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Proactive customer orientation and joint learning capabilities in collaborative machine to machine innovation technology development: the case study of automotive equipment manufacturer

JEL Classification: *M31; L80; O32*

Keywords: *proactive customer orientation; industrial information technology; joint learning capability; collaborative innovation development, expert power dimension*

Abstract

Research background: There is a considerable amount of literature focused on customers' motivation to participate in cooperative new product development [NPD], but previous research neglected the suppliers' perspective concerning organizational mechanisms for the facilitation of customer involvement in cooperative new product development.
Purpose of the article: The aim of the study is to explore the influence of two kinds of dynamic capabilities, proactive customer orientation [PCO] and joint learning capability [JLC] on the acceptance and use of machine to machine interaction [M2M] in collaborative innovation development [CID], from the supplier's perspective.

Methods: The research is based on a case study carried out from June 2018 till June 2019 of a Polish automation integrator supplying a manufacturer of automotive equipment, i.e. automotive industry, in a fully robotized workstation. In order to understand how the company functions in this case, in-depth interviews with the company's employees have been conducted.
Findings & Value added: The results revealed that intelligent devices, interacting machines, and real-time data transfer to the supplier may cause disruptions through their impact on establishing trustful business relationships. We believe our findings could have a profound impact on the way how proactive customer orientation and relational interactions supported knowledge sharing and joint learning sense-making through operational meetings and on-the-job workshops which role was to evaluate the collaborative project.

Introduction

Rapid changes in the contemporary business world influence the understanding of the theory and practice of the company and its relationships. Specifically, the dyad buyer-supplier, have attracted both theoreticians and practitioners (e.g. Kalwani & Nayarandas, 1995). One important example of a strategic advantage delivered by such relationships can be the establishment of collaborative innovation, occasionally identified by the term "supplier involvement in new product development" (Petersen *et al*., 2003). Several authors stress out that innovations are not the result of a single company but the outcome of activities by various entities (e.g. West & Bogers, 2014; Yam *et al*., 2011; Khrystoforova & Siemieniako, 2019). Furthermore, new sources of knowledge and technology are required in the active search process by firms and institutions to develop new or improved products.

This paper seeks to address the exploration of the influence of chosen dynamic capabilities (Mitręga, 2019) such us: proactive customer orientation [PCO] and joint learning capability [JLC] on the acceptance and use of industrial information technology, specifically machine to machine interaction [M2M] in collaborative innovation development [CID], from the supplier's perspective. The context of M2M interactions connected to the Fourth Industrial Revolution (Ślusarczyk *et al*., 2019), suggests to focus our case study research on collaborative innovations development. In this context, we initiated a case study research of the automation integrator supplying a manufacturer of automotive equipment in a fully robotized workstation.

This paper is divided into five sections. Section one gives a brief overview of the literature in the topics of new product development and relational capital, as well as joint learning capabilities. The second section presents the applied research methods. We opted for qualitative research and used case study research method. This particular research method was cho-

sen due to the fact that qualitative research methodology is helpful in the exploration of a phenomenon within a particular context. In the third section the case study research results are analysed. The discussion part follows with managerial implications, research limitations of our study and future research possibility is presented in section four. In the final section the conclusions are drawn in.

Literature review

Vast amount of literature focuses on customers' motivation to participate in cooperative new product development [NPD] (Khrystoforova & Siemieniako, 2019), but the number of works dealing with the suppliers' perspective concerning organizational mechanisms needed to facilitate customer involvement in cooperative new product development still remains limited (Smals & Smits, 2012; Ruey-Jer *et al*., 2017).

The positive impact of relational capital on cooperative NPD is well documented in the literature. The majority of current studies dealing with supplier–buyer relationships and collaborative NPD (for instance, Cuevas-Rodríguez *et al*., 2014; Trainor *et al*., 2013) claim that, generally, the company's ability to establish and develop successful business relationships has a positive influence on outcomes of collaborative NPD with that ability being defined through the term relational capital.

Relational capital is defined by Ruey-Jer *et al.* (2017) as the scope on which long-term oriented relationships between suppliers and their customers are based on, with factors such as trust and goal congruence. In the relationship building process, trust is identified as a key factor and as an antecedent of becoming committed to a company (Siemieniako & Gębarowski, 2016, 2017). Consequently, when trust increases, according to Falkenreck and Wagner (2017), buyers likewise feel a sense of obligation towards the company they trust related to morality. In similar vein such a connection is also confirmed by Siemieniako (2011). Trust includes the assurance in the goodwill and dependability of a partner (De Clercq & Sapienza, 2006), whereas goal congruence can be understood as a construct of social or clan control with the aim of establishing a common culture, values, and goals in alliances or partner firms (Das & Teng, 2001). Relational capital creates therefore a safe harbour for open interactions that in consequence facilitates joint sense-making, sharing the knowledge and knowledge integration into a memory associated with the relationship (Huikkola *et al*., 2013). Moreover, it has been suggested by Chang and Gotcher (2007) that relational capital plays a crucial role in the business success of relational innovation,

joint learning, and, in particularly, intellectual capital among other factors. It is crucial to note that both, firm-specific features, and soft and behavioral antecedents, lead to the creation of alliances or the increase of alliance success (Beugelsdijk *et al*., 2006).

According to Soosay *et al.* (2008) by enhancing not only the amount but also the quality of knowledge and information-sharing between sides of business relationship, relational capital can lessen the risks and complexity which in consequence can impede radical innovation. Most studies that tested an immediate interconnection between relational capital and innovation (e.g. Cuevas-Rodríguez *et al*., 2014; Pérez-Luño *et al*., 2011) identified a positive impact on developing radical innovation.

Fang and Zou (2010) refer to joint learning capabilities as "the ability of partners to develop relationship-specific organizational infrastructure and communication channels to integrate the partners' knowledge, create a new knowledge base for their relationships and institutionalize new knowledge in the context of the relationship." Subramaniam and Youndt (2005), for example, propose joint learning as a tool to help and ease firms to gain access and exposure to various knowledge fields and promote new solution approaches for problems within an organization. Consequently, the integration of relationship knowledge into existing knowledge bases can lead to the fact that suppliers are able to predict future market tendency and implement breakthrough ideas in commercial technology (Youndt, 2005).

Huikkola *et al.* (2013) draw on an extensive range of sources to define joint learning as a relational dynamic capability that appear at the level of Research and Development [R&D] collaboration. In the same vein, sharing the knowledge refers to the transfer of knowledge with the help of formal and informal interactions between customer and supplier (Chang & Gotcher, 2007). R&D collaborations happen in related industries between firms operating along the same value chain and focus on development, i.e. production networks and especially product related services (Martínez-Noyaa & Narulab, 2018; Ejsmont, 2014).

Blocker *et al.* (2010) performed preliminary work on strategic relevance of PCO. This study refers to proactive customer orientation as "a provider's capability to continuously probe customers' latent needs and uncover future needs". Consequently, it can be stated that it is being closely related to the proactive type of innovation strategy (Urban & Hauser, 1993). Therefore, it is important in generating innovation, as it supports companies' constant quest of anticipating latent and future needs and wants of customers. Providers of products and services adapting a proactive customer orientation have a strengthened capability to create and develop innovative products as they anticipate what customers may appreciate in the future

and subsequently implement a corporate culture where dynamic changes are anticipated and expected. This orientation not only leads to better customer understanding itself but also gives a supplier a competitive advantage (Sachpazidu-Wójcicka, 2017) in the customer's market context and technological aspects (Atuahene-Gima, 2005).

The research of Kim *et al*. (2018) argued that proactive customer orientation positively influences cooperative NPD outcomes with the link being simultaneously moderated by the supplier–customer dependences and the degree of supplier design responsibility. This require technical competency which in turn could influence capability development and learning, as well as innovation in inter-organizational relationships (Azadegan & Dooley, 2010). Design responsibility means the technical ability of taking customer perspective and market trends by having a PCO and as a result to create in essence new products. When it comes to joint learning, such a supplier is rather capable to identity the technical importance of new knowledge derived from joint learning and is able to transform the created know-how into the new products (Ruey-Jer *et al*., 2017).

Tippins and Sohi (2003) argue that information technology is linked with organizational learning. Furthermore, electronic integration can support firms better in the interpretation of market information, and hence, help develop new knowledge sets in the collaborative relationship (Malhotra *et al*., 2005). Finally, a focus on the internet of things [IoT] too opens new business and market opportunities (Miorandi *et al*., 2012). For instance, manufacturers who adapt a focus on IoT data transfer not only could improve machine efficiency but also could reduce maintenance costs. Furthermore, by providing an opportunity to share digital data, IoT technologies can boost buyer–seller interactions and touchpoints. In consequence, firms not only improve customer satisfaction and loyalty but, in the end, also their market position by acknowledging, that creating and maintaining of digital relationships with their customers is of highest importance (Kannan & Hongshuang, 2017).

The term IoT was first coined in 1999 (Ashton, 2009) and can be described as a concept of connecting any entity or network of devices to the Internet. This can occur through any form of sensor, and without any human interference. As IoT allows for virtually endless opportunities and connections to take place, these devices can create an extensive network that supports, for example, smart machine to machine interactions.

In manufacturing, including, for example, the automotive industry, industrial robots that are part of a M2M network perform various types of tasks from material handling to welding and painting (Michalos *et al*., 2010). Some critical questions which need to be addressed in this matter

are, among others, fault detection and alarm limits that will influence several business-critical processes including service levels and order taking. In business relationships within the steel industry, information concerning steel hardness has been sent via wireless networks for a long time now. This enabled the steel hardening company to immediately fill gaps in its production line (ibid). In their effort to remain competitive, manufacturers of automotive assembly systems, whose customers in most instances rely on just-in-time [JIT] or have to adopt quickly to new market wants and needs, as well seek out new technologies.

There are several reasons M2M solutions implemented in technological or new product innovation development increase business risk for customers. The first is the solution's novelty which, without a sufficient base of implementation, does not allow assessment of its advantages and disadvantages (Nagy *et al*., 2018). The second concerns the issue of limiting human decision making and increasing the autonomy of machines creating trust issues. In cases where problems arise with M2M interactions in a newly designed technology, human control of the technological process is limited. This may sometimes mean, because of remote management, that there is no direct human control over processes (Momeni & Martinsuo, 2018) in which M2M interaction is used.

Research method

This work follows a case study design, with in-depth analysis of dyadic R&D collaboration. By employing the form of a case study approach, this allows for the collection of in-depth information using interviews. Further, it provides evidence of the practices that companies follow in such relationships, taken under consideration the complexity of relationships and interactions in business networks (Beverland & Lindgreen, 2010). The PCO and JLC of the supplier being considered in the research were analyzed from the perspective of their influence on the success of collaborative innovation development. Categories for researching PCO were adopted from Blocker *et al.* (2010), and for JLC from Huikkola *et al.* (2013) and Kim *et al.* (2018).

The case study was conducted from June 2018 till June 2019 and examined a Polish manufacturer of equipment for the automotive industry. Due to the non-disclosure agreement signed between the organization and the authors, information concerning the organization, including product application and description of automated assembly lines, cannot be exposed in detail.

Several individual interviews were conducted with members involved in the project, to assess their perspectives on and experiences with the robotic integration of production processes — assumed to be collaborative innovation development. Interviewees were selected from multiple areas of the company's operations and included, for example, the Chief Executive Officer (CEO), design engineers, project leader and customer's operations manager. Interviews were supplemented with observation of selected activities at sites of both the supplier and the customer, such as daily activities related to projects as well as operational meetings. This allowed the authors to gain first-hand exposure to the process instead of relying solely on accounts of interviewees. Analysis of documents related to the project as well as documents regarding future planned projects with the same client were also carried out. The researchers participated in commercial meetings between the supplier and the customer concerning the development of a robotic assembly line utilizing M2M interaction solutions. It was also possible to analyze the customer's needs and motivations as to their perception of the use of M2M solutions in the production processes. The above criteria contributed to the signing of a contract for the delivery of a complicated, robotic assembly station.

Research results

The presentation of findings has been organized into two analytical categories: on the one hand, PCO and on the other, JLC as two types of relational capabilities. According to our data, the decision concerning the level of automation is neither a planned nor a structured activity. Furthermore, it is important that there are no support decision systems to adopt. On the contrary, our study revealed that it is an activity that occurs primarily ad hoc. Generally speaking, there are few methods for designing, introducing and evaluating automation projects. The customer struggled with decision-making in more than two areas with the most crucial ones being risks connected with innovative machinery and trust that it will continue working successfully in the future.

"It took me a long time to convince the board of directors that it is possible to automate the assembly processes. I revealed the possibility that we may have to wait for target effects they nevertheless finally agreed, especially when it was possible to get a supplier from the local market."
(Operations Manager of Production/Customer)

The supplier influenced the customer on making the decision about choosing the provider. Taking the time to understand their needs and concerns led to the identification of several innovative solutions and ideas. The important role was to limit the gaps of different knowledge bases of the supplier and buyer to ensure development of potential projects. Besides the core offer, the provider further created value for the customer through service support such as installation, training, or maintenance, all of which are important in high volume production with robotised processes. The establishment of a business relationship created opportunities to form social bonds thanks to which the communication and ease of doing business improved. Organization of operation meetings and on-the-job workshops helped teams of engineers and project managers from both parties to realize that the assembly line design was very complex.

"Whenever we start automatics integration projects, our customers split into two groups. The first one is made up of those who strongly support the idea of replacing human employees with robots and machines that will not only take over the simplest of tasks, but also assess them. The other group consists of those people who are afraid of changes and damages that the solution may cause. By sharing our experiences and answering their questions, we help them see the positive impact of the project."
(CEO/Supplier)

The design for the assembly line came from the customer who prepared the technological process. The main processes included the production of metal and plastic parts and their assembly. The latter was subjected to performance analysis and the concept of its improvement was created through the integration of the process with robots. The project assumed an increase in efficiency of product assembly where, in an 8-hour work shift, the quantity of assembled products would go from 300 pieces to 540 pieces during one shift as well as a limitation of labour assets with a reduction from 6 people per shift to only 1 person. The client used the following guidelines to select a supplier: 1. experience and references from previous robotization projects; 2. a local company operating on the local market, assuring short response times in the event of machine failure; 3. ability to design a machine in accordance with the assumptions prepared by the customer. The significance of the informal factor, the existing business relationship between the supplier and the client, was yet another important element. An analysis carried out after the interviews with customer's representatives indicated that they had a good opinion about the supplier. Previous business meetings and references from other local customers increased trust in the supplier's capabilities and expertise in automatics integration. Additionally,

it was revealed during the interviews that several customer's representatives have had previous relations with the supplier's project manager.

"I used to work with three of the customer's managers. We knew each other well; I could easily offer them what they wanted and had no doubt they would accept it."
(Project Manager/Supplier)

The high number of involved variables, such as line efficiency, cost, reliability, and space were the customer's greatest uncertainties. Having interviewed the CEOs of both, the supplier and the customer, it became apparent that they both agreed that, in general, quality was positively correlated with trust.

"Concerning the machine's features and its reliability, we were capable of stimulating confidence. When it comes to these types of projects, past projects with higher success, have led to the fact that they (the customer) intend to place a repeat order which means more work for us and that's a good thing."
(CEO/Supplier)

Interviewees who were involved in the relationship recognized the significance of interpersonal company management meetings in order to determine a common understanding of technological developments and verify the future of the industry.

"*Creating new technologically advanced products or integrated solutions is an opportunity for our company to develop and offer innovative products."*
(CEO/Supplier)

"We tried to reach a point where our shared processes allowed us to finalize the project. But only top management decision-makers could make that happen. The person responsible for the area of automation, their Production Manager, didn't have enough courage to make the decision to get things done."
(Project Manager/Supplier)

The line automation was to yield crucial improvements: a considerable increase of workstation saturation, a better coherence with JIT principles, a slimming of the work force, and an enhancement of quality control processes. New knowledge, which made the innovation possible, came from both parties at different phases of the project.

"We had weekly project meetings, face to face, during which we handled technical issues. We also used e-mails or made phone calls."
(Project Manager/Supplier).

Interviewees indicated the importance of interacting with people and the proactive sharing of knowledge about the robotized process and new ideas on two levels: the close physical and psychological proximity, in order to become familiar with people, and trust, i.e. the other party will not behave opportunistically.

"*Well, both sides had been working on this idea individually, however, once we sat around the same table then it started to move forward."*
(Chief Design Engineer /Supplier about the Operations Manager of Production/Customer).

Furthermore, the proximity of sites, as discussed above, facilitated common meetings in which the parties could work conjointly on solutions. These common meetings were significant as R&D knowledge can be complex and hence, requires explanations and discussions to find a common understanding. Consequently, it can be concluded that, as it has been described by the interviewees, proximity facilitates the decision-making and understanding.

Mutual understanding required a significant investment of time and effort from the employees of each party. Additionally, an analysis of an opinion expressed by one of the interviewees showed that investment into knowledge in terms of dedicated employee resources also increases relational trust and commitment and helps to create innovative solutions.

"*To effectively integrate mechanics with automation and create a simple interface for each user, knowledge and advanced qualifications of the design and executive team are required."*
(Chief Design Engineer/Supplier).

Discussion

In our research, we have explored the role and interconnections of proactive customer orientation and joint learning capabilities in collaborative industrial information technology innovation development, which is a risky project, in which the assumption was that operational decision making is taken through M2M interactions. Our research emphasized the specificity of the context of the R&D collaborative project involving M2M solutions in technological innovation development.

As the interviewees highlighted their positive personal relationship positively influenced knowledge sharing and progress in collaborative project development, which is line with Mainela and Ulkuniemi (2013). It was

also indicated that proximity of customers and suppliers' sites, facilitates decision-making process and common understanding of complex matters. It suggests the possibility of organizational culture similarities, which may positively impact on relationship development. This is consistent with previous results (Beugelsdijk *et al.*, 2006).

The research results suggest that joint learning capability in buyer-supplier relationships is positively connected to more balanced expert power, one of the power bases (French *et al*., 1959), of both sides of analysed business relationships. It is in line with the part of the B2B relationship literature on power and power asymmetry in buyer-supplier relationships, which emphasized the necessity of balancing expert power to increase the effects of joint learning between partners (e.g. Cowan *et al*., 2015; Siemieniako & Mitręga, 2018).

Furthermore, mutual understanding required a significant investment of time and effort from the staff of both parties. Investment into knowledge development, through dedication of the employees of both companies, influenced also on increase of trust and commitment, which were important factors of analysed project development. It refers to evolutionary development of business relationship, in which trust is developing in time (Lacoste & Johnsen, 2015; Siemieniako & Mitręga, 2018; Kubacki *et al*., 2020).

Focusing on joint learning capability as the mediating construct, with industrial information technologies and proactive customer orientation to impact on innovation generation, this study broadens the understanding of how suppliers' innovation can be generated in customer-supplier relationships, which in the literature is relatively limited developed (see Ruey-Jer, 2016).

Our research results suggest that in using proactive customer orientation by the supplier and in leveraging joint learning, the important role leadership plays in supplier's top management and in innovation development in inter-organizational teams. For instance, Cooper (2019) draws attention to the drivers of success in New Product Development, and leadership was indicated as a one of them, which means that the top management is supporting, managing, or leading the innovation process at every opportunity. Our research delivers a more nuanced picture of the leadership influence.

The results also reveal the difficulty of industrial customer engagement into the complex collaborative innovation technology development project. For instance, Wang *et al.* (2020) in similar vein, in agreement with our results, emphasize the importance of trust and the need for implementing the clear and specific guidelines on what the customer's responsibilities are and what kind of role they should play.

On the basis of our results, we have arrived at the conclusion that mutual trust increases with familiarity, which is in line with research of Huikkola *et al.* (2013). An important feature of the context of our study is increased business risk for customers in comparison to R&D collaborative projects based on more traditional technologies. As trust between partners increases in R&D collaborative processes, it enables knowledge sharing and reduces the transaction costs of R&D collaboration, which is similarly to Kim *et al.* (2018) research. Our research further suggest that joint learning capability and proactive customer orientation are a critical competence in success of collaborative risky innovation projects development.

Conclusions

Our results highlighted how proactive customer orientation and relational interactions supported knowledge sharing and joint learning sense-making through operational meetings and on-the-job workshops which role was to evaluate the collaborative project. The establishment of a business relationship created opportunities to form social bonds thanks to which the communication and ease of doing collaborative risky project on technology innovation development improved. It occurred the need for decreasing power asymmetry in analysed dyadic relationship with regards to expert power source, as an antecedent for facilitate joint learning on issues related to complex innovative project development.

Our findings are important for managers, particularly those operating in similar business and technical context of risky and complex collaborative innovation development projects. In today's business world more often than before, not only business customer, but also suppliers expect to be involved in innovation projects development, including technological innovation, within business relationship. For many companies this is a critical point in achieving competitiveness and more widely business success. When the question occurs if the company should collaborate with supply chain partners on innovation development, managers very often close this option and prefer to use traditional closed (in-house) innovation development approach. Our research, showed that managers should use knowledge-sharing and consequently trust building, as crucial aspects for success of risky and complex innovative projects development, e.g. with regards to error finding. We suggest that it is especially important when it comes to projects with the M2M solutions, where the human interaction is limited and, therefore, the supervision is the most crucial element. Furthermore, especially collaborative innovations development helps to secure or stabi-

lize the company's relations as interaction and communication must be a part of it. Our research suggest that, managers should invest in the creation of relational capital with supply chain partners, but should also analyse the effectiveness of such an investment. Our findings do support that the effort put into the creation and development of relational capital leads to higher efficiency or increased output, as well as, improve forecasting and solve existing problems. Furthermore, these inter-organizational relationships can be treated as a poison pill for discouraging hostile takeover attempts as breaking up these relationships by buying one of the companies, could lead to the loss of tacit knowledge and destroy the established relations.

Nevertheless, this research results have some limitations. The first one is related to the specific contextuality of sole dyadic relationship, which is analysed as a case study research. It could be the case that within a similar setting, the research conducted in a different context, could have led to a different result. For instance, the proactive customer orientation could have been either underestimated or overestimated. The issue of external validity or generalisability can be critiqued. Despite this, our work expands the knowledge from the suppliers' point of view and path the way how managers should facilitate the customer involvement in collaborative innovative technology development.

However, despite the given limitations, our research may still be inspiring for future research. The further research could refer to different industries of geographical contexts. The issue of power asymmetry in dyadic relationship and its role in PCO and JLC could also more deeply investigated. In the same vein, the organisational culture dimension could be considered as a mediator of the two relational capabilities analysed here. We believe that our research could be also a springboard for designing and conducting quantitative research on the impact of PCO and JLC on outcomes of the collaborative innovation development.

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