What drives the successful launch of IoT-related business models?

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Abstract

Purpose – Customer value perception of Internet of Things (IoT)-based services has not been studied in the context of a company's readiness to adopt IoT technology. The purpose of this paper is to address this gap by indicating a research framing that combines insights from the IoT business model literature and customer perception of the value of such models and their drivers.

Design/methodology/approach – The interplay between a company's IoT readiness and its perception of the value of IoT services is tested using a sample of 90 Eastern European business customers in a competitive business field. The conceptual framework described also examines relationships among constructs that refer to relationship quality. This study evaluates its quantitative sample using partial least squares path modeling.

Findings – Customers' perceived value of IoT business models strongly relates to their digitalization capabilities and their own company's innovativeness. When referring to disruptive technical offerings, existing trustful and satisfactory relationships cannot enhance the customer's value perception.

Research limitations/implications – The sample of Eastern European buyers is not representative of the majority of manufacturing companies. A randomized sample using other sources such as large industry databases could be useful. In addition, a replication of the study in other countries would allow for a cross-border validation of this study's results.

Practical implications – This study suggests a detailed process that is based on a careful preselection of test customers working for innovative companies. A marketing communication approach must state clearly the benefits the buyers get in return for their sacrifice of sharing data.

Originality/value – Technology readiness refers to the user's propensity to embrace and use new technologies. The results indicate that IoT readiness influences the successful launch of IoT-related business models. For managers, this study proposes a process to implement IoT-related business models.

Keywords Internet of Things offering, Business-to-business, Disruptive business models, Quantitative study

Paper type Research paper

1. Introduction

The global Internet of Things (IoT) service market is growing continuously and will reach US$172.6bn by 2025. The total installed base of IoT-connected devices worldwide is projected to be 30.9 billion units by 2025 (www.statista.com). Digital technologies have altered business-to-business (B2B) products and services (Galvani and Bocconcelli, 2022). In total, 60% of industrial companies that have already undergone a digital transformation have created new business models to meet the challenges inherent in such a change. Approximately 30% of their revenues can be assumed to relate to digital projects within 10 years (Galvani and Bocconcelli, 2022). Despite increasing interest in IoT business models and the critical contributions made to the literature, IoT-related research in B2B contexts is still at a very early stage (Soltani, 2021), and the empirical data is missing (Helkkula *et al.*, 2018). While the opportunities might be clear and the adoption rate is increasing, some organizations are still reluctant to embrace IoT technology.

Managing business interdependent buyer–manufacturer relationships is more complex today. Actors are confronted with rapid technological changes, increasing company specialization and challenges to pursue efficiency and innovativeness at the same time (Håkansson and Snehota, 2017; Waluszcwski *et al.*, 2018; Falkenreck and Wagner, 2021). The IoT adaptation barriers cited most frequently include some aspects of technology

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readiness: insufficient legislation, security risks, privacy concerns, perceived costs, data complexity, compatibility issues, lack of IoT skill and expertise, gaps in technical knowledge and hardware and infrastructure weaknesses. These systems require a customer's willingness to share machine data, which is crucial when IoT technology is designed to improve supply chains, logistics, maintenance, customer experience or revenues (Balaji and Roy, 2017). IoT technologies also pose certain risks customers may not be able to deal with in existing business models (Paiola and Gebauer, 2020). To capture the value of IoT business models, customers weigh the possible benefits against concerns related to trust, security and privacy of data and a lack of IoT readiness (Hasselblatt *et al.*, 2018). Soltani (2021) emphasizes that further research is needed to determine the antecedents of customer IoT engagement. The value aspect of IoT-based digitalization has been studied from the perspective of IoT functionalities (Ritter and Pedersen, 2020) or the manufacturer's point of view (Hasselblatt *et al.*, 2018; Wengler *et al.*, 2021). The customers' perceived value of IoT business models in the B2B context remains underexplored. Falkenreck and Wagner (2021) claim that managing disruptive business models in the digital age is influenced by the insufficient existing trust to accept IoT projects in buyer–manufacturer relationships. While previous research offers some understanding of IoT business models, there is still a need for research on IoT adoption drivers from the business customers' perspective. Until today, a B2B–customer value perception of IoT-based services has not been studied in the context of its company's readiness to adopt IoT technology. Our study addresses this gap, indicating a research framing that combines insights from the IoT business model literature and customer perception of the value of these models, together with their drivers. This leads us to the following research question:

RQ1. Concerning relationship marketing management, is the value perception of IoT-related business models influenced by B2B relationship drivers or by the organizational IoT readiness of the involved company or person – or both?

Previous research on IoT mainly delivered qualitative data from stable economies, especially in Western and Northern Europe (Paschou *et al.*, 2020). That is why we have chosen to verify the drivers of Eastern European B2B customers' attitudes toward IoT-based business models qualitatively and quantitatively.

The structure of the paper is as follows: the next section introduces the theoretical background of our study, followed by a section on the development of the hypotheses and the conceptual model. Next, we examine the results. Then, we evaluate the drivers of IoT business model success or failure based on our findings. Finally, our paper concludes by proposing future research questions based on our study's findings.

2. Theoretical background

2.1 Internet of Things business models

An early work by Timmers (1998) describes a business model as an architecture of product and information flows, including a description of various business actors and their roles. Today, business models are referred to as plans implemented by a company to generate revenues. They have grown popular in the electronic B2B environment since the early 2000s (Doganova and Eyquem-Renault, 2009). Still, business model concepts lack an established definition and a clear theoretical foundation (Wieland *et al.*, 2017). What business models exactly are (Chesbrough and Rosenbloom, 2002; Wieland *et al.*, 2017) and their purpose (Doganova and Eyquem-Renault, 2009; Zott *et al.*, 2011) remains undefined. They have been inadequately understood – and were also confused with other popular terms such as business concept, revenue model, economic model or even business process modeling (DaSilva and Trkman, 2014).

Doganova and Eyquem-Renault (2009) highlight that in the context of digital technologies, business models are market devices allowing companies to explore a market and release their innovation – a new product, a new venture, and the network that supports it. Following Höller *et al.*'s (2014) findings, an IoT-related business model includes three dimensions: "Who, Where and Why." "Who" refers to collaborating partners, which form the value network based on IoT technology. "Where" describes the foundation of the value cocreation rooted in the layer model of digital objects, and "why" refers to how partners benefit from collaborating in the value network. Falkenreck and Wagner (2021, p. 645) suggest that business model innovation is linked to "the strategic decision to participate in an IoT-based value chain." Cocreation of value in IoT-based business models refers to "a joint creation of value by the service provider and the customer or a collaborative interaction where value is coinvented between service providers and users." In IoT-based business models, Snyder *et al.* (2016) characterize actors' challenges as a disruption that includes a high degree of change in the development process and the perceived newness of the service for all stakeholders.

2.2 Perceived value of Internet of Things

One of the most important marketing tasks in companies is to offer and communicate a value proposition to customers. Zeithaml (1988, p. 12) defined a customer's perceived value as "[...] the customer's overall assessment of the utility of a product based on perceptions of what is received and what is given." This refers to the difference between the benefits (in terms of get) and the sacrifices (in terms of give), including the monetary and nonmonetary costs related to what the buyer has to invest into the relationship (Lapierre, 2000).

IoT has a significant influence on the nature of products (Turber *et al.*, 2014), services and the relationships between the actors involved (Falkenreck and Wagner, 2017). The IoT can potentially enhance the architecture of value propositions by embedding digital services in a physical product (Kowalkowski *et al.*, 2015). First, IoT monitoring and controlling operations might lead to decreased cost and increased productivity. Second, data analytics and shared information from physical products might effectively influence B2B e-collaboration (Lee and Lee, 2015). Third, by sharing data with a substantial number of customers, the supplier creates an opportunity to compare the usage of and interaction with products to modify a business model intended to benefit all actors (Patricio *et al.*, 2018). Thus, IoT-related options may empower or completely transform the features of new business concepts (Adrodegari and Saccani, 2017; Ardolino *et al.*, 2018). This process implies a specific business model, to develop a proposal for the customer and implement the latest technology and extensive organizational changes on both sides of the relationship (Baines, 2015). However, IoT-based services cannot be delivered without the customers' and suppliers' active participation, particularly when it comes to exchanging proprietary or sensitive data (Balaji and Roy, 2017). Without customer commitment to data sharing, the supplier cannot deliver value using IoT business models (Falkenreck and Wagner, 2021). To reduce a company's risk of developing business models that lack customer value, it is crucial to identify the customer's perception of these innovative concepts.

In IoT, the trade-off between benefits and sacrifices may be linked to the question of what a customer's company will receive in return for sharing machine data with the manufacturer. Lapierre (2000) has identified value-based benefit drivers linked to the product itself, the service provided by the supplier and relationship-related drivers. In the context of IoT business models, technological aspects have been studied more than managerial ones, so authors call for a better understating of value creation from such models (Matthyssens, 2019). This research includes the openness of the buyers concerning IoT business models in the study on value perception.

3. Hypothesis development

3.1 Perspectives on the value of Internet of Things business models: relational approach and technology readiness

IoT has become a ubiquitous technology, seamlessly connecting the physical world with the internet. However, security, trust and privacy issues are still serious challenges in IoT because less work has been done on data security than technological aspects. Combining the definitions of Zott and Amit (2010) and Ritter and Pedersen (2020), our study defines an IoT-related business model as the content, structure and governance of virtual, automated data exchange networks based on the willingness of all actors to share their machine-to-machine data to create value to exploit business opportunities. Without customer commitment to data sharing, the manufacturer cannot deliver value using IoT business models (Falkenreck and Wagner, 2021).

While most researchers focus on the features of IoT systems (Ritter and Pedersen, 2020) and the manufacturer's approach to value (Hasselblatt *et al.*, 2018; Wengler *et al.*, 2021), a customer's perceived value of IoT business models in the B2B context remains underexplored (Falkenreck and Wagner, 2021). Clohessy *et al.* (2019) conceptualize *perceived value* as the main predictor of customer behavioral intention. Perceived value refers to the extent to which a business customer thinks using an innovative technique positively influences company success (Davis, 1989). We agree with Ritter and Pedersen (2020) that linking machines and things with business models created to enhance the perceived customer value is still a challenge for today's B2B customers.

B2B marketing literature suggests that complex digital solutions should be offered and cocreated based on continuous seller–customer relationships (Ulaga and Kohli, 2018). Falkenreck and Wagner (2017, 2021) found the importance of a trusted relationship with the supplier to be an essential requirement for a customer's acceptance of IoT-based services. With good relationships with key customers, suppliers have an in-depth understanding of customer needs and can better quantify the value in a way that appeals to those customers. Many uncertainties can be solved through relationships, and the creation of mutual trust helps companies find solutions that go beyond the context of written contracts (Ndubisi *et al.*, 2016). However, we propose that linking IoT value to relational aspects might not be enough to explain a business customer's perception of IoT business models. That approach underestimates the organizational and technological aspects of a customer's understanding of the value that inevitably arises, especially in the case of digital technologies (Keegan *et al.*, 2022).

To capture customer preparedness to accept IoT business models, we derive the concept of IoT readiness from technology adoption readiness. In a broader sense, it focuses on the company's capability to adopt new technology (Yang *et al.*, 2015). According to Parasuraman (2000, p. 308), technology readiness refers to a user's propensity to comprehend and use new technologies to accomplish their goals. In the context of information technology (IT) systems, Zhu and Kraemer (2005) suggest focusing on infrastructure, relevant systems and technical skills. Following the research results on adopting IoT technology by Soomro *et al.* (2020), digital readiness refers to how prepared an organization is for digitalization. Digital readiness comprises different dimensions: digital competencies and skills, the integration of vertical and horizontal value chains, the use of digital tools and applications and agile IT infrastructure, as well as the adaptation and optimization of innovative business models. The extent of the company's networking and the existence of digital products and services influence the level of digital readiness for IoT technology. Ritter and Pedersen (2020) highlight the necessity of sufficient resources, knowledge and digital capabilities to implement IoT systems.

Linking a relational approach with the concept of digital readiness, we develop our conceptual model by hypothesizing in three areas: the role of trust in IoT relationships, the link between IoT-related relationship quality and the perceived value of IoT business models and the interplay between a company's IoT readiness and its perception of the value of IoT offered by a manufacturing supplier.

3.2 Linking IoT-related relationship quality to the perceived value of IoT business models

A customer's trust in a manufacturer is defined as encouraging anticipation of this partner's helpful behavior (Cho, 2006). A more substantial level of trust is needed when a manufacturer is directly integrated into a customer's processes rather than simply providing products or services (Raddats *et al.*, 2019). Ventekatesh *et al.* (2012) emphasize that a trustful customer–manufacturer relationship is one of the key requirements for project success.

In B2B services, trust is regarded as an even more critical relationship driver because buyers face the challenge of examining many intangible aspects of a manufacturer's offering (Doney *et al.*, 2007). In addition, McKnight *et al.* (2002) highlight the value of trust in technologies, where a customer's

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observation of risk must be minimized to use that technology. Therefore, we hypothesize:

H1a. A customer's perceived general importance of a trustful customer–manufacturer relationship is positively related to trust in a customer–manufacturer relationship.

Many studies highlight the critical role of trust in a successful relationship (e.g. Morgan and Hunt, 1994; Moorman *et al.*, 1992). A customer's trust in the integrity of the manufacturer's IoT is a precondition to developing trust and confidence in these innovations, as opposed to growing fears of real supervision scenarios (Santucci and Lange, 2008). Trusted partners are more open and their close interactions may support technological development (Anderson, 1995). In general, as value perceptions refer to specific situations (Ulaga and Eggert, 2006), there are distinctions in the value of the relationship between the judgments of customers and manufacturers (Walter and Ritter, 2003). Buyers try to reduce the perceived risk of purchasing services by selecting companies they can trust, those that have performed reliably in the past.

Consequently, building trust in IoT credibility benefits both parties, saving resources that would otherwise be spent on investigating partner reliability. However, this implies that the amount of effort the partners integrate to maintain and intensify the relationship will be high (Andersen and Kumar, 2006). Thus, we posit:

H1b. The general importance of a trustful customer–manufacturer relationship is positively related to the development of a buyer's attitude toward a manufacturer's IoT credibility.

McKnight *et al.* (2002) stress the significance of preliminary trust, particularly for disruptive innovations, where the perceived risk of these disruptions must be overcome to generate a readiness to use these technologies. Falkenreck and Wagner (2017, 2021) indicate that trust in a manufacturer's IoT-related integrity (e.g. data storage and use of data) not only influences a customer's relationship commitment but also has an impact on the acceptance of the IoT as part of a business model. The perceived value of proposed IoT business models and the volition to use them, along with trust in the integrity of the manufacturer's IoT processes, are the main drivers of IoT technology approval (Ventekatesh *et al.*, 2012). In line with Jayashankar *et al.*'s (2018) observation of a positive relationship between trust and the perceived value of adopting IoT technology and incorporating the results of technology acceptance studies (Ventekatesh *et al.*, 2012), we suggest the following:

H2a. Trust in a customer–manufacturer relationship is positively linked to the perceived value of IoT business models.

As IoT business models involve cooperating B2B partners, the uncertainty and risk associated with IoT projects are the primary concern of the customers in their perception of their value because there is a lack of useful IoT business models in industrial markets (Fantana *et al.*, 2013; Ardolino *et al.*, 2018). Del Bosque *et al.* (2006) indicate that relationships based on a high level of trust have a simultaneous sense of security, resulting in higher satisfaction. Thus, we hypothesize:

H2b. The recognized importance of a trustful customer–manufacturer relationship is positively linked to a customer relationship satisfaction.

Trust builds on knowledge because it is derived from interactions in the past (Goryagin and Wagner, 2018). Scholars argue that trust drives the successful implementation of new technology (e.g. Alaiad and Zhou, 2014; Benbasat and Wang, 2005). Obal (2017) proposes that a customer will transfer previous relationship trust and apply it to their assessment of the manufacturer's new innovative technology.

In Eastern European IoT-related projects, trust is "mainly driven by the general attitude toward the manufacturer as well as how generally important a trustful customer–manufacturer relationship is to the customer" (Falkenreck and Wagner, 2017, p. 190). We are not just testing this relationship in Eastern Europe but in a competitive business field. Therefore, we consider a positive linkage between *trust in the buyer–manufacturer relationship* and a *buyer's attitude toward a manufacturer's IoT credibility* to increase mutual interest and decrease perceptions of risk and uncertainty regarding IoT (AlHogail, 2018) and posit:

H2c. Considering innovative business contexts, trust in the buyer–manufacturer relationship positively influences a buyer's attitude toward the manufacturer's IoT credibility.

Research on IoT acceptance shows that technology can increase customer satisfaction (Lo and Campos, 2018). Still, they do not study the reverse relationship – the impact of satisfaction with the cooperation with a manufacturer or supplier on the perception of the value of the IoT business model. When considering this issue, we take into account the studies of DeLone and McLean (2003), which assume that satisfaction impacts the tendency to use innovative IT systems. We also refer to Bhattacherjee (2001) and Lee and Park (2008), who noticed that when considering disruptive technology purchases, satisfaction with previous cooperation enhances the acceptance of solutions provided by suppliers. Thus, we hypothesize:

H3. A customer who feels a high degree of customer–manufacturer relationship satisfaction is more likely to positive IoT business model perception.

Many studies have investigated various customer-related outcomes of satisfaction. A positive linkage between customer satisfaction and trust in the supplier is reported in new technologies. Ganesan (1994) indicated that business customers tend to mitigate the risk and uncertainty of buying technologies by selecting suppliers based on satisfactory relationships. Thus, we hypothesize:

H4. There is a positive relationship between buyers' relationship satisfaction and their positive manufacturer IoT credibility attitude.

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Highly disruptive offerings that change current business models are expected to be perceived as challenging, and users may hesitate to accept these technologies. In innovative IoT business models, risk must be considered (Raddats *et al.*, 2019) because an increasing degree of connectivity and transfer of sensitive or personal data included in these offerings may lead to questions related to security and personal data. To best cocreate ideas and value with customers, it is necessary to rely upon the manufacturer's IoT credibility (Falkenreck and Wagner, 2017). Customer reliance on the manufacturer's IoT data integrity is a precondition to increasing trust in these innovative disruptions to avoid exacerbating the fear of real supervision situations (Santucci and Lange, 2008). Bhattacharya *et al.* (2017) emphasize the importance of a sense of predictability of behavior or actions from the manufacturer who provides an IoT business model. They argue that without transparency in daily business interactions to maintain reliability and protect privacy, customers will not engage in the offering or the value cocreation process. Thus, in line with Falkenreck and Wagner (2017), we posit:

H5. A buyer's positive manufacturer IoT credibility attitude positively influences the perceived value of IoT business models.

3.3 A company's IoT readiness as a driver of a buyer's IoT value perception

We follow Hurley *et al.*'s (2005) approach and define organizational innovativeness as the "organizational climate that provides environmental support for the continuous creation of new ideas and products over time." Company innovativeness has been conceptualized as one of the factors of B2B customers' organizational preparedness to accept advanced offerings (Vaittinen and Martinsuo, 2019). This has been broadly construed to limit the extent to which it constrains or behaves as a facilitator of IT acceptance (van de Weerd *et al.*, 2016). Understanding a customer's IT resources can be essential for the manufacturer's change plans (Vaittinen and Martinsuo, 2019; Sakyi-Gyinae and Holmlund, 2018). These results expressly refer to innovative companies in competitive business fields, as the pressure to invest in disruptive offerings is high (Balaji and Roy, 2017). This leads us to:

H6a. A positive relationship exists between a customer's organizational innovativeness and their perceived value of IoT business models.

IoT business models focus on connected partners "where internal, external, collaborative, cocreative ideas can be converted to create organizational and shared value" (Lee *et al.*, 2012, p. 818). The challenging issues are embedded in IoT security due to its deployment, mobility and complexity (Li and Xu, 2017). However, research on the relationship between trust and organizational innovativeness is rather scarce, and the link between them has been approached from different, predominantly discrete points of view (Ellonen *et al.*, 2008). Innovation is expected to be demonstrated by knowledge about the process, technologies and implementations and by trying out novel systems with enhanced confidence linked to one's capability with new technology and the perception of accessibility. Furthermore, it is related to the perception that the supplier of the system is credible, honest and benevolent (Hwang, 2009). Therefore, we hypothesize:

H6b. A positive relationship exists between the customer's organizational innovativeness and a buyer's positive manufacturer IoT credibility attitude.

As discussed earlier in this paper, a company's digitalization capability "provides the basis for subsequent commercialization of data, which expresses itself in digital value propositions and value demonstrations" (Ritter and Pedersen, 2020, p. 188). Risk must be considered in innovative IoT business models (Raddats *et al.*, 2019), as the high level of computerization, interconnectivity and the option or likelihood of transferring sensitive or personal data in these processes may raise security and privacy questions. We assert that demonstrating a comprehensive understanding of technical standards, chances and challenges of IoT business models – digitalization capabilities – are essential relationship drivers. This may influence a customer's willingness to engage in IoT business models. The authors propose the following:

H7a. A customer's digitalization capabilities positively impact a customer's perceived value of IoT-related projects.

H7b. There is a positive relationship between a company's digitalization capabilities and organizational innovativeness.

According to Lambe *et al.* (2000), developing solid digital collaboration with selected customers may strengthen relationship quality and enhance value for all parties. Furthermore, Hollenbeck *et al.* (2009), as well as Matarazzo *et al.* (2021), suggest that the supplier can build customer's trust by showing practical technological knowledge and having boundary spanners personally involved in every aspect of digital collaboration. Therefore, we suppose that:

H7c. A customer company's digitalization capabilities positively influence the development of a buyer's attitude toward a manufacturer's IoT credibility.

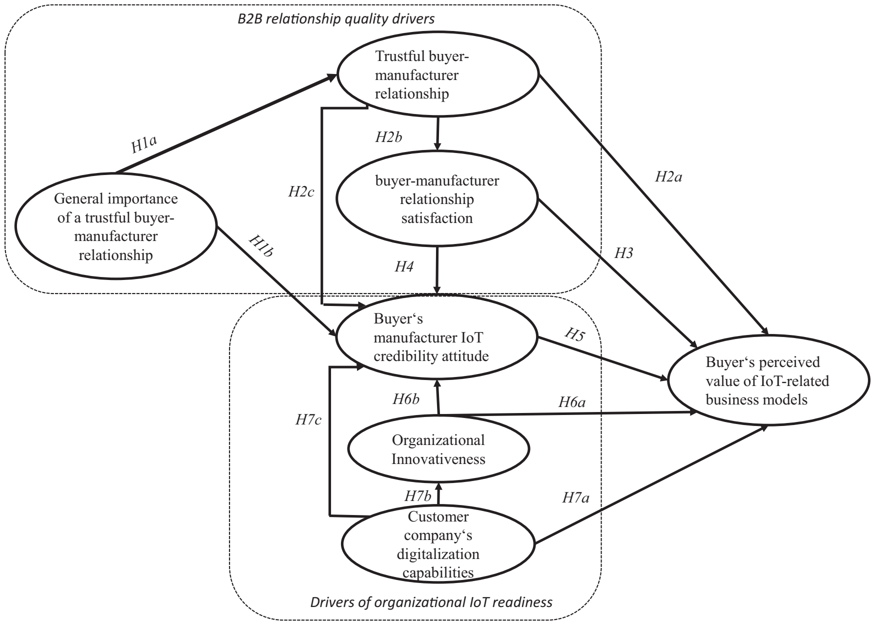
Considering *H1–H4* on IoT-related relationship quality and *H5–H7* on organizational IoT readiness, we develop the conceptual model seen in Figure 1 to investigate the influencing factors on buyers' perceived value of IoT business models. The world has entered a new era of industrial connectivity. So, even if customers trust a company while using an earlier technology, they will need to carry that trust over when applying disruptive technology in high-risk and uncertain scenarios.

4. Methodology

4.1 Study area and data collection

To test the hypotheses, the authors conducted research by selecting manufacturers that produce complex industrial solutions with IoT functionality. The selection criteria were established market position, stable relationships with business customers operating in Eastern Europe and being in the implementation stage of IoT-based business models at the time

Figure 1 Conceptual model of drivers of a customer's perceived value of IoT business models



Source: Authors' own work

of selection. Table 1 presents the profiles of the three companies carefully selected for the study.

In the second research stage, the authors developed an online survey based on the concepts of Falkenreck and Wagner (2017). We used the sample selection criteria to select customers of companies A, B or C that: (1) sell products to business customers in Eastern Europe, (2) have at least a three-year-long, active relationship with companies A, B or C, (3) offer products in competitive business fields [following Hunt's (2000) meaning of competitive markets related to resource-advantage theory] and (4) have enhanced digitalization capabilities [following Lenka *et al.*'s (2017) meaning of digitalization capabilities]. Markets are always in disequilibrium. Hunt (2000, p. 3) argues that resource-advantage theory explains and predicts certain phenomena better than, e.g. perfect competition would, and can be considered realistic when is it "close enough" to real-world economic conditions. Following this advice, we carefully selected our survey participants, always considering their buyer–supplier relationships in competitive business fields.

To select companies, we used sales data (for Criteria 1 and 2) and the expertise of sales executives from companies A, B and C (for Criteria 3 and 4). Finally, we selected 339 innovative customers and asked the head of purchasing, technology or production to participate in this study. This amount of

Table 1 Characteristics of the manufacturing companies

Company details	Company A	Company B	Company C
Company size	140 employees	160 employees	160 employees
Founded	1990	1993	1984
Ownership	Listed on stock market	Family-owned business	Family-owned business
Core activity	Design, manufacturing, installation and maintenance services for comprehensive solutions of passive fire protection systems. Company is focused on gates, fire protection gates, smoke curtains, fire protection curtains and doors for a wide variety of buildings	General contractor focused on buildings for industrial, office, construction and technological investments. Offers comprehensive industrial investment services (consulting, designing, constructing and equipping with technologies)	Manufacturing and assembling machine parts, mainly as subcontractor for manufacturers of printing machines, textile industrial machines, mechanical power transmission products and automotive machine tools
IoT advancement	Fire-suppression devices and installations with sensors installed in customer facilities are equipped with IoT technology	Customer buildings are equipped with smart devices ready for IoT	Machines delivered to customers are equipped with IoT sensors
IoT-based business model offered to customers	Monitoring, controlling and optimizing the operation of all devices that initiate and signal a fire alarm	Building management systems based on optimization of energy consumption and security control	Controlling all parameters of the machine operation, reducing the number of errors and providing preventive maintenance

Source: Authors' own work

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customer data represents all customers meeting the abovementioned manufacturer criteria. Excluding responses with incomplete data, 90 customers returned a completed questionnaire. The response rate was 26.54%, which is acceptable in B2B research (Dillman, 2006; Harzing, 2000). Table 2 summarizes the sample in more detail.

4.2 Measurement

The measurement items used in this study are listed in Table A1 and can be found in the Appendix. Although the measurement items were established using the construct presented in previous literature, some modifications were necessary to fit them into our framework.

5. Data analysis and results

5. 1 Path model estimation

Considering the relatively small sample size of this data set, we used structural equation modeling (SEM) with the component-based partial least square (PLS) method (Hair *et al.*, 2017). To test our PLS model, we used SmartPLS 3.0 (Ringle *et al.*, 2005) and carried out nonparametric bootstrapping to get the standard errors. PLS-SEM applies ordinary least square regression intending to maximize the R^2 values of the endogenous constructs. PLS-SEM uses the indicators' total variance; the process creates linear combinations of indicators "to represent the constructs, thereby constituting a composite model approach to SEM" (Hair *et al.*, 2017, p. 18)

The literature indicates that SmartPLS is a helpful instrument for empirical research (Henseler *et al.*, 2014); a less restricted model (the composite factor model) is estimated, it is considered reliable, as it is less susceptible to results of misspecification in subparts of the model. A nonparametric procedure (bootstrapping) was applied that allows testing the statistical significance of PLS-SEM results. We were following the suggestions of Hair *et al.* (2017).

5.2 Evaluation of structural and measurement model

To test the hypotheses in this conceptual framework, we used the entire sample of 90 participants. We confirmed all hypotheses for which the related path coefficient was larger than 0.1 and significant at $p < 0.05$ (Chin, 1998; Lohmoeller, 1989). In our model, all outer loadings are of acceptable quality (above the common threshold of 0.70, most items show a threshold above 0.85). The overall fit indices in Table 3 indicated a good or at least satisfactory fit between the hypothesized model and the empirical data.

Table 2 The sample

Company	Total sample size $N = 339$	Collected feedback $n = 90$
A	$N = 174$ customers	$n = 54$ filled-in questionnaires, response rate 31.0%
B	$N = 38$ customers	$n = 13$ filled-in questionnaires, response rate 34.2%
C	$N = 127$ customers	$n = 23$ filled-in questionnaires, response rate 18.1%

Source: Authors' own work

Table 3 Model fit

Fit summary	Saturated model	Estimated model
SRMR	0.079	0.069
d_ULS	2.852	4.881
d_G	1.070	1.143
Chi-square	463,889	472,098
NFI	0.528	0.520
nms Theta 0.256		

Source: Authors' own work

The reliability of three constructs (company's digitalization capabilities, perceived value of IoT business models and innovativeness of customers) was between 0.67 and 0.70, which indicates acceptable consistency (Fornell and Larcker, 1981). However, the component reliability (the internal consistency) of the other constructs was above 0.80, indicating excellent internal consistency (see Table 3). In our study, all average variance extracted scores are higher than the upper limit value of 0.5 (Fornell and Larcker, 1981). According to the literature, there are two different limits to be considered (>0.7: Nunally and Bernstein, 1978; >0.4: Peter, 1997), depending on the number of indicators use per construct. In our research study, the constructs consist of up to three individual constructs, so a threshold Cronbach's alpha value of >0.4 (Peter, 1997) is sufficient. Nevertheless, four constructs score above the threshold value of >0.7 (Nunally and Bernstein, 1978).

The following quality criteria were assessed, among others: the cross-validated R^2, R^2 *adjusted*, f^2 (explaining the strength of the effect), construct reliability and validity, discriminant validity, collinearity statistics (outer and inner VIF values), model fit (see Table 4) and model selection criteria. The R^2 values in PLS-SEM are more significant as a forecaster of the variance incorporated in the indicators of the endogenous constructs than the R^2 value in CB-SEM (Hair *et al.*, 2017). An R^2 value of >0.6 is "substantial," a value of 0.3 is "moderate" and a value of 0.19 is a "weak value" (Chin, 1998). Our conceptual framework explains 61% of all impact factors that drive a customer's perceived value of IoT business models. In addition, our research data explains 58.6% of the impact factors on satisfaction. Our conceptual model explains 41.4% (moderately high R^2 value) of the impact factors on buyers' *positive manufacturer IoT credibility attitude*. This leads to the conclusion that some additional factors drive this construct. Generally, our study results support the reliability and validity of the research.

5.3 Partial least square-structural equation modeling and hypotheses testing

As discussed, this conceptual framework examines relationships among constructs that refer to relationship quality (*trustful customer–manufacturer relationship*, *satisfaction with customer–manufacturer relationship* and *buyer's positive manufacturer IoT credibility attitude*), together with the IoT readiness (*organizational innovativeness*, as well as *company's digitalization capabilities)* in a B2B customer setting.

This study aims to understand the drivers affecting the customer's perceived value of IoT business models. Figure 2 illustrates the model with the standardized path coefficients and

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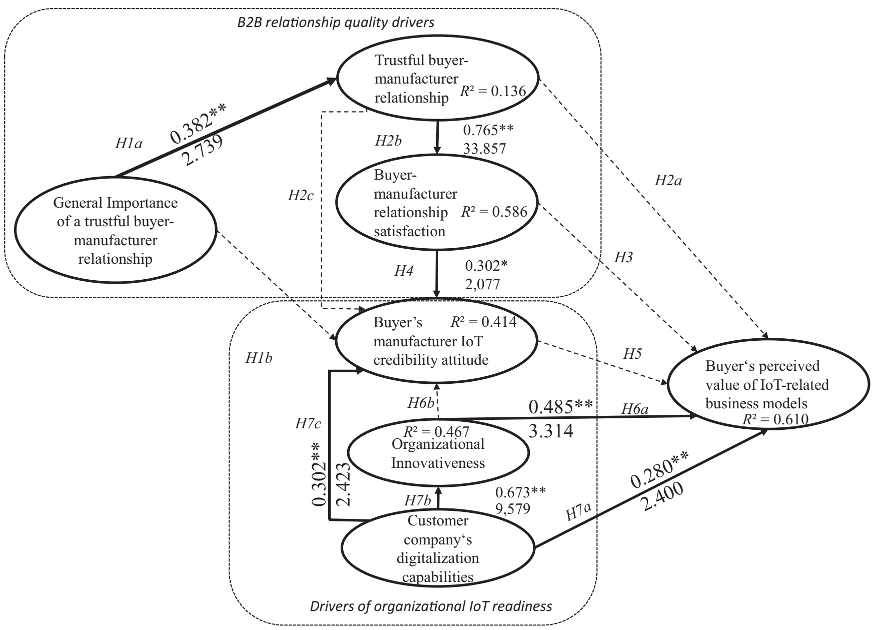
Table 4 Reliability assessment

Construct	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Customer's company's digitalization capabilities	0.669	0.789	0.652
General importance of a trustful buyer–manufacturer relationship	1.000	1.000	1.000
Organizational innovativeness	0.673	0.804	0.513
Perceived value of IoT business models	0.683	0.787	0.554
Satisfaction with buyer–manufacturer relationship	0.858	0.934	0.876
Attitude toward a manufacturer's IoT credibility	0.867	0.918	0.788
Trustful buyer–manufacturer relationship	0.848	0.905	0.760

Source: Authors' own work

Figure 2 Estimated model of drivers of customer's perceived value of IoT business models



Notes: $^*p < 0.05$; $^{**}p < 0.01$
Source: Authors' own work

t-values. We were able to confirm 7 out of 13 hypotheses. In our data, the *general importance of a trustful customer–manufacturer relationship* is strongly related to (*H1a*) *a buyer's strong relationship with their manufacturer* (p = 0.382**; t = 2.739). Interestingly, *H1b* was unsupported. We found no significant relationship between the constructs of the *general importance of a trustful customer–manufacturer relationship* and *attitude toward the manufacturer's IoT credibility*. Also, the existing trustful buyer–manufacturer relationship does not enhance a buyer's *manufacturer's IoT credibility attitude* (*H2c*). Furthermore, *organizational innovativeness* (*H6a*) strongly relates to *the perceived value of IoT business models* (p = 0.485**; t = 3.314). Our findings indicate that a customer who is satisfied with the existing customer–manufacturer relationship does not perceive the value of IoT business models in a more positive way (*H3*). Also, *trust in the buyer–manufacturer relationship* does not positively influence *a buyer's attitude toward the manufacturer's IoT credibility* (*H2a* and *H2c*). Thus, existing satisfying and trustful customer–manufacturer relationships do not help to increase the *perceived value of IoT-related business models* (*H5* and *H1c*).

As hypothesized in *H2b*, a *trustful customer–manufacturer relationship* is positively linked to the *customer's satisfaction with this relationship* (p = 0.765**; t = 33.857). Also, a *buyer's satisfaction with the relationship* with their manufacturer positively influences their *attitude toward the manufacturer's IoT credibility* (*H4*, p = 0.302*; t = 2.077), of the latter. But, curiously, the customer's trustful relationship, general satisfaction or even their attitude toward the manufacturer's *IoT credibility* does not positively influence a buyer's *perceived value of IoT business models* (*H2a* and *H3*). On the other hand, our research study indicates that a company's IoT readiness drives a buyer's *perceived value of IoT business models* (*H6a*, p = 0.485**; t = 3.314; *H7a*, p = 0.280**; t = 2.400).

There is a strong positive relation (p = 0.280**; t = 2.400) between (*H7a*) the *organizational innovativeness* and the *perceived value of IoT business models*. The more they know about digitalization, the more a buyer is likely to believe in the manufacturer's credibility. *H7b* indicates a positive relationship between a *company's digitalization capabilities* and *organizational innovativeness* (p = 0.674**; t = 9.579). Finally, we found a strong relationship between a customer's *company's digitalization capabilities* and (*H7c*) a buyer's attitude toward a manufacturer's IoT credibility (p = 0.302**; t = 2.423). Our research is in line with the findings of Hollenbeck *et al.* (2009), claiming that technological savviness and personal involvement in collaboration in a digital context impact the attitude toward the manufacturer's IoT credibility.

Interestingly, we did not find a relationship between *organizational innovativeness* and a buyer's *attitude toward the manufacturer's IoT data credibility (H6b)*.

6. Qualitative research study

As our hypotheses regarding the influence of relationship quality on perceived IoT value were not supported, we decided to explore how interested industrial customers are in an interactive approach to joint value cocreation based on an IoT business model in our qualitative research study. Therefore, we focused on the same sample of Eastern European companies participating in quantitative research. We asked them for in-depth elaboration on the role the IoT will play in their business in the future and the way it will be integrated into the development of new supplier IoT service offerings.

Based on the participation of n = 23 participants (N = 90), we received responses to these questions. Considering the well-known challenges of collecting data in CEE countries (Ivanova-Gongne *et al.*, 2018), the response rate was acceptable. Mayring's (2001) qualitative content analysis was used to evaluate the data.

In the first question of our qualitative study, our research results indicate that there are four conceptualizations of IoT:

1 as liquefaction and density of information of resources;
2 as digital materiality;
3 as an assemblage or service system; and
4 as modules, transactions and services.

Only two respondents established an association with IoT and the remote use of connected devices to an increase in efficiency. Most customers presented a technology-oriented approach to IoT, which adds new services to suppliers' offers. They did not understand the IoT as an extension of existing devices delivered by the manufacturer, but as a new business model.

Concerning our second question, our results indicate that B2B customers would not proactively engage in joint future IoT service opportunities, they would wait for proposals from their contractors or business partners. Customer explanations indicate that if they have little knowledge of how the IoT might be useful for the future success of their businesses, they would not proactively engage in new IoT service opportunities from suppliers. Developing their organization's innovativeness and digitalization capabilities is a precursor to understanding the value of IoT-related business models.

7. Discussion

We would like to reiterate our research question in the first section. In relationship marketing management, is the value perception of IoT-related business models influenced by B2B relationship drivers or by the IoT readiness of the company or person – or both? Interestingly, our study results indicate that the value perception of IoT-related business models is influenced by the IoT readiness of the involved company or person.

Our findings show that customers perceive the value of IoT business models from a technology-oriented perspective. They are in line with Ng and Wakenshaw's (2017, p. 4) proposition that the IoT creates new opportunities because of liquefaction and density of information of resources, digitalization of materiality, enhancing an assemblage or service system and enhancing the ways of transactions and service. Focusing on the buyers' approach to value in IoT business models, our study shows that the perceived value of IoT business models is driven by a customer's company's readiness to adopt IoT technology. This finding supports the assumption that the innovativeness of a company enables the adoption of information technologies, including IoT (van de Weerd *et al.*, 2016).

This research shows that perceived value is linked to prerequisites that relate to the customer and the customer's company itself. If customer innovativeness and IoT readiness are not sufficient to perceive the supplier's IoT value proposition, the positive relationships with that supplier will also not help explain it. Although long-term relationships (one of the selection criteria of our study participants) between manufacturers and buyers enhance the manufacturer's position as a knowledge hub for digital technologies (Keegan *et al.*, 2022), this is not the case when offering IoT business models to customers. That result confirms the conclusions of Raddats *et al.* (2019), arguing that customers might be concerned about increased risk in IoT-based business models. A buyer's innovativeness and digitalization capabilities are the important factors for the value of manufacturer IoT business models. Our study is in line with the results of Forkmann *et al.* (2017), which indicate that manufacturers developing an IoT business model must consider their customers' digital capabilities. Our research sheds light on the perception of IoT value process created by business customers.

For IoT-based offerings, we could not confirm the findings of Zaheer *et al.* (1998) or Ventekatesh *et al.* (2012), who suggested that trust creates constructive attitudes that lead to a growing likelihood of innovation acceptance. Our findings also challenge the assumptions of Cannon and Perrault (1999) or Deleon and Chatterjee (2017) about the meaning of satisfaction in acceptance of disruptive offerings for business relationships. In the case of IoT, buyers are focused on their satisfaction with the manufacturer's security policy rather than on the history of the relationship (Sicari *et al.*, 2015).

The relatively low importance of good relationships in how customers perceive the value of manufacturers' IoT business models in our findings can be explained by studies of uncertainty in B2B. These are situations where a partner does not have enough information to predict the consequences of his decisions, so he cannot make key decisions with confidence (Achrol and Stern, 1988). Good relationships with suppliers are usually presented as a way of alleviating uncertainty (Sharma *et al.*, 2015), but contrary effects have been reported when it comes to digital technologies. Hadjikhani and Lindh (2020) found that uncertainty increases when technology impacts social interaction despite the quality of the preexisting relationship, and our findings support their conclusions. This finding can be significant in Eastern European cultures, where the role of trustful business relationships is lower than in Western Europe (Falkenreck and Wagner, 2017).

Interestingly, a positive relationship exists between *satisfaction with the buyer–manufacturer relationship* and *a manufacturer's IoT credibility*. This leads us to conclude that if customers are satisfied with the core technology and service delivered, they can develop trust in the manufacturer's IoT data safety behavior. However, good relationships with a manufacturer might have a different meaning for customers when participating in cooperative processes. Or, they can be different when creating additional value simply by adding IoT business models to manufacturers' core product offerings (Raddats *et al.*, 2019).

Summing up, existing positive relationships and relational or adaptive selling processes and the impact of organizational IoT readiness are not predictors of a customer's perceived value of IoT-related business models (Arli *et al.*, 2018). To understand the value of business models, the sacrifices must be discussed (Walter *et al.*, 2001), and in the context of our study, the customer's sacrifice is sharing big data. Our findings support the works of Chen and Zhuang (2011) about relationship uncertainty, asking if the former relationship requirements are still applicable and reliable when new technology is implemented.

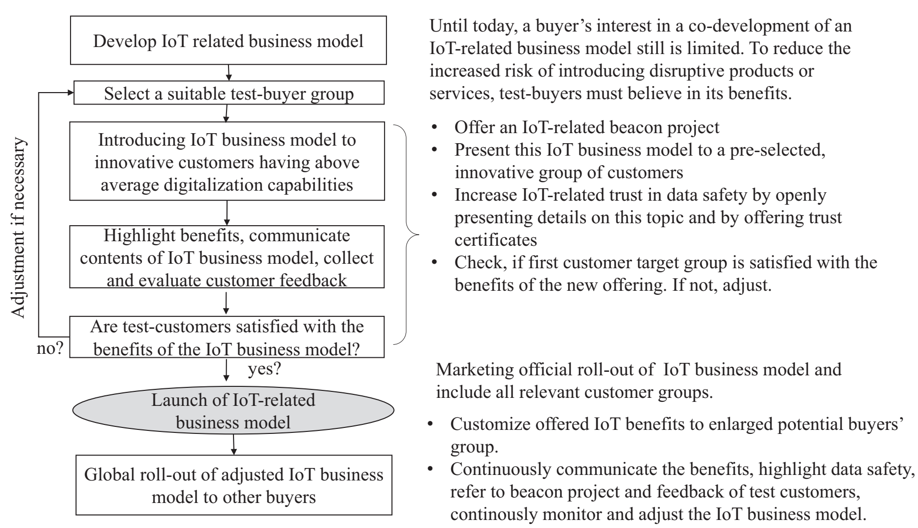
8. Managerial implications

In a competitive environment, where sources of both product-based and service-based competitive advantages may not offer sufficient benefits to the buyers (Arslanagic-Kalajdzic and Zabkar, 2015), a commitment to customer-value innovation is essential to sustaining a competitive advantage (Lapierre, 2000). However, the results of our study contradict the idea of Lapierre (2000) and Falkenreck and Wagner (2017) to look at relational value-based drivers. Trust in the manufacturer and satisfaction with the buyer–manufacturer do not enhance the value perception of IoT-related business models. Therefore, marketing and sales managers need to consider IoT business models as disruptive innovations. Buyers are reluctant to accept models if their benefits are unclear and the sacrifices (sharing sensitive data) are high. Furthermore, the history of the relationship does not strengthen the customer's perception of its usefulness. In light of our research results, we suggest a process that supports a more successful launch of IoT-related businesses.

Our research questions referred to the drivers or benefits of B2B buyers' perceived value of IoT-related business models. Scholars have already pointed out that IoT-based services require both the customers' and sellers' active participation when exchanging proprietary or sensitive data (Balaji and Roy, 2017). If customers understand the benefits of data sharing, they will opt in and enable the seller to use their data to deliver value using IoT business models (Falkenreck and Wagner, 2021). Based on our qualitative and quantitative studies and the feedback of the B2B buyers, we propose the following IoT-related business model launching process (Figure 3). Considering the approach of Höller *et al.* (2014), the focus is on the early integration of suitable customer groups. "Who" refers to selecting suitable test buyers from the existing value network. We suggest concentrating on buyers from innovative companies experienced in digitalization projects. "Where" describes the basis of the value cocreation rooted in the IoT business model (sacrifices vs benefits), and "why" refers to the way customers benefit from collaborating with each other in the value network and the related benefits of sharing their data.

Although the seller may not control a customer's value perception directly, suitable marketing actions are said to influence customer perceived value (Arslanagic-Kalajdzic and Zabkar, 2015). Therefore, we suggest a careful preselection of test customers who work for innovative companies and increasing trust in the manufacturer's IoT credibility using, e.g. official digital trust certificates. We also emphasize that a marketing communication approach to the IoT-related

Figure 3 IoT business model development, customer benefits and related launching process



Source: Authors' own work

business model after test roll-out must clearly state the benefits the buyers get for sharing their data. Furthermore, the benefits must be customized to the buyer's requirements to increase the acceptance of the new IoT-related business model.

9. Scientific implications, limitations and questions for further research

Our research makes three important theoretical contributions. First, we contribute to the B2B marketing literature about the value of digital technologies by taking the customer's point of view and discussing the relational approach with the concept of IoT readiness. Earlier research mainly focused on the technological features of IoT systems (Ritter and Pedersen, 2020) or on the manufacturer's ways of dealing with its value (Wengler *et al.*, 2021). We identify the drivers of the perceived value of manufacturers' IoT business models.

Second, we extend the literature on digitalization capabilities by stressing the importance of IoT readiness for value perception in IoT business models. Several studies suggested the significance of organizational capability when adopting new technologies (Ritter and Pedersen, 2020; Raddats *et al.*, 2019). This study supports it, taking into account the customers' understanding of the value of manufacturers' IoT business models.

Third, this research contributes to the literature on trust and credibility of business suppliers in the eyes of their customers by pointing out limitations on the available influence in quality for relationships including digitalization. Our study confirms the importance of good relationships between suppliers and customers (Falkenreck and Wagner, 2017, 2021; Ritter and Pedersen, 2020), but presents it as a factor that is not sufficient to overcome a customer's apprehension in the case of IoT implementation. We argue that digital servitization of manufacturers' offerings based on IoT business models should no longer be considered only in the context of "soft," relational context. Following Ferreira and Lind's (2022) findings, it should be supplemented by a "hard" organizational and technological context that defines the customer's capability to work with digital technologies.

As in any empirical research, the results of the present study cannot be interpreted without considering the study's limitations. This research focuses on the preimplementation phase of a new IoT business model in three meticulously selected companies. Clearly, empirical research based on a substantial B2B customer sample size would be advantageous. Convincing B2B suppliers to share their customer database with researchers is a challenge. Based on 339 customers of three different B2B companies, we managed to receive questionnaires from 26.5% of the respondents, which is an above-average return. It should be emphasized that the customers were embedded in a unified relationship context with a specific supplier (they had developed long-term relationships).

This sample of Eastern European buyers is not representative of most manufacturing companies. A randomized sample using other sources, such as large industry databases, could be helpful. In addition, replicating the study in other countries would allow for a cross-border validation of our results. The way business functions in the countries in this region influences the attitudes and behavior of the actors in these relationships and determines the role relationships play in the success of cooperation. At the same time, the digitalization of the economy in Eastern Europe did not cover all industries to the same extent, which may significantly shape the extant level of knowledge of IoT and the general attitude to business solutions based on IoT (Falkenreck and Wagner, 2017).

Our research findings indicate a research agenda for conceptual and empirical developments in the future. First, additional studies might explain how companies can engage customers in IoT-related business models because the delivery of IoT business models requires data owned by the buyer (Ardolino *et al.*, 2018) and how suitable buyers can be selected when considering launching an IoT business model. Our results indicate that focusing on innovative customers that show a higher degree of digitalization may be helpful. But we believe that because of the limitations mentioned above, there is plenty of scope for additional research to untangle this and understand it thoroughly. Second, how should the suppliers deal with their customers' uncertainty about IoT? Suppliers may decide to integrate preselected customers that are innovative and have above-average digitalization capabilities first. However, IoT business models are disruptive with reference to their value demonstration (Syam and Sharma, 2018) and value proposition (Gandhi *et al.*, 2018). How can suppliers identify the buyers' individual approach to IoT and communicate IoT-related values? We think this might be a favorable route for further research. Finally, yet importantly, further studies might investigate why the preexisting buyer–manufacturer relationship is not driving a buyers' perceived value of IoT business models. That finding is in contrast to earlier studies that considered the quality of business relationships important for new technology acceptance in the perception of the value offered by manufacturers and suppliers (McKnight *et al.*, 2002). The complexity of IoT-related business models due to the different actors, relationships and processes involved makes it an interesting context for testing and extending theory.

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Appendix

Table A1 Formation of constructs

Construct	Items
Buyer's attitude toward manufacturer's IoT credibility **Based on the works of Cho (2006) and Falkenreck and Wagner (2017, 2021)**	Please give us your opinion about the following statements: seven-point Likert scale, ranging from 1 (strongly agree) to 7 (strongly disagree): Company X will not engage in any kinds of exploitive and damaging behavior that impacts negatively on its customer's data security Company X will act responsibly and reliably while working with the data of its customers With regards to data selection and data use, company X will promote customers' benefits as well as its own
Trustful customer–manufacturer relationship **Enhancement of Falkenreck and Wagner (2017)**	Seven-point Likert scale, ranging from 1 (strongly agree) to 7 (strongly disagree): Our company maintains a trustful business relationship to company X Our company always feels well informed about new products of company X Our company always feels well informed about sales, service and company news of company X
General importance of a trustful customer–manufacturer relationship. Based on Falkenreck and Wagner (2021) and Falkenreck and Wagner (2017)	Single item: A trustful customer–manufacturer relationship is the basis of a successful business cooperation Seven-point Likert scale, ranging from 1 (strongly agree) to 7 (strongly disagree), single item
Perceived value of IoT business models **Enhancement of Falkenreck and Wagner (2017)**	The Internet of Things technology implies, among other things, that data exchange between customers and manufacturers is done quickly and easily. Companies in an integrated supply-chain network collaborate with their suppliers and customers, sharing information, service data and knowledge. Please let us have your opinion on the following statements: (seven-point Likert scale, see above) • Connecting machines to the supplier via the internet is a helpful service offering with regards to maintenance • In general, our company is interested to keep up with new tech • In general, the data exchange option of the IoT is a very helpful support for customers and manufacturers
Organizational innovativeness (graphic based on Guo *et al.*, 2019)	• Our company always seeks new ways to do things • Not investing in IoT technologies will keep our business from staying competitive • We excel at identifying new business fields • Our business is intensely competitive
Customer's digitalization capabilities (author's graphic)	• In general, our company is well prepared for the challenges of digitalization • Within the next five years, our company will surely engage in projects that refer to business cases of the Internet of Things
Satisfaction with buyer–manufacturer relationship **Based on Falkenreck and Wagner (2017)**	• In general, our company is very much satisfied with the business relationship to company X • If I compare the performance of company X to the performance of my other suppliers – the performance of company X is much better

Source: Author's own work

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