-paid code validation mechanism suited to lower-income communities. With its increasing economies of scale, Firm F is expanding across Mexico and hopes to replicate its model for other rural communities in need throughout other Mexican markets.

However, more than just reducing or filling infrastructural gaps, experts emphasise the social benefits that new and improved IoT smart service systems can produce for the region. In the words of Firm F's head of technology, *"IoT devices not only allow an increase in productivity and economic spillover, but they also have a powerful social component that perhaps we sometimes take for granted"* (expert 9). For instance, basic healthcare and well-being services can be enabled through data-based alerts on unhealthy or dangerous environmental conditions. Integrated into Firm F's smart solar grids, engineers include "panic-buttons" designed to report emergencies such as poisonous animal bites in real-time, facilitating a faster response from local emergency services. Likewise, natural disasters in Mexico can be more effectively predicted and reacted to by monitoring IoT devices deployed across connected rural areas. In Colombia, local IoT integrators at Firm E are installing LPWAN-powered early warning systems on riverbeds, striving to help rural governments prevent the loss of human lives before devastating flash floods and landslides hit their vulnerable communities. Societies across more urbanised regions can also benefit from IoT ecosystems designed to improve environmental protection. Through the continuous monitoring and optimisation of smart traffic systems, local authorities from densely populated cities in Mexico can make faster and better decisions to reduce pollution and improve their constituents' air quality.

Category	Manifestation	Experts
<i>Product and factor markets</i>	Enhanced product quality through error avoidance and documentation	1, 4
	Fraud prevention through continuous monitoring and remote control	5
	Improved workflows/ processes and resource utilisation through transparency and scenario simulation	1, 2, 3, 4, 5, 6, 8, 9
<i>Rule of law institutions</i>	Enhanced public safety through property protection and crime prevention	5, 6, 7, 8
<i>Resource allocation and institutional policy coordination</i>	Optimised goods distribution through the integration of all producing units on a central platform	2, 3, 4, 5, 6, 8, 9
<i>Other structural constraints to growth, inclusion, and sustainability</i>	Improved utilisation of existing infrastructure through use analysis and guidance systems	2, 3
	Improved maintenance of existing infrastructure through continuous monitoring	1, 5, 9
	Improved planning of new infrastructure through decision support systems	4, 5, 6, 7, 8, 9
	Alternative to connect rural and isolated areas through low consuming technologies	7, 9
	Improved healthcare and well-being through data-based alerts on unhealthy environmental conditions	2, 4, 8, 9
	Improved environmental protection through optimised traffic and continuous monitoring	2, 3, 5, 6, 7, 8, 9
	Faster reaction to natural disasters through monitoring, the connection of rural areas and prediction	4, 5, 6, 8, 9

Table 2. Smart service systems in which IoT is expected to have a high benefit in Mexico

## 4.2 Challenges that providers face when conducting IoT projects in Mexico

Although the experts assign IoT a high significance to Mexico's development, Mexican idiosyncrasies often inhibit its implementations (cf. Table 3). One significant condition is the behaviour of both individuals and collectives. In Mexico, companies are usually very traditional and have maintained doing business without change for centuries. When moving on to use IoT technologies, such structures and approaches are often obstructive. As one expert states, "*we have run into projects from large companies where it has become complicated, because of their ways of operating and being open in terms of technology, in terms of technology transfer, sharing experiences and more*" (expert 9).

In the best case, this merely leads to missed opportunities, in the worst case to substantial malinvestments. Associated with this is the lack of exchange across departmental and disciplinary boundaries. In the case of a video surveillance project of a firm A customer, an IoT solution was implemented without involving the people responsible for the existing information system infrastructure. This resulted in an insufficient network capacity that had to be corrected with unaccounted investments and led to a considerable delay of the go-live.

There is also an unwillingness to take actions and to experiment with IoT technologies with which several Mexican firms are still unfamiliar. Although a reasonable number of companies expresses their interest in conducting or joining an IoT project, this commitment vanishes at the moment of truth. The projects get stuck in planning and never get carried out. One reason is that many managers estimate their

company's technological maturity and are not willing to take the risk of investing in IoT projects. Beyond the intra-company context, the readiness to cooperate with other companies is not very pronounced. *"Actually, as Mexicans, we work very isolatedly, and it is challenging for us to associate. [...] Sometimes, we view the sharing of information with others with distrust. One challenge is to understand that these cultural barriers will make it a little difficult for us to enter open ecosystems [...]"* (expert 8) This fundamental distrust of people or organisations outside the own sphere of influence hinders Mexican companies from participating in smart service systems, which rely on free access to data from numerous sources and collaboration.

As co-creator of a smart service, the customer takes a vital role in the smart service system. However, we also found evidence on why customers are somewhat reserved in Mexico when it comes to IoT projects. Either the customers (1) hardly understand or miss the capability to measure the added value of IoT, (2) have false expectations on IoT, (3) are not willing to carry technological obsolescence as a result of the rapid development of IoT technologies, or (4) especially in the case of end consumers have not even met the basic needs such as access to water or electricity, making IoT less of an issue. We also found a lack of the necessary set of skills to implement and operate an IoT application, a prevailing condition caused by political authority. Experts are essential as *"there are the knowledge and specialisation part of 'how I am going to send the data, which is the most efficient network, and what radio frequency or telecommunication knowledge I require?'. Whether it is cellular, whether it is LoRa [long range], whether it is [firm B solution], any of these requires in-depth knowledge, it is not just putting up an antenna."* (expert 6) Only a few experts are trained in Mexico, as the education systems are not aligned with IoT's needs. Also, with a flawed incentive system, the few local professionals are hardly kept in the country, and external specialists are barely attracted.

The experts agree that the government has the role of a central organiser and executor of IoT projects. Accordingly, the lack of government support is a frequently raised issue. Implementation projects are often unstructured and dependent on individual civil servants because there is no general government strategy. One example is the previously discussed panic button, which was planned to enhance police's reaction time on crime incidents. Mid-term, the administration changed, the project was rejected, and the planning effort was in vain. Even if projects are sponsored, these are rather theoretical research projects and rarely result in actual applications. Often there are not even investments at all. One reason is the low priority of the government to invest in IoT solutions. Developing regions such as Mexico usually have fewer financial means at their disposal. Especially in rural municipalities, the money available is then already spent to satisfy essential public services. Also, corruption and nepotism are tremendous issues in Mexico that reduce the financial capacity for investments and misroute available resources. *"We have the example of the 2017 earthquake. If we add up all the money that Mexico received from other countries, from foundations and private individuals, it provided almost enough to rebuild the houses without any problem, and that did not happen"* (expert 7).

A third factor that affects the implementation of IoT solutions in Mexico is the local market structure and economic parameters. In comparison, developing countries tend to have centralised, densely populated cities that are relatively developed. At the same time, regional areas are sparsely populated and isolated. Because of this substantial disparity, rural regions are often neglected by governments and companies. To return to the applications of Firm F presented in the previous chapter, Firm F works with *"isolated rural communities that do not have access to the electricity grid. [...] So, it becomes difficult to be able to provide quality service in those locations"* (expert 9).

With a missing (connectivity) infrastructure in the countryside, offering services, e.g. to farmers, needs another approach than in developed countries. A possible strategy would be establishing ecosystems to share the risk and make smart services feasible in the first place. Leaving aside the already discussed fundamental distrust, it is complicated finding qualified partners. Either because local companies often still miss competence in IoT-related topics and because there is no "platform" that allows companies to find and exchange knowledge with potential partners. The former could be remedied by inviting foreign companies. However, the limiting market structures prevent or at least make it more difficult for those foreign companies to gain a foothold. For example, Firm A already had some IoT solutions requests in

a technology cluster in Mexico City. However, the project came to nothing because, at that time, only national companies could carry out such projects.

Category	Manifestation	Experts
<i>Collective behaviour as a prevailing condition</i>	Necessary implementation processes are not taken due to still prevailing traditional structures and approaches	1, 4, 6, 9
	Opportunities are not fully exploited due to a lack of intra-organizational/ interdisciplinary exchange	4, 6
	Uncoordinated implementation of IoT projects due to lack of focus and commitment to action	4, 6, 8
	Reduced dynamism in the development and implementation project due to distrust	4, 8, 9
	Lack of understanding and appreciation of IoT solutions due to the cautious nature of customers	1, 4, 6, 7
<i>Political authorities as a prevailing condition</i>	Lack of experts to coordinate resource integration due to a misalignment of the education system and lack of incentive systems	1, 4, 5, 6, 7, 8, 9
	Unstructured implementation of extensive IoT projects due to a lack of government strategy	3, 4, 5, 6, 7, 8
	Insufficient amount of governmental investments due to a lack of awareness, commitment, or capacity	1, 2, 3, 4, 5, 6, 7, 9
	Misuse of resources due to corruption and nepotism	4, 7
<i>Local market structure and economic parameters as a prevailing condition</i>	Neglect of rural areas due to extreme differences in population density and vast regional territories	4, 7, 9
	Difficulty to find required collaboration partners due to many companies on the market not being qualified	2, 4, 5
	Foreign companies can hardly gain a foothold due to a limiting market structure	4

Table 3. Challenges when implementing IoT in Mexico

## 5 Discussion

Our insights provide empirical evidence on how a specific socio-economic context can motivate and inhibit the willingness to co-create in Mexico. Service exchange takes place in a surrounding smart service system in which several participating actors co-create value. Not the individual user alone determines and creates value. Instead, the success of an implementation depends on all participating actors. Those projects that took a systemic perspective and analysed who and why they were involved were the most successful. While each actor has own wishes and needs, they are all active in a shared environment that equally exerts a significant influence on all. Therefore, this socio-economic context must be considered during the design of an IoT solution and its smart service system. Simply transferring technology from another socio-economic context is insufficient. Consequently, in addition to introducing new technologies, an IoT initiative should consider its contribution to transforming the socio-economic context in which it is situated.

### 5.1 How the socio-economic context motivates the willingness to co-create

The socio-economic context motivates the companies' willingness to co-create mainly through framing the expected benefits. With a focus on the Mexican context, our results reveal several IoT applications that are associated with high expected benefits. In this sense, we expand research on IoT applications,

which has so far been conducted primarily in the context of Europe and Asia (Whitmore et al., 2015). Economic factors, especially structural deficits, mainly determine the expected benefits of IoT. Infrastructure, environmental protection, disaster control, security, goods allocation, and resource utilisation are the most prevalent themes in the conducted projects and the expert's arguments. Although social and cultural factors also affect the expected value, this is not considered very significant – at least not for solutions that resolve structural deficits. We only noticed that solutions from market participants, which the locals perceived as "powerful" and did not belong to their network, were often treated with caution or even neglected.

Our observations are in line with the S-D logic concept of resource usage (Edvardsson et al., 2014): a resource or solution with its specific feature, hardware, and specifications – in our case, an IoT technology artefact – has no value in itself (Ramadani et al., 2017). It is instead uniquely and phenomenologically determined by the user as the primary beneficiary (Vargo and Lusch, 2016): value is not inherent but emergent. Understanding the people's daily routine and needs in Mexico is an important task when implementing an IoT solution. Such a phenomenon has already extensively been discussed in IT adoption literature at an individual level using the concept of perceived usefulness with context as an essential part (e.g., Schmidhuber et al., 2020; Li et al., 2019; Gao and Bai, 2014; Chong et al., 2012; Davis, 1989). Our data instead looks at IT adoption from a systemic perspective and extends the current IT adoption and diffusion discourse by illustrating how a macro-scale context can exert an influence on willingness to co-create. And this view of IT as an embedded system is in line with the ensemble view of IT (Orlikowski and Iacono, 2001). The macro context has a particular impact when the service system actors (i.e., customers, providers, and third stakeholders) "exist" in different macro contexts. This can lead to conflicting views on how resources should be used (Vargo et al., 2015). E.g., the large and sparsely populated rural areas of Mexico are often relatively undeveloped where even basic needs such as access to food, water, or electricity are not sufficiently met. The project initiators did not realise that the local population is still busy satisfying basic needs. Instead, they have tried to offer advanced services that the potential customers perceived as extravagant. While there was no fault in the IT technology per se, the locals were not enthusiastic about these smart services and rejected these IoT solutions. Thus, one challenge for the successful implementation of IoT is identifying and implementing common "rules of the game" that are accepted across all system's actors.

## 5.2 How the socio-economic context inhibits the willingness to co-create

Resources viewed in isolation only have potential value. Nevertheless, only through resource integration can this value become "real" (Edvardsson et al., 2014). While the influence of context on value creation in IS research is usually attributed to behavioural mechanisms (e.g., using Hofstede's cultural theory (Hofstede and Bond, 1984)), S-D logic emphasises resource integration as a channel for contextual conditions that influences smart service systems. Particular attention will be paid to the processes of the involved actors in the system, whether the necessary level of cooperation can be achieved, and how the actors experience this collaboration (Edvardsson et al., 2014). The significant challenges the many companies experienced are related to these aspects of resource integration, which reduces the willingness to co-create. We have noticed a pronounced form of lethargy that prevents local companies from actively pursuing IoT projects. The objectives set are not pursued vigorously, and the approval of the companies remains instead a lip service. And the companies' internal processes and structures are not aligned to cooperation. Alternatively, the responsibility is shifted to the government, emphasising that an IoT project cannot work without them. Accordingly, IoT projects are hardly conducted, and resources are hardly brought into cooperation. Simultaneously, the elites, e.g., the government, are not yet convinced of IoT's possibilities and therefore lack a comprehensive strategy and investment resources. This stagnation can dramatically reduce the willingness to co-create.

We also observed a reluctance to cooperate with other actors in a smart service system because of distrust and weak relationships. This ranges from departmental boundaries and a lack of coordination with other parts within a company to a refusal to cooperate with other companies, especially foreign ones. A robust relationship is a prerequisite for value co-creation in functioning smart service systems (Breibach et

al., 2013). While previous findings highlight the importance of trust in using IT on an individual level (Lu et al., 2011; Gao and Bai, 2014), trust is also a vital facilitator for interaction on an organisational and systemic level. Trust can only be built through a long-term and continuous investment in the relationship. On top, corruption and nepotism, due to a lack of institutional supervision of persons in authority, results in the misuse of resources and erodes mutual trust.

During the interviewees' implementation, many of the problems resulted from complex interactions between different contextual influences (e.g., trust, nepotism, education). Those contextual influences cannot be immediately addressed by any of the actors regardless of how much they were aware of their existence. It would be wrong to any of them for having an "uninformed stance toward context". However, it might benefit the implementation if all actors (especially local companies and users) actively participated in context-oriented actions for improvement (Diniz et al., 2014). Companies might want to actively inform all participating actors about the expected benefits of IoT and incentivise and empower them to jointly work towards the expected benefits, i.e., to create a "shared" value together.

## 6 Conclusion

Our explorative case study results contribute to our understanding of how the socio-economic context motivates and inhibits the implementation of an IoT application by affecting a company's willingness to co-create. By adopting a S-D logic perspective, we gained an analytical lens to explain this connection between context and implementation success. On the one hand, context frames the expectations all actors have on what benefits IoT can provide and, thus, it must be ensured that the resources involved, especially the IoT technology as the central resource in the smart service system, are used correctly. On the other hand, context also inhibits IoT implementation by causing numerous challenges related to resource integration that hamper the willingness to co-create. The proper coordination of resource integration, i.e., to ensure that all players cooperate and that the processes are aligned accordingly, is vital.

By shedding light on the influence of the socio-economic context on IoT adoption, our study contributes to both the literature on smart service systems and IT adoption in three ways. First, we offer practitioners who want to develop a solution for the Mexican market an overview of potential fields of IoT applications for which there is an urgent need. Second, we demonstrate how central phenomena discussed in service system literature, such as the influence of the socio-economic context on the willingness to co-create that has been discussed on an abstract and conceptual level (Ramadani et al., 2017), manifests in a developing country. Third, we investigate how S-D logic can extend IT adoption research by offering a new analytical lens that focuses on systems and not individuals. We argue that S-D logic contributes to the understanding of the mechanisms of market exchange. The systemic perception of value creation is an alternative approach to study IT adoption by broadening the focus to all actors involved and to the macro context. And as IT artefacts such as those built on IoT technology are increasingly embedded with different (smart) objects, people, and contexts, such an "ensemble view" on IT (cf. Orlikowski and Iacono, 2001) will provide us with a better conceptualisation of IT. S-D logic's concept of service systems addresses one central concern of ensemble views of technology: it takes into account *"emergent aspects of technological artifacts that arise as designers, developers, users, regulators, and other stakeholders engage with evolving artifacts over time and across a variety of contexts"* (Orlikowski and Iacono, 2001, p. 132).

We acknowledge one limitation. Single explorative cases are appropriate to gain a deep and detailed understanding of scarcely studied phenomenon such as the nascent contextualisation of smart service systems in developing countries. Beyond that, a multiple case study could provide additional insights, e.g., whether there are differences between B2B and B2C or different sectors such as smart agriculture, smart city, and smart factory.

## References

- Adner, R. and Kapoor, R. (2010). "Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations." *Strategic Management Journal* 31 (3), 306–333.
- Allmendinger, G. and Lombreglia, R. (2005). "Four strategies for the age of smart services." *Harvard Business Review* 83 (10), 131–145.
- Archpru Akaka, M. and Vargo, S. L. (2014). "Technology as an operant resource in service (eco)systems." *Information Systems and e-Business Management* 12 (3), 367–384.
- Archpru Akaka, M., Vargo, S. L. and Lusch, R. F. (2012). "An Exploration of Networks in Value Cocreation: A Service-Ecosystems View." In S. L. Vargo and R. F. Lusch (eds.) *Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing*, pp. 13–50: Emerald Group Publishing Limited.
- Avgerou, C. (2019). "Contextual Explanation: Alternative Approaches and Persistent Challenges." *MIS Quarterly* 43 (3), 977–1006.
- Badinelli, R., Barile, S., Ng, I., Polese, F., Saviano, M. and Di Nauta, P. (2012). "Viable service systems and decision making in service management." *Journal of Service Management* 23 (4), 498–526.
- Balaji, M. S. and Roy, S. K. (2017). "Value co-creation with Internet of things technology in the retail industry." *Journal of Marketing Management* 33 (1-2), 7–31.
- Barile, S., Lusch, R. F., Reynoso, J., Saviano, M. and Spohrer, J. C. (2016). "Systems, networks, and ecosystems in service research." *Journal of Service Management* 27 (4), 652–674.
- Barrett, M., Davidson, E., Prabhu, J. and Vargo, S. L. (2015). "Service innovation in the digital age. Key contributions and future directions." *MIS Quarterly* 39 (1), 135–154.
- Benkenstein, M., Bruhn, M., Büttgen, M., Hipp, C., Matzner, M. and Nerding, F. W. (2017). "Topics for service management research. A European perspective." *Journal of Service Management Research* 1 (1), 4–21.
- Beverungen, D., Breidbach, C. F., Poepplbus, J. and Tuunainen, V. K. (2019a). "Smart service systems: An interdisciplinary perspective." *Information Systems Journal* 29 (6), 1201–1206.
- Beverungen, D., Lüttenberg, H. and Wolf, V. (2018). "Recombinant service systems engineering." *Business & Information Systems Engineering* 60 (5), 377–391.
- Beverungen, D., Müller, O., Matzner, M., Mendling, J. and Vom Brocke, J. (2019b). "Conceptualizing smart service systems." *Electronic Markets* 29 (1), 7–18.
- Bitner, M. J., Brown, S. W. and Meuter, M. L. (2000). "Technology Infusion in Service Encounters." *Journal of the Academy of Marketing Science* 28 (1), 138–149.
- Blau, B., van Dinther, C., Conte, T., Xu, Y. and Weinhardt, C. (2009). "How to Coordinate Value Generation in Service Networks." *Business & Information Systems Engineering* 1 (5), 343–356.
- Böhm, T., Leimeister, J. M. and Möslin, K. (2014). "Service systems engineering." *Business & Information Systems Engineering* 6 (2), 73–79.
- Breidbach, C. F., Kolb, D. G. and Srinivasan, A. (2013). "Connectivity in Service Systems." *Journal of Service Research* 16 (3), 428–441.
- Chan, K. W., Yim, C. K. and Lam, S. S. (2010). "Is Customer Participation in Value Creation a Double-Edged Sword? Evidence from Professional Financial Services Across Cultures." *Journal of Marketing* 74 (3), 48–64.
- Chandler, J. D. and Vargo, S. L. (2011). "Contextualization and value-in-context: How context frames exchange." *Marketing Theory* 11 (1), 35–49.
- Chatterjee, S., Byun, J., Dutta, K., Pedersen, R. U., Pottathil, A. and Xie, H. (2018). "Designing an Internet-of-Things (IoT) and sensor-based in-home monitoring system for assisting diabetes patients: iterative learning from two case studies." *European Journal of Information Systems* 27 (6), 670–685.
- Chong, A. Y.-L., Chan, F. T. and Ooi, K.-B. (2012). "Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination between China and Malaysia." *Decision Support Systems* 53 (1), 34–43.
- Constantin, J. A. and Lusch, R. F. (1994). *Understanding resource management. How to deploy your people, products, and processes for maximum productivity*. Oxford, Ohio: Planning Forum.

- Corbin, J. M. and Strauss, A. L. (2015). *Basics of Qualitative Research. Techniques and Procedures for Developing Grounded Theory*. 4th Edition. Thousand Oaks: Sage publications.
- Davis, F. D. (1989). "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." *MIS Quarterly* 13 (3), 319.
- Diniz, E. H., Bailey, D. E. and Sholler, D. (2014). "Achieving ICT4D Project Success by Altering Context, Not Technology." *Information Technologies and International Development* 10 (4), 15–29.
- Dobson, J. and Nicholson, B. (2017). "Exploring the Dialectics Underlying Institutionalization of IT Artifacts." *Journal of the Association for Information Systems* 18 (12), 848–871.
- Dodson, L. L., Sterling, S. R. and Bennett, J. K. (2012). Considering Failure: Eight Years of ITID Research. In: *Proceedings of the 5th International Conference on Information and Communication Technologies and Development (ICTD)*.
- Edvardsson, B., Kleinaltenkamp, M., Tronvoll, B., McHugh, P. and Windahl, C. (2014). "Institutional logics matter when coordinating resource integration." *Marketing Theory* 14 (3), 291–309.
- Edvardsson, B., Tronvoll, B. and Gruber, T. (2011). "Expanding understanding of service exchange and value co-creation: a social construction approach." *Journal of the Academy of Marketing Science* 39 (2), 327–339.
- Eisenhardt, K. M. (1989). "Building Theories from Case Study Research." *The Academy of Management Review* 14 (4), 532.
- Félix-Brasdefer, J. C. (2008). *Politeness in Mexico and the United States*. Amsterdam: John Benjamins Publishing Company.
- Flick, U. (2014). *The SAGE Handbook of Qualitative Data Analysis*. London, United Kingdom: SAGE Publications Ltd.
- Gao, L. and Bai, X. (2014). "A unified perspective on the factors influencing consumer acceptance of internet of things technology." *Asia Pacific Journal of Marketing and Logistics* 26 (2), 211–231.
- Gibbert, M., Ruigrok, W. and Wicki, B. (2008). "What passes as a rigorous case study?" *Strategic Management Journal* 29 (13), 1465–1474.
- Glaser, B. G. and Strauss, A. L. (1967). *The discovery of grounded theory. Strategies for qualitative research*. 11. printing. New York: Aldine.
- Glaser, B. G. and Strauss, A. L. (1998). *Grounded theory. Strategien qualitativer Forschung*. Bern: Huber.
- Handrich, M. and Heidenreich, S. (2013). "The Willingness of a Customer to Co-Create Innovative, Technology-based Services: Conceptualization and Measurement." *International Journal of Innovation Management* 17 (04), 1350011.
- Heidenreich, S. and Handrich, M. (2015). "Adoption of technology-based services: the role of customers' willingness to co-create." *Journal of Service Management* 26 (1), 44–71.
- Hofstede, G. and Bond, M. H. (1984). "Hofstede's Culture Dimensions." *Journal of Cross-Cultural Psychology* 15 (4), 417–433.
- Howell, J. P., DelaCerde, J., Martínez, S. M., Prieto, L., Bautista, J. A., Ortiz, J., Dorfman, P. and Méndez, M. J. (2007). "Leadership and culture in Mexico." *Journal of World Business* 42 (4), 449–462.
- Hsu, C., Backhouse, J. and Silva, L. (2014). "Institutionalizing Operational Risk Management: An Empirical Study." *Journal of Information Technology* 29 (1), 59–72.
- Jacobides, M. G., Cennamo, C. and Gawer, A. (2018). "Towards a theory of ecosystems." *Strategic Management Journal* 39 (8), 2255–2276.
- Jarvenpaa, S. L. and Leidner, D. E. (1998). "An Information Company in Mexico: Extending the Resource-Based View of the Firm to a Developing Country Context." *Information Systems Research* 9 (4), 342–361.
- Jouny-Rivier, E. and Ngobo, P.-V. (2016). "Drivers of companies' willingness to co-create B2B services." *Recherche et Applications en Marketing (English Edition)* 31 (3), 61–87.
- Jouny-Rivier, E., Reynoso, J. and Edvardsson, B. (2017). "Determinants of services co-creation with business customers." *Journal of Services Marketing* 31 (2), 85–103.

- Kim, M.-J., Lim, C.-H., Lee, C.-H., Kim, K.-J., Park, Y. and Choi, S. (2018). "Approach to service design based on customer behavior data. A case study on eco-driving service design using bus drivers' behavior data." *Service Business* 12 (1), 203–227.
- Li, J., Ma, Q., Chan, A. H. and Man, S. S. (2019). "Health monitoring through wearable technologies for older adults: Smart wearables acceptance model." *Applied ergonomics* 75, 162–169.
- Lu, Y., Yang, S., Chau, P. Y. and Cao, Y. (2011). "Dynamics between the trust transfer process and intention to use mobile payment services: A cross-environment perspective." *Information & Management* 48 (8), 393–403.
- Lusch, R. F. and Nambisan, S. (2015). "Service innovation. A service-dominant logic perspective." *MIS Quarterly* 39 (1), 155–175.
- Lusch, R. F. and Vargo, S. L. (2014). *Service-Dominant Logic. Premises. perspectives, possibilities.* Cambridge: Cambridge University Press.
- Maglio, P. and Spohrer, J. C. (2013). "A service science perspective on business model innovation." *Industrial Marketing Management* 42 (5), 665–670.
- Maglio, P., Vargo, S. L., Caswell, N. and Spohrer, J. C. (2009). "The service system is the basic abstraction of service science." *Information Systems and e-Business Management* 7 (4), 395–406.
- Moore, J. F. (1996). *The death of competition. Leadership and strategy in the age of business ecosystems.* Chichester: Wiley.
- Nielsen, J. A., Mathiassen, L. and Newell, S. (2014). "Theorization and Translation in Information Technology Institutionalization: Evidence from Danish Home Care." *MIS Quarterly* 38 (1), 165–186.
- Orlikowski, W. J. and Iacono, C. S. (2001). "Research Commentary: Desperately Seeking the "IT" in IT Research—A Call to Theorizing the IT Artifact." *Information Systems Research* 12 (2), 121–134.
- Prahalad, C. K. and Ramaswamy, V. (2004). "Co-creation experiences: The next practice in value creation." *Journal of Interactive Marketing* 18 (3), 5–14.
- Ramadani, L., Kurnia, S. and Breidbach, C. F. (2017). Advancing ICT4D Research through Service-Dominant Logic. In: *Proceedings of the Australasian Conference on Information Systems (ACIS)*.
- Rosemann, M. (2014). "The Internet of Things: new digital capital in the hands of customers." *Business Transformation Journal* (9), 6–15.
- Runkler, T. A. (2015). *Data Mining. Modelle und Algorithmen intelligenter Datenanalyse.* 2nd Edition. Wiesbaden: Springer Vieweg.
- Schmidhuber, L., Maresch, D. and Ginner, M. (2020). "Disruptive technologies and abundance in the service sector - toward a refined technology acceptance model." *Technological Forecasting and Social Change* 155.
- Schüritz, R., Farrell, K., Wixom, B. and Satzger, G. (2019). Value Co-Creation in Data-Driven Services: Towards a Deeper Understanding of the Joint Sphere. In: *Proceedings of the 40th International Conference on Information Systems (ICIS)*.
- Tsujimoto, M., Kajikawa, Y., Tomita, J. and Matsumoto, Y. (2018). "A review of the ecosystem concept — Towards coherent ecosystem design." *Technological Forecasting and Social Change* 136, 49–58.
- Urbach, N., Drews, P. and Ross, J. (2017). "Digital business transformation and the changing role of the IT function." *MIS Quarterly Executive* 16, 2–4.
- Urquhart, C., Lehmann, H. and Myers, M. D. (2010). "Putting the 'theory' back into grounded theory: guidelines for grounded theory studies in information systems." *Information Systems Journal* 20 (4), 357–381.
- Vargo, S. L. and Lusch, R. F. (2004). "Evolving to a New Dominant Logic for Marketing." *Journal of Marketing* 68 (1), 1–17.
- Vargo, S. L. and Lusch, R. F. (2011). "It's all B2B...and beyond: Toward a systems perspective of the market." *Industrial Marketing Management* 40 (2), 181–187.
- Vargo, S. L. and Lusch, R. F. (2016). "Institutions and axioms: an extension and update of service-dominant logic." *Journal of the Academy of Marketing Science* 44 (1), 5–23.
- Vargo, S. L., Wieland, H. and Archpru Akaka, M. (2015). "Innovation through institutionalization: A service ecosystems perspective." *Industrial Marketing Management* 44, 63–72.
- Villarreal, A. (2002). "Political Competition and Violence in Mexico: Hierarchical Social Control in Local Patronage Structures." *American Sociological Review* 67 (4), 477.

- Voorberg, W. H., Bekkers, V. J. J. M. and Tummers, L. G. (2015). “A Systematic Review of Co-Creation and Co-Production: Embarking on the social innovation journey.” *Public Management Review* 17 (9), 1333–1357.
- Wang, J., Ma, Y., Zhang, L., Gao, R. X. and Wu, D. (2018). “Deep learning for smart manufacturing: Methods and applications.” *Journal of Manufacturing Systems* 48, 144–156.
- Wessel, L., Davidson, E., Barquet, A. P. B., Rothe, H., Peters, O. and Megges, H. (2019). “Configuration in smart service systems: A practice-based inquiry.” *Information Systems Journal* 29 (6), 1256–1292.
- Whitmore, A., Agarwal, A. and Da Xu, L. (2015). “The Internet of Things—A survey of topics and trends.” *Information Systems Frontiers* 17 (2), 261–274.
- World Bank (2018). *Mexico - Systematic Country Diagnostic (English)*. World Bank Group.
- Yin, R. K. (2018). *Case study research and applications. Design and methods*. 6th Edition. Los Angeles: Sage.