

Co-creation of value in the digital age: disruption management in B2B and B2G relationships

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Abstract

Internet of Things (IoT) research investigates the idea that a wide array of devices can be interconnected to enable these entities to be located, identified, and even operated without any human interference. This technology is universally seen as transforming the manufacturing and services sectors. Questions about whether—and, if yes, how—the IoT impacts on business networks in Business-to-Business (B2B) relationships have not yet been settled, due to a lack of empirical marketing-focused studies. Is “connectivity for anything” perceived as an additional, co-created value in manufacturer-buyer relationships? Based on research data from B2B and business-to-government (B2G) customers stemming from two manufacturers active in different business fields as well as several German plant operators and their suppliers, our study addresses the following questions: 1. Considering manufacturers and professional buying organizations, do the disruptive challenges of the digital age lead to relationship asymmetries in customer–supplier relationships? 2. With reference to disruption management -is there a difference in the acceptance of digital services between different B2B and B2G groups (e.g., manufacturing industry, process industry)? 3. In customer acceptance of IoT, does it make a difference in customer attitude towards IoT-related services if the product, plant or service is standardized or customized to requirements? 4. The goal is to communicate using the preferred channels of the customers. Considering that the volume of information has risen—how can commercial digital communication build trust? We finally propose a four-step approach to more successfully implement IoT-related projects.

Introduction

Internet of Things (IoT) technologies and related innovations have influenced and will continue to influence our business and private life in different ways. At Stanford University, researchers narrowed their study panel to eight domains where artificial intelligence is already having or is projected to have the greatest impact: transportation, healthcare, education, low-resource communities, public safety and security, employment and workplace, home/service robots, and entertainment. According to Falkenreck and Wagner (2017, 181), the term IoT is used for “a network of entities that are connected through any form of sensor, enabling these entities to be located, identified, and even operated without any human interference”. Real-time data exchange between buyers and manufacturers is available and conveniently automated (Prasad and Kumar 2013, Balaji and Roy 2016, Ehret and Wirtz 2016). Social networks, data transfer and data sharing have opened new business opportunities.

Questions about whether—and, if yes, how—the IoT impacts on business networks in Business-to-Business (B2B) and Business-to Government (B2G) relationships have not yet been settled, due to a lack of empirical marketing-focused studies. (Falkenreck and Wagner 2017). Is “connectivity for anything” (Atzori, Iera and Morabito 2010) perceived as an added value in manufacturer-buyer relationships? Jointly creating value in relationships is difficult to achieve and susceptible to damage. Opportunism is an issue, if it is mainly the manufacturer who takes positive advantage of large amounts of customer data (Big Data), new maintenance options and a transparent life cycle of the machines sold to the manufacturing-sites of their customers. Relationships between two parties are rarely equal—this is also true in the light of disruption management in the digital age (Falkenreck and Wagner 2017). As Johnsen and Lacoste (2016) claim, one of the ways customer-supplier relationships may change is due to the changing nature of industry and developments in information technology. Changing customer expectations may also lead to relationship asymmetries.

In this paper, we discuss the IoT incorporating two German manufacturers (business areas: mechanical engineering products, and thermal analysis instruments) and their international B-to-B and B2G customers. We are additionally evaluating and comparing the feedback from German water treatment plant operators. Our study concentrates on the communication-related facet of the IoT. With reference to the programmability of machines, instruments or industrial manufacturing sites that send and receive digital messages, we attempt to answer the following research questions:

1. Considering manufacturers and professional buying organizations, do the disruptive challenges of the digital age lead to relationship asymmetries in customer–supplier relationships?
2. With reference to disruption management, is there a difference in the acceptance of digital services between different B2B or Business-to-Government groups (e.g., manufacturing industry, process industry)?
3. With reference to the customer’s acceptance of IoT-related changes and the different sales approaches used: Does it make a difference in a customer’s attitude towards IoT-related services if the product, plant or service is standardized or customized to customer requirements?
4. The goal is to communicate using the preferred channels of the customers. Considering that the general amount of information has risen—how can commercial communication in the digital age build trust?

Internet of Things: Managing asymmetric relationships in the digital age

Working with connected devices, e.g., using smart glasses to interact with the manufacturer’s employees or using machine-to-machine interfaces, alters customer relationship management and may therefore influence relationship quality. Systems, instruments or machines that are connected through the IoT are said to create disruption at a Schumpeterian level that is only in its nascent stages (Ng and Wakenshaw 2017): a creative destruction, linked to technological changes and innovations perceived as being completely new. Most discussions in the literature refer to the following: a disruption (or a set of disruptions, innovations and changes), and how to deal with this disruption considering the strategic, economic and operational performance of the company (Ivanov, Sokolov and Dolgui 2014). A customer’s willingness to remain committed is based on the idea that the relationship will produce continued value or benefits to both parties (Lacey and Morgan 2009, Morgan and Hunt 1994). Value is seen as being dynamic and it “occurs when the offering is useful to the customer or beneficiary” (Lusch and Nambisan 2015, 159). Supply chain partners are active players and co-developers of personalized experience (Gummesson and Mele 2010). Relationship disruption may be caused by the fact that buyers and manufacturers do not share the same vision of the IoT’s advantages (Falkenreck and Wagner 2017). Machine-to-machine data exchange between a buyer and a supplier, or within a supply chain, starts with a strategic decision that ties the partners together and negatively influences the likelihood of collaboration with other partners due to conflicts arising from dissimilar technical standards or legal considerations. “Data as a service” is a new aspect in buyer-manufacturer relationships.

Research on industrial exchange interactions integrating the IoT

Trust is a buyer’s belief that a manufacturer is reliable, stands by its word, and does not take unexpected actions that would lead to a negative outcome for the buyer’s company (Anderson and Narus 1990). A customer’s trust in the IoT credibility of the manufacturer is a precondition to building trust and confidence in these new technologies, to avoid increasing the fear of total surveillance scenarios (Santucci und Lange 2008). Incorporating the findings of Venkatesh, Thong, and Xu (2012), we assume that trust in buyer-manufacturer relationships is the basic requirement for relationship commitment. Controlling and managing the physical world of goods, value chains and machines requires dynamic service platforms and the integration of customer data (Ng and Wakenshaw 2017). IoT technology needs to be adopted by a significant majority of its users. Arguing that the buyer’s anticipation of the high costs of switching gives rise to the buyer’s interest in maintaining a quality relationship (Dwyer, Schurr and Oh 1987), the basis for future collaboration may be supported by implicit and explicit assumptions, trust, and planning. Following the findings of Lang and Colgate (2003) we argue that in the context of information technology projects, relationship marketing is becoming increasingly important. Manufacturers as well as plant or service providers that fail to provide additional technology background for IoT projects will find it more difficult to forge a positive attitude towards IoT projects. Therefore, we claim that a detailed knowledge of the challenges and benefits of the IoT are important relationship

drivers that influence a buyer's willingness to cooperate with industrial IoT-related projects and we propose the following:

P1a: Buyer's familiarity with and knowledge about IoT technology have a positive impact on the willingness to cooperate with industrial IoT projects.

P1b: The perceived usefulness of data as a service has a positive impact on the buyer's willingness to cooperate with industrial IoT projects.

Disruptions caused by new technologies may raise a buyer's concern about whether the original relationship conditions are still valid and can be relied upon (Chen & Zhuang, 2011). In the context of the IoT, the goal of relationship marketing is to achieve the willingness of the buyer to cooperate in IoT service projects. Morgan and Hunt (1994) as well as Palmatier et al. (2013) highlight the importance of communication on buyer-manufacturer relationship quality.

P2. Standardization or customization of a product, service or production plant has an impact on a customer's attitude towards IoT-related services.

Following the classic definition of a communication channel from Reinsch and Lewis (1984), there is a technical (formal) side of the communication process that allows the transfer of information from sender to receiver. A communication channel incorporates all the means for creating and accepting a message. The challenge behind the communication channel selection is related to the fact that the manufacturer and the customer may both select to use it—or can decide not to use it. A specific channel may be a preferred option, trusted in certain situations or may be totally ignored in other circumstances (Batra and Lane Keller 2016). Channels can be used separately or may be combined with each other. The goal is to communicate using the preferred channels of the customers. Considering that the general amount of information has risen—how can commercial communication in the digital age build trust?

P3. Personal communication will increase acceptance of and generate commercial communication that fosters a trustful manufacturer-buyer relationship in the context of the IoT.

Research design

To answer the research questions in section 1 and to be able to evaluate the validity of the propositions listed in section 2 of this paper, in 2015, 2017 and 2018, the authors carried out three research studies. The companies and organizations selected for this study can be described as follows:

- Company 1 is a typical medium-sized German manufacturer that specializes in mechanical engineering. Its product portfolio includes internationally sold standardized and customized machines. We obtained qualitative data in 2015 from 1,342 experienced customers only: heads of purchasing and production departments as well as from CEOs from Austria and Germany.
- Company 2 manufactures technical instruments for thermal analysis and supplies to B2B companies as well as universities and research institutes in the Business-to-Government (B2G) sector. About 5,000 employees are working at company 2. In 2017, the authors carried out a quantitative and qualitative study and got feedback from 156 European B2B customers as well as 58 B2G customers.
- Industrial and governmental customers dealing with critical (plants are located in cities with more than 200,000 citizens) and non-critical infrastructure for water supply companies and wastewater treatment plants participated in study 3. The industrial customers came from Germany, Switzerland and Austria, all governmental customers are in Germany.

The first research study includes company 1: Avoiding common method bias (MacKenzie and Podsakoff 2012), we conducted six one-on-one interviews at the locations of the customer's companies, followed by focus group interviews carried out during the manufacturer's annual customer days at the manufacturer's company in Germany. 40 customers participated in the focus groups. The second study includes company 2: A questionnaire based on the feedback of the focus groups, consisting of qualitative and quantitative questions was sent out in 2017 to B2B and B2G customers, as well as to employees and managers of company 2. The third study incorporates feedback from industrial customers (n= 275) as well as governmental customers dealing with critical (n=57) and non-critical (n= 77) infrastructure serving water supply companies and wastewater treatment plants. In October 2017, the authors carried out eight in-depth interviews in Germany, Austria and Switzerland, followed by two focus groups with a total of 16 participants in March 2018: governmental customers, plant manufacturers, architects, and wastewater treatment plant designers. Finally, online research was carried out. In April 2018 the authors send out a standardized online survey to 2,217 participants and received completely filled-in questionnaires from 631 participants. The third study was carried out to test and analyze whether the

attitude towards digital service offerings differs between “normal industrial customers” and “customers working with critical infrastructure”—and whether the age groups make a difference.

Evaluation of data

The research results from all participant groups and study designs confirm that knowledge about IoT-related services and processes is still sparse. It emphasizes that generally, the companies and institutes do not feel they are well prepared for the challenges of digital transformation (mean values B2B customers: 4.06 B2G customers: 4.46). About 10% of the customers completely agree that their company/institute/plant is well prepared for the challenges of digital transformation—compared to 24% of the management of the technical instruments manufacturing company. This leaves room for improvement in both sectors. With reference to all three studies, our sample results refer to long term buyer-seller relationships and generally satisfied customers. In-depth knowledge in IoT-related services is limited. In general, customers want to exchange experience and maintain personal contact between buyers and service employees (evaluation of qualitative feedback).

The following figure 1 highlights that reservations with regards to the usefulness of digital services are stronger with the industrial customers (mean value: 3.57, standard deviation: 2.54) compared to B-to-G customers working at universities (mean value 2.81, standard deviation 2.08). With reference to 80 governmental customers, (plants refer to critical infrastructure, mean value 4.16, standard deviation 2.64) and 78 governmental customers (plants refer to non-critical infrastructure, mean value 4.47, standard deviation 2.66), a negative attitude against connected machines are even stronger. The following question was asked to the survey participants of study 2 and 3—leaving out the customers of the mechanical engineering company.

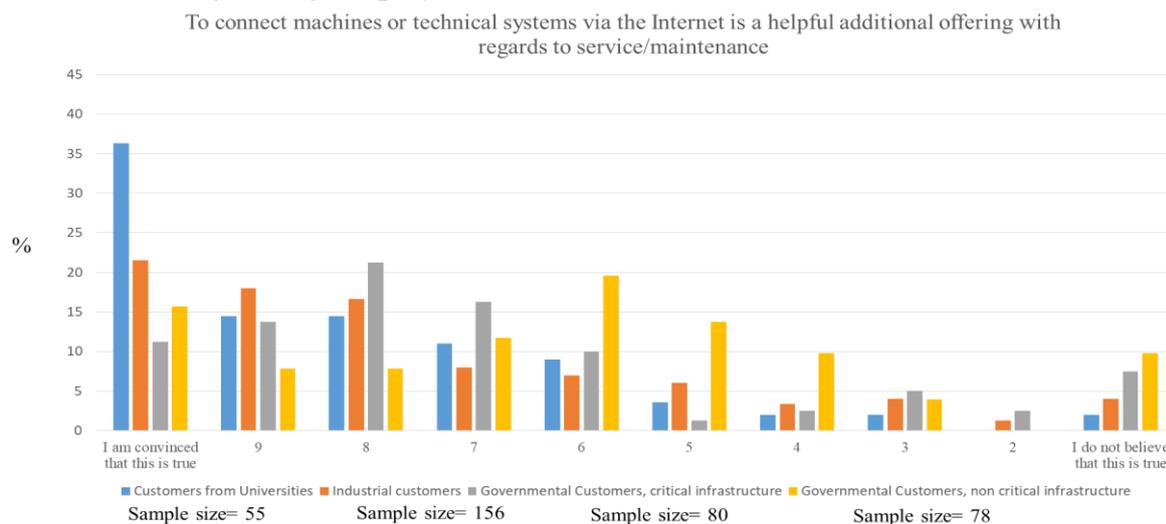


Figure 1: Openness of customers of different industries with reference to IoT service offerings

According to the findings of Cho (2006), distrust is not only the absence of trust, but the active expectation that the other party will behave in a way that violates one’s welfare and security. As a result, we defined “Trust in a seller’s credibility with regards to IoT safety” based on Cho’s research study.

Figure 2 incorporates the data from all three studies, customers of the mechanical engineering company, the B2B customers (mean 2.56, standard deviation 1.73) and B2G customers (mean value 2.23, standard dev. 1.79) of company 2 and B2G plant operators. As far as the feedback of the organizational customers is concerned, customers working with critical as well as non-critical infrastructure believe even less in their indirect supplier’s trustworthiness when working with their data. On a 10-point Likert scale, more than 30% of the customers dealing with non-critical infrastructure (as well as 18% of customers dealing with critical infrastructure) do not believe in an indirect supplier’s responsible and reliable way of working with customer data—compared to 4% of the customers from universities (non critical infrastructure mean 5.90, standard deviation 2,70).

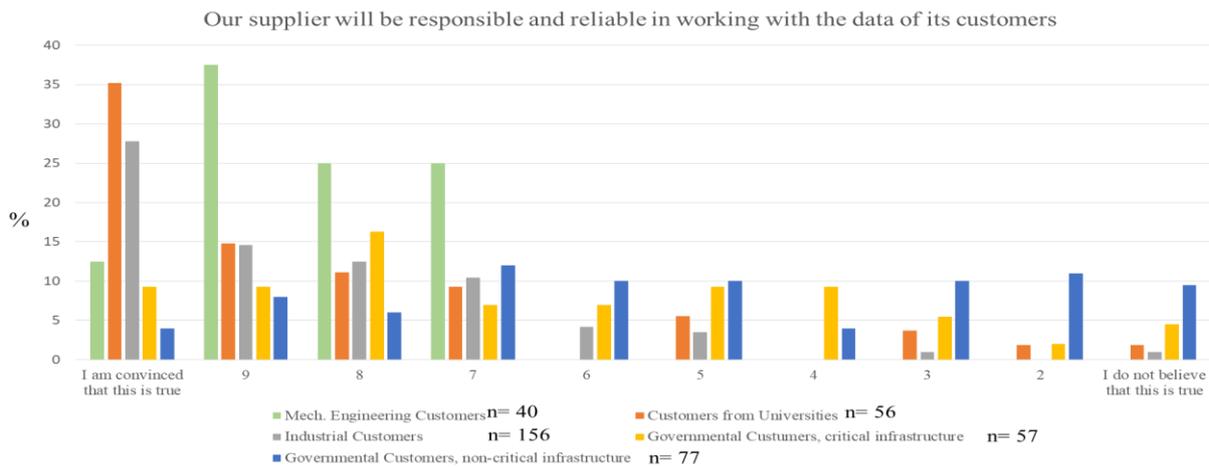


Figure 2: Customers' and employees' trust in the manufacturer's IoT-credibility

To learn about trust in a manufacturer's credibility with regards to the IoT and its positive impact on the buyer's technology acceptance, we evaluate the customers' attitude towards the manufacturer's behavior. Figure 3 indicates that trust in the manufacturer with regards to customer data security is highest in customers working for universities (mean value B2B customers: 3.73, standard deviation: 2.01, B2G: mean value 3.23, standard deviation 2.51). Data from governmental customers working with critical infrastructure (mean value 5.06, standard deviation 2.71) or non-critical infrastructure (mean value 6.12, standard deviation 2.70), again, indicates a much higher doubt—and distrust in a supplier's integrity.

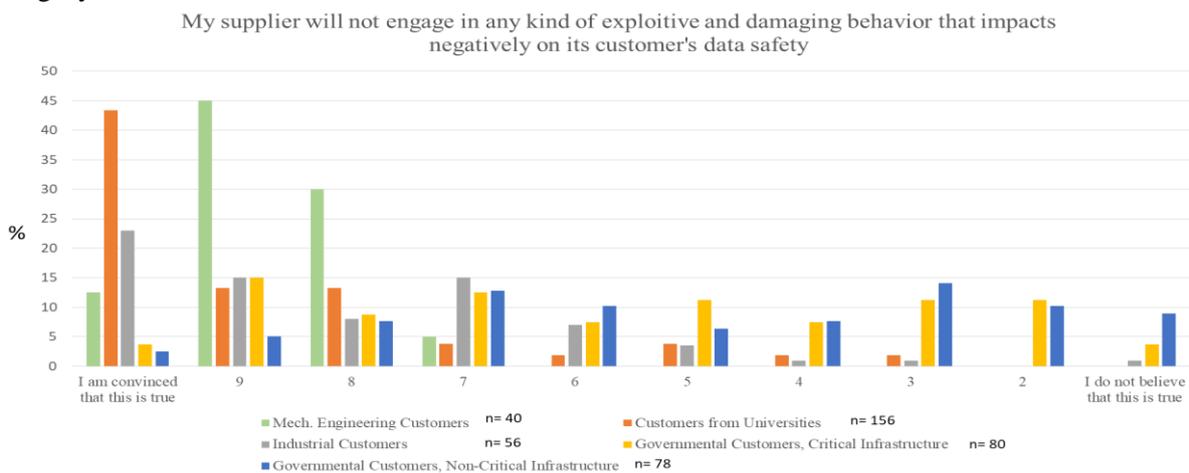


Figure 3: Evaluation of trust in a manufacturer's credibility with regards to the IoT

To help solve the challenges of the impact of disruptive new technologies on customer relationship management, we argue that an open and honest communication positively impacts on the development of trust in a manufacturer's credibility with regards to the IoT (P3). Summing up, we claim the following:

- With reference to the results of our studies, IoT project acceptance differs strongly between the different business areas. The longer the sales chain, the more negative the customers' judgement with reference to the credibility of their (indirect) supplier. Obviously, direct personal contact to the salesperson together with personal communication helps to build trust in IoT projects.
- A substantial lack of knowledge about the chances and challenges of the IoT exists among all customer groups, the highest rates were found among B2G plant operators. Not much is known about how IoT-services work and how helpful they could be.

Discussion of research findings and marketing-related implications

Our research result confirmed the theoretical works of Kannan and Hongshuang (2017) that discuss how IoT technologies alter buyer–seller interactions and touchpoints.

Table 1: Overview on the evaluation of propositions

Proposition	Findings	Supported/contradicted.
P1a: Buyer's familiarity with and knowledge in IoT technology has a positive impact on the willingness to cooperate with industrial IoT projects.	Compared to B2B customers, B2G University customers are more open towards IoT service projects. Possibly due to their scientific background, this group of customers is more familiar with the chances and challenges of the IoT. With reference to B2G customers working in wastewater plants, 45 customers out of a sample of 165 participants had no idea what is behind the word “digitalization”. In our study, this group is most negative towards IoT projects.	Supported, but needs to be verified further
P1b: The perceived usefulness of data as a service has a positive impact on the buyer's willingness to cooperate with industrial IoT projects.	Between 40% (industrial customers) and 50% (university customers) generally perceive the connection of machines and systems to the Internet to be useful. Reservations about IoT projects in the context of B2G plant operators are still high, driven by distrust in data security. In this early stage of IoT service products, disruptive uncertainties are stronger than the perceived usefulness of data as a service.	Partially supported, varies between the business areas
P2. Standardization or customization of a product, service or production plant has an impact on a customer's attitude towards IoT-related services.	To summarize the findings of our three studies carried out in different business areas, we see a strong difference in trustful buyer-manufacturer relationships. Personal interaction indicates trustful relationships and a more positive attitude towards IoT projects (study 1), whereas customers purchasing standardized products sold via wholesalers or over the Internet show a higher level of distrust. Highest values of distrust were found in study 3, stemming from plant operators that interact formally and indirectly through consulting engineers.	Supported
P3. Personal communication will increase acceptance of, and generate commercial communication that fosters a trustful manufacturer-buyer relationship in the context of the IoT.	Manufacturers' communication related to (future) IoT projects is still sparse. Quantitative research results indicate that for most B2G customers, personal contacts, references, conferences and fairs were the preferred communication channels. Findings of our study 1 indicate that customers having direct contact to their manufacturer's sales team are more open towards new IoT-related service projects. Hence, the perceived open and honest communication carried out through personal contacts influences the positive attitude towards the IoT.	Supported, but needs to be verified in other business areas

Following the findings of Ng and Wakenshaw (2017) the visibility of use and the customer experience are two of the implications of the IoT and their research posits that marketing activities may help manufacturers and customers to reflect on this topic by shaping the conversation. They ask for new resource models of exchange in the context of the IoT and claim that human needs have not changed and that “individuals may find themselves trading away their choices and freedoms, especially when the product consideration set becomes more limited [...]” (Ng and Wakenshaw 2017, 17). Figure 4 depicts a model that incorporates four project phases to internally and externally successfully implement IoT-related projects. The four-phase modular design supports marketing management to increase IoT project success, to enhance relationship quality, and to solve disruption-related project challenges. Coming back to our research questions, we like to conclude the following: Disruptive challenges of the digital age lead to relationship asymmetries in customer–supplier relationships. Still today, a substantial number of customers has no idea of what digitalization stands. Data safety as well as new IoT projects are topics that needs to be discussed openly at eye level (see figure 4, phase 4).

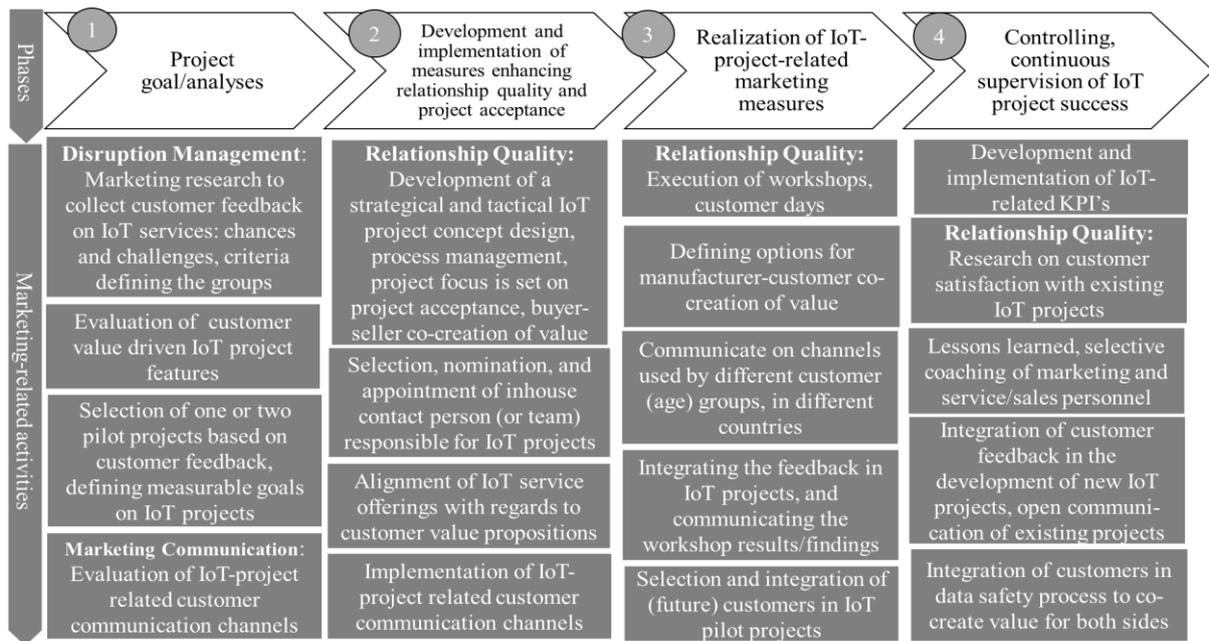


Figure 4: Modular concept of relationship alignment in disruptive IoT-related projects

With reference to disruption management, there is a difference in the acceptance of digital services between different B2B or B2G groups. Our findings indicate that, with reference to the customer's acceptance of IoT-related changes and the different sales approaches used, it makes a difference in a customer's attitude towards IoT-related services if the product, plant or service is standardized or customized to customer requirements. This is because customized products in B2B or B2G business fields are frequently sold directly. Buyers have a close, long during relationship to their manufacturers and tend to trust their suggestions. In this research group, the acceptance of IoT service products is the highest. The last question relates to the selection of communication channels: How can commercial communication in the digital age build trust? Here, direct, personal communication is the method of choice to build trust in B2B and B2G context. We conclude that trust in IoT safety is an important driver of relationship quality. To incorporate customers in platforms and networks and to provide them with the digital services they are interested in will lead to a higher level of acceptance and co-creation of value in joint IoT projects. These projects will help to increase trust in a manufacturer's credibility in IoT data security and solve the disruptive challenges. Relationships in the context of digital projects can be categorized as "ever-changing phenomena that need continuous adjustment" to meet the changing needs of customers—and manufacturers. This is in line with the findings of Lusch and Nambisan (2015): value is seen as being dynamic and needs to be useful to the customer or beneficiary.

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