SOLVING CUSTOMER-DRIVEN HETEROGENEITY IN ORGANIZATIONS: DEALING WITH INTERNAL TENSIONS TO REACH SOLUTIONS FOR CUSTOMER INQUIRIES

MASTER THESIS

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Introduction

Creating customer value persists to be a core element in business (Miles, 1962; Porter, 1985; Anderson & Narus, 1999) and is one of the main goals of marketing as it provides a sustainable competitive advantage in means of differentiation that can be achieved by offering better value for target customers (Narver & Slater, 1990; Ravald & Grönroos, 1996; Grönroos, 2000). Logically, the marketing concept proposes that *"an organization's purpose is to discover needs and wants in its target markets and to satisfy those needs more effectively and efficiently than competitors* (Slater & Narver, 1998, p. 1001). The meaning and implementation of the marketing concept is *"customer oriented"*, *"market driven"*, and *"market oriented"* (Webb, Webster, Krepapa, 2000, p. 102). Over time, when adopting the marketing concept in business, the role of marketing changed from seeing marketing less as a function, but more as a set of values and processes where all functions in an organization engage in implementing (Moorman & Rust, 1999). Thus, in this view marketing becomes everybody's job and is not solely the responsibility of the marketing department (Greyser, 1997; Kohli & Jaworski, 1990). Undoubtedly, it emphasizes that creating superior value requires the coordinated efforts of different departments, which is better known as interfunctional coordination in market orientation literature (Narver & Slater, 1990; Day, 1994; Deshpandé, Farley, & Webster 1993). To satisfy customer needs more effectively, classic marketing strategies for designing a targeted customer-centric strategy are concerned with the segmentation of heterogeneous markets into a number of smaller homogeneous markets based on the varying wants of consumers, subsequent targeting of which segments to serve based on the market segments' attractiveness, and taking a distinct and unique position for the product or service relative to competition and translating this into an appropriate marketing mix (Dibb & Simkin, 1991, 1994; Kotler & Armstrong, 2009; Smith, 1995; Wind & Bell, 2008). Thus, marketing strategies are concerned with homogenizing target markets and trying to manage the ambiguity in customers' needs.

However, creating value is inherently a heterogeneous process since no two customers are the same (Zeithaml & Bitner, 2000). Bolton (1998) argues that some customers have a higher utility for a service offering than others, so a considerable amount of heterogeneity is present. It is therefore important to incorporate heterogeneity among preferences and attitudes in the underlying dimension of value (Desarbo, Jedidi, Sinha, 2001; Olsen, Prebensen, & Larsen, 2009). Therefore, the notion of customer heterogeneity has become an innate part of the new Service-Dominant Logic (SD logic) in marketing as promoted by Vargo and Lusch (2004). This perspective on value creation (Edvardsson, Gustafsson, & Roos, 2005) by Vargo and Lusch (2004) challenged the traditional view of marketing for its focus on the exchange of goods and services (Good-Dominant Logic) as primary unit of value rather than how value is actually derived from using goods and services (see also Gummesson, 1995). It follows that value can only be phenomenologically determined by customers, is context and meaning specific (Grönroos, 2008, Schembri, 2006; Vargo & Lusch, 2008). Or as Vargo and Lusch (2008) argue: *"value is idiosyncratic, experiential, contextual, and meaning laden"* (p. 7). Consequently, value cannot be created unilaterally, but is co-created with customers and is not embedded in offerings but rather determined in use by the customer also known as value-in-use (Vargo & Lusch, 2004; Grönroos, 2008; Woodruff, 1997). As customers are co-creators of value, they also determine the value of offerings as value-in-use (Vargo & Lusch, 2004). Logically, the active customer role in value creation follows from the concept of value-in-use (Grönroos, 2008). From this perspective, suppliers can initiate value propositions that meet customers' needs, but only the customer can determine what is of value, so the experience of it is customer specific (Ballantyne, Varey, Frow, & Payne, 2008; Grönroos, 2004; Storbacka & Lehtinen, 2001; Vargo & Lush, 2008).

Evidently, the concept of value-in-use is very context and customer specific, which leads to heterogeneity in value determination by the customers irrespective of the extent to which these customers are segmented. Not taking heterogeneity into account results in the implicit assumption that even properly segmented customers must always respond in homogenous and predictable ways (Vargo & Lusch, 2014). As customers respond in heterogeneous ways, it demands organizing efforts on behalf of suppliers. Thus, this means that customer-driven heterogeneity inflicts the way in how employees manage to support the creation of value for the customer, i.e., affects how interfunctionally coordinated decisions are made and executed (Shapiro, 1988). Contemporary research largely explored the opportunities arising from SD logic to co-create value based on notion of value-in-use (e.g., Ballantyne & Varey, 2006; Echeverri & Skålén 2011; Payne, Storbacka, & Frow, 2008; Macdonald, Wilson, Martinez, & Toosi, 2011; Sandström, Edvardsson, Kristensson, & Magnusson, 2008;) and the process of aligning sub-processes between customers and suppliers that need support in the total value creation process in order to facilitate co-creation opportunities (Grönroos, 2008; Grönroos, 2011; Grönroos & Helle, 2010; Payne et al., 2008). All customer-supplier interactions help to support the use of a core offering as value for the customer does not only emerge from the core offering only, but ways of handling inquiries also have impact on what value the customer manages to create out of the core product (Grönroos, 2011). SD-logic offers a way to view interfunctional coordination as a much more dynamic concept and allows for the study of suppliers' value creating processes, i.e., business processes, which influences the customers' value creating processes. Yet, despite the sensitivity towards heterogeneity and the co-creation process, the alignment issues at the interfunctional coordination level have so far remained unexplored.

Therefore, the aim of this study is to elicit how customer-driven heterogeneity affects the practices of the coordinated efforts of departments that provide support for the co-creation of value. Subsequently, the guiding research

question of this research is:

How does customer-driven heterogeneity manifests in the process of handling inquiries? Does this lead to tensions? And how are the tensions resolved in the organization and lead to solving customer problems?

Using an Actor-Network Theory (ANT) (Latour, 2005) infused practice theory lens (Gehman, Treviño, & Garud, 2013), emphasis is on the doings and sayings of actors (Schatzki, 2001) and how the imposed heterogeneity that emerges in action manifests in reaching consensus on how to solve customer inquires. In particular, customer-driven heterogeneity emerging from customer problems and whishes are investigated. As such, this study will illustrate how imposed heterogeneity is managed and with what result for the customer. The study sought to generate new theoretical insights based on inductive reasoning (Sandberg & Tsoukas, 2011) by providing a theoretical framework on the type of processes that occur in solving customer problems. Informed by the ANT-infused practice lens, an Ethnographic Case Study (ECS) (Visconti, 2010) is carried out by making use of complemented forms of observational and interview data. The study is explored in a single-case industrial steel machinery organization serving the beam and plate processing industries. Though it has been stated that in industrial markets service is seen as an added-on value (Robinson, Clarke-Hill, & Clarkson, 2002), manufacturers are increasingly adopting service based strategies to remain competitive despite of declining profitability in core product markets, slower growth, and commoditization (Salonen, 2011).

Grönroos (2011) calls for further research of adopting service marketing concepts in business relationships and the marketing implications for the firm resulting of this logic (Grönroos & Ravald, 2011). Also, Ostrom et al. (2010) discuss the priority for more research on business-to-business services. Especially, the understanding of organization and employee issues relevant to successful service provision (Ostrom, Parasuraman, Bowen, Patrício, & Voss, 2015). In addition, Kohtamäki and Rajala (2016) propose more use of ANT, practice theory and narrative methods in B2B context for value co-creation research. These priorities motivate the current research by responding to these calls. Hereby contributions are made to co-creation literature (e.g., Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2004, 2008; Payne et al., 2008; Grönroos, 2008, 2011) by deepening the knowledge on the complexity in the practices and processes that support co-creation and its implementation inside organizations. From a practical standpoint, organizations will have the apprehension how customer problems are resolved and which path this follows through the organization.

The outline of the study is as follows. First, an evaluation of previous research on interfunctional coordination and value co-creation is provided that eventually indicates the research gap. In addition, the ANT-infused practice lens is introduced which builds on an existing framework by Gehman et al. (2013). Following, the methodology is described which delineates the chosen research strategy and techniques used for data collection and analysis. Further, results are presented in narrative accounts which elicit the dynamics in solving customer problems and eventually leads to a construction of an extended framework. This contributes to the insights about understanding the practices involved in the emergence of coming up with a solution. Lastly, the research question is answered and implications, limitations and directions for future research are stated in the discussion.

2. Literature review

2.1 Customer orientation and the coordinated functional efforts to create superior customer value

This study will only focus on interfunctional coordination as a means to infer how working together across departments unfolds when handling customer inquiries. However, to get a clear understanding of the engagement in activities across departments to create customer value, the related concepts of interfunctional coordination have to be discussed as well. Interfunctional coordination originates from the market orientation concept. The market orientation concept has received a lot of attention by scholars (e.g. Day, 1994; Deshpandé et al., 1993; Kohli & Jaworksi, 1990, Narver & Slater, 1990, Ruekert, 1992; Shapiro, 1988). The market orientation concept in its turn comes from the marketing concept, in which market orientation refers to the extent of implementing the marketing concept in an organization (Agarwal, Erramilli, Dev, 2003; Jaworski & Kohli, 1993; Webb et al., 2000). The marketing concept, a philosophy in business, states that *"the firm should base all its activities on the needs and wants of customers in selected target markets"* (Grönroos, 1989, p. 52), and while doing so, in a more effective way than competitors (Kotler, 1997). So, the marketing concepts is innately committed to a customer-orientated focus (Desphandé et al., 1993). Marketing is not viewed as a sole function in an organization, but as a principle that spreads throughout the whole organization (McKenna, 1991). Therefore, it is no surprise that in order to become more market oriented, and thus, to create customer value, engagement of every employee and functions are essential. Accordingly, coordinated responses are needed of the interfunctionally established dependencies.

In general, there is consensus that a market orientation encompasses behavioral facets for businesses in which all employees are committed to the continuous creation of superior value for customers (Day, 1994; Kohli & Jaworski, 1990; Narver & Slater, 1990). Differences in conceptualizations of market orientation are related to emphasizing different organizational elements of the notion, basically adopting a behavioral/activities/process perspective versus a cultural one (Jaworski & Kohli, 1996). Desphandé and Farley (1998, p. 213) define market orientation as "*the set of cross functional processes and activities directed at creating and satisfying customers through continuous needs-assessment*." Likewise, Day (1994) focuses on organizational competences as he

describes that organizations can become more "market-driven" by identifying and building special capabilities such as market-sensing and customer-linking capabilities (Day, 1994). Day (1994, p. 38) refers to capabilities as *"complex bundles of skills and collective learning, exercised through organizational processes, that ensure superior coordination of functional activities."* Emphasizing decision-making processes, Shapiro (1988) argues that three characteristics make an organization market driven: (i) information on all important buying influences permeates every corporate function; (ii) strategic and tactical decisions are made interfunctionally and interdivisionally; (iii) divisions and functions make well-coordinated decisions and execute them with a sense of commitment. In another way, Kohli and Jaworski (1990, p. 6) refer to market orientation as "*the organizationwide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organizationwide responsiveness to it.*" Market intelligence comprises all the exogenous market factors that may influence the current and future needs of customers (Kohli & Jaworski, 1990). Closely related to this conceptualization is Narver and Slater's operationalization of market orientation while underwriting a cultural perspective (1990,1994): *"market orientation consists of three behavioral components – customer orientation, competitor orientation, and interfunctional coordination – and two decision criteria - long-term focus and profitability"* (Narver & Slater 1990). All definitions summed up, organizations need the thorough understanding of their target customers and the market they are operating in to subsequently make committed interfunctionally coordinated decisions on basis of this information to ensure value provision for its customers (Kohli & Jaworski, 1990; Narver & Slater, 1990; Shapiro, 1988). So, in practice, a market concept entails three pillars: customer focus, competitor focus, and coordination (Day & Wind, 1980; Kohli & Jaworski, 1990; Narver & Slater, 1990).

Despite the differences, all authors explicitly or implicitly acknowledge that the organization must act to provide value for customers (Jaworski & Kohli, 1996). That is, in all definitions for market orientation the core value is related to the coordinated efforts of all departments to take action and work together to actually create value for customers (Narver, Slater, & Tietje, 1998). For instance, Slater and Narver (1994) explicitly mention that the value for the customer is a result of successfully utilizing core capabilities which can be developed in all functional areas in an organization.

Importance for coordination has been long withstanding in organization theory (e.g., Malone & Crowston, 1994; Thompson, 1967). But, why is interfunctional coordination so crucial in market orientation literature? Poor coordination will lead to a misapplication of resources and a loss of exploiting market opportunities (Shapiro, 1988). Hence, interfunctional coordination is important in the value creation process (Golicic & Vitasek, 2007). Understandably, regular communication and cooperation between functions reduce redundancies in tasks and improve process efficiencies (Golicic & Vitasek, 2007). This greater efficiency converts to improved value creation and competitiveness (Golicic & Vitasek, 2007). According to Kahn and Mentzer (1998) integration of departments calls for interaction and collaboration. Outcomes show that collaboration and interaction drive organizational performance (Kahn & Mentzer, 1998). In addition, interfunctional coordination leads to increased organizational excellence (i.e., efficiency and effectiveness) (Tuominen, Rajala, & Möller, 2000). Building on Kahn and Mentzer (1998) and Kahn, Reizenstein, and Rentz (2004), Golicic and Vitasek (2006), propose that the essential elements of interfunctional coordination comprise of collaboration, open communication, and an organizational climate that supports the prior two components. However, Golicic and Vitasek (2007) state that interfunctional coordination is difficult to implement. Agarwal et al. (2003, p. 78) describe that *"an alignment of the functional areas' incentives and the creation of interfunctional dependency is needed, so that each area perceives its own advantage in cooperating closely with the others, to achieve effective interfunctional coordination."* Kohli and Jaworski (1990) implicitly acknowledge the difficulties in interfunctional coordination as they view interdepartmental dynamics as an antecedent for market orientation. Kohli and Jaworski (1990, p. 9) define interdepartmental dynamics to denote the "*the formal and informal interactions and relationships among an organization's departments*" and operationalize this with interdepartmental connectedness and interdepartmental conflicts.

While some attention in literature has been devoted to difficulties in interfunctional coordination, market orientation itself is postulated on a fixed view of value creation (cf. Vargo & Lusch, 2004). Fundamentals to execute a market oriented behavior is to have clarity on the organization's value proposition and naturally the market targeting and positioning herein (Slater & Narver, 1998). Although, the commitment of market orientation is to understand not only the expressed, but also the latent needs of customers and explore unserved markets to achieve innovation and hereby to continuously learn about and from customers (Slater & Narver, 1995, 1998; Webster, 1988), the locus on value creation is still viewed to be achieved through the exchange of product and service offerings in the aggregation of costumers as a target for the organization's offerings that satisfies their needs (cf. Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2004). Hence, the role of the customer is not seen as something which is marketed with, but rather marketed to (cf. Vargo & Lusch, 2004). Consequently, market segmentation, targeting, and positioning remain critical choices in this view (Webster, 1994) constituting a GD-logic lens to perceive and approach how value is created (Vargo & Lusch, 2004). Hence, market orientation literature cannot deal with much dynamic in exchange processes and tends towards simplifying and homogenizing situations. However, from a SD-logic lens, customers are no longer acted on, they are not "targets", but the customer becomes a co-creator of value and hereby are active participants in the value creation process (Vargo & Lusch,

2004). In this way, it does not underwrite the implications of dynamic exchange relationships that are present in value creation (Grönroos, 2011; Vargo & Lusch, 2004). As a market orientation enables organizations to learn (Dickson, 1996) and as such, is inherently a learning organization (Slater & Narver, 1995), it might be argued that interaction between customer and organization is valued, something which is foundational in SD-logic to jointly create value. Nonetheless, as value is perceived to be embedded in the good and service offerings, it does not define the impact that the customer has on the organization's processes as the customer is the one that perceives and determines what is of value (Vargo & Lusch, 2004). Value creation turns out to be much more dynamic and heterogeneous in the service centered view of marketing (Vargo & Lusch, 2004). The focus on the dynamics of exchange processes (i.e., exchange of intangibles, specialized skills and knowledge, and processes) (Vargo & Lusch, 2004) draws attention to not only the joint exchange process, but as well as the supplier's own business processes and practices which influence the core business process of the customer and naturally the value that the customer manages to create out of the core offering (Grönroos, 2011). While customer value is not explicitly defined in market orientation literature, choosing SD-logic as a point of departure means to view interfunctional coordination in terms of *supporting* the co-creation of value as the customer is the one that determines the value of offerings in use (Vargo & Lusch, 2004). In summary, as interfunctional coordination remains a critical concept and prerequisite to provide the desired benefits for customer, the dynamics of customer-driven heterogeneity has major implications herein and needs to be highlighted thoroughly.

2.2 Value creation and value co-creation through an SD logic lens: emphasis on dynamics and heterogeneity

So far we have argued that interfunctional coordination is a traditional but important concept in everyday business and marketing thought, however it is not adjusted to the idiosyncratic environment of value creation. Viewing marketing as process and not simply as a separate business function, continues in SD-logic, as Vargo and Lusch (2004) state that the service-centered view implies a market-oriented and learning organization (Slater & Narver, 1995). Inherently, importance is attributed to interfunctional coordination. However, as the nature of marketing shifts from the primacy of tangible resources to intangible resources in SD logic, it has much further *"implications for how exchange processes, markets, and customers are perceived and approached"* (Vargo & Lusch, 2004, p. 3) and by doing so, has implications on interfunctional coordination. This critical distinction is made in operand and operant resources representing static versus dynamic resources. Operand resources require to be operated or acted on to produce an effect (e.g., machine) whereas operant resources are the producers of effects and act on other operant resources (e.g., knowledge and skills) (Constatin & Lusch, 1994; Vargo & Lusch, 2004). Subsequently, knowledge is perceived to be the fundamental source for economic growth and competitive advantage. In GD logic, customers are seen as operand resources, and need to be acted on; customers are segmented, targeted and promoted to (Vargo & Lusch, 2004, 2014). SD logic counteracts the traditional perspective on the creation of value which emphasizes the independent role of firms and thus, views customers as not being part of the value creation process (Porter, 1985) However, this view is criticized as it is argued that firms cannot create value on their own, customers want to interact more, and thereby have an active role in the creation of value (Prahalad & Ramaswamy, 2004; Normann and Ramírez, 1994). The role of value shifts towards experience and evaluation, representing a cognitive assessment (Prahalad & Ramaswamy, 2004; Sandström, Edvardsson, Kristensson, & Magnusson, 2008; Vargo & Lusch, 2004, Woodruff, 1997). The notion of value-in-use depicts that value is not there until customers can make use of it (Grönroos, 2004). Before use, it represents potential value (Grönroos, 2008, 2011; Vargo & Lusch, 2004). Customers use their own skills and add other resources to the provided resources where the value potential of these resources all can develop into value-in-use (Grönroos, 2008). Value-in-use is the aspect of the value determination during sale, but it is also one aspect of determination of value by the customer post-sale (Ballantyne & Varey, 2006). The current value-in-use notion is underpinned by two facets: value emerges in use (i.e. not embedded in the product or services) and can only be perceived and determined by the customer (Vargo & Lusch, 2004). Consequently, organizations can only offer value propositions, since customers determine and are the fundamental creators of value (Grönroos & Gummerus, 2014, Vargo & Lusch, 2004) Accordingly, firms cannot deliver or create value independently (Vargo & Lusch, 2008). Thus, organizations' focal point in value creation should be to understand, support, facilitate, and complement its customers value-creating processes by identifying and offering specific competencies and activities (Ballantyne, Williams, & Aitken, 2011, Grönroos, 2000; Grönroos & Gummerus, 2014; Grönroos & Helle, 2010; Payne et al. 2008; Normann & Ramírez, 1993; Vargo & Lusch, 2004). Basically, to adopt service logic in business, firms have to understand the means to manage co-creation of value by aligning the corresponding activities and sub-processes of its customers to find a "structural fit" (Grönroos, 2011; Grönroos & Helle, 2010; Heinonen et al., 2010; Payne et al., 2008). Important herein is that value for the customer also emerges from the activities that help support the core offering such as handling service failures (Grönroos, 2011). Therefore, it can be stated that value creation under these conditions may be referred to and occurs as a primary unilateral problem-solving process for suppliers in their own value-creating process (cf. Aarikkaa-Stenroos & Jaakkola, 2012). While research has started to make efforts in providing insights into value co-creation practices between suppliers and customers (e.g., Aarikkaa-Stenroos & Jaakkola, 2012; Marcos-Cuevas, Nätti, Palo, & Baumann, 2016) research into suppliers' own practices that constitute the preconditions for engaging in value co-creation practices

remain unexplored. Day and Moorman (2010, p. 233) argue that *"no firm can consistently drive superior value without investing in and managing the capabilities to do so."* Logically, this means that organizations also have to put one step back and look at their own business processes and practices in order to comprehend the means to co-create value (Payne et al., 2008). Not only the interactions between customer and organizations have to be aligned and coordinated, interactions between employees in organizations have to be coordinated as well (Kohli & Jaworski, 1990). Taking the dynamics that operant resources bring and the imposed heterogeneity resulting from value-in-use into account, issues in coordinating the processes and practices that constitute the support of co-creation of value are likely to occur for suppliers. Prior research has not devoted much effort to understand the emergence of these problem-solving processes for suppliers unfolding over time.

2.3 Towards a practice perspective on understanding the dynamics of dealing with customer-driven heterogeneity and tensions that arise with that

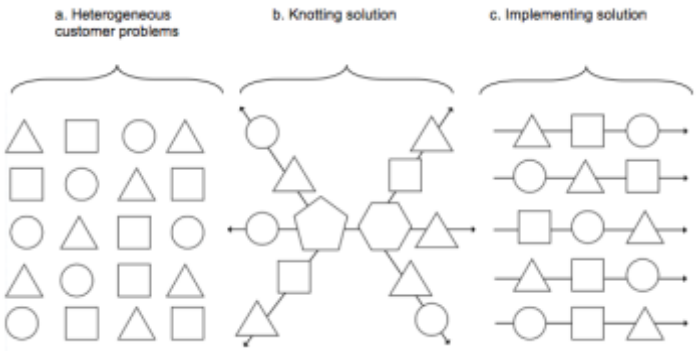
To explore the black box of how departments work to contribute to value creation, in particular, how the problem-solving process emerges and how their coordinated decisions are affected by imposed customer-driven heterogeneity, is investigated by applying a theoretical lens of practice theory. Practice theory can offer new ways to understand and explaining social and organizational phenomena (Bain & Mueller, 2016; Feldman & Orlikowski, 2011; Miettinen, Samra-Fredericks, & Yanow, 2009; Nicolini, 2012). Practices can be postulated to be routinized ways of doing performed by actors, underpinned by operand and operant resources (Marcos-Cuevas et al., 2016; Reckwitz, 2002). Practices simply refer to ways of doing things as it is a manifold of doing and sayings, an array of activities (Schatzki, 1996; Schatzki, 2001). Thus, practice-orientated research examines what people do (i.e., action-oriented) rather than what they say they do (Pickering, 1992). Practices ensure stability and regularity for organizations (Cohen, 2007). Schatzki (2006) views organizations as bundles of practices and material arrangements. Likewise, Orlikowski (2007) considers organizational practices to be "sociomaterial", referring that practices entail both social aspects, as well as material aspects such as ICT systems, tools, technology, and materials. There is an inherent inseparability between the social and the technical (Orlikowski & Scott, 2008). Hence, it means that in every working life, situated actors are not only engaged in social interaction, but also in interaction with material dimensions in many ways. So, the social and the material are constitutively entangled when actors try to perform tasks and materiality is integral to their organizing. Materiality is used by actors, so it mediates their activities (Orlikowski, 1992). In this theory, human action may be enabled but also constrained by technology by the meaning actors appropriate to it influenced by its design, organizational standards and norms, and interpretive schemes (Orlikowski, 1992). Applied to this research, this view asserts that technology and inherently systems are intrinsic in creating solutions but may as well play an important role in engender tensions during the achievement of a solution for customers.

By applying a theoretical lens of practice theory means to concentrate on everyday activity, yet to be critically involved with a specific explanation for that activity (Feldman & Orlikowski, 2011). It is concerned with the *"dynamics of everyday activity, how these are generated, and how they operate within different contexts and over time"* (Feldman & Orlikowski, 2011, p. 1241). This corresponds with the aim of this research by reason of understanding the dynamics of customer-driven heterogeneity in an organization and how the sociomaterial practices constitute the emergence of solutions and tensions. To understand the sources of tensions and its solutions in practice, we specifically draw on a branch of practice theory, namely Actor-Network Theory (ANT). (Callon, 1986; Latour, 2005). ANT can help to understand in greater detail how actors in their sociomaterial settings act upon tensions and find solutions in order to stabilize their routines in practice. For this reason, ANT, as a practice lens, is increasingly used in organization studies (e.g., Gehman, et al., 2013). An important feature of ANT is that the social world is reproduced as flat as possible in order to ensure that the formation of links is clearly visible in which emphasis is on explaining these links (Latour, 2005). These connections, or associations, are deployed between different actors in a "network" where actors refer to individual human actors as well as non-human actors (e.g., technological artefacts, animals, things etc.) in which all actors are granted equal amounts of agency, constituting all actors free of order (Dolwick, 2009; Latour, 2005). The associations of human and non-human entities result in new actors (new links) in an actor-network. As a consequence, it provides ways to understand how human and non-human actors shape social processes, or try to stabilize the heterogeneous elements in a network and how this network is composed and maintained. Evidently, emphasis is on the inextricably linked social and materials elements (Orlikowski, 2007) which are in the state of routine behavior merged (Orlikowski & Scott, 2008; Pickering, 1993). However, to combine practice theory and ANT is to not only look at what actors do, but to elicit the linked elements in a network that enfolds into a stabilized state, which in this research means to understand how tensions are acted upon and solutions are achieved. On basis of these concerns, ANT is consistent with following controversies, as a means to draw connections between the heterogeneous relationships of social and material elements (Latour, 2005). Controversies can be defined as *"situations where actors disagree"* (Venturini, 2010, p. 261). This definition needs to be taken in its broadest sense: it refers to everything that is not yet stabilized or therefore to shared uncertainty (Yaneva, 2016). Latour (2005) states that connections are traceable by following the work done to stabilize the controversies. This is why the facets of ANT approach are very suitable for this study. Handling customer inquiries are situations which are ambiguous and therefore are not always "black boxed" yet. Thus, the different meanings or shared uncertainty

between actors can result in controversies on how to solve the problem for a customer. These then end when a compromise is found between actors.

This study will draw on a conceptual model proposed by Gehman et al. (2013). Gehman et al. (2013) used an ANT-infused practice lens to view how values come to be practiced in organizations, in which they call value practices. By studying the development of an honor code within a large business school, the authors theorize that the values work comprises of four interrelated processes: dealing with pockets of concern, knotting local concerns into action networks, performing values practices, and circulating values discourse. Although the topic is different from this research, the model provides an excellent frame of reference to study the emergence of solving customer problems. The adopted assumption in this research holds that heterogeneous customer inquiries could lead to controversies that have to be resolved. Therefore, on basis of the theoretical model of Gehman et al. (2013) an initial conceptual model is proposed in figure 1. The first process is dealing with the pockets of concern that the heterogeneous customer problems bring about and where the actual problem that must be resolved, becomes framed by actors. Second process is where these pockets become enrolled, or better, knotted into the network of heterogeneous elements through interaction of actors and technological systems mediated by the immanent knowledge in those elements and reach their solution in this process (Schembri, 2006). One might expect that these first two processes will be very ambiguous in practice, as every customer problem is relatively unique and asks for a specific response. Thus, it seeks for a different way in which the heterogeneous social and material elements interact with the customer problem. The final process is where the pockets of concern are stabilized to be implemented as a solution for customers.

Figure 1. Customer-driven Heterogeneity Theoretical Model (Based on Gehman, et al., 2013)



3. Methodology

3.1 Research strategy

Guba and Lincoln (1994) define a paradigm as "*the basic belief system or worldview that guides the investigator, not only in choices of method but in ontologically and epistemologically fundamental way*" (p. 105). So, organizational studies always are concerned with fundamental assumptions on the nature of organizational phenomena (ontology), the nature of knowledge about the phenomena (epistemology), and the nature of ways of investigating the phenomena (methodology) (Gioia & Pitre, 1990). Hitchcock and Hughes (1995, p. 12) propose that the ontological assumptions induce epistemological assumptions where these in turn give rise to methodological considerations, and these in turn give rise to the issues of data collection and instrumentation. Consequently, this shows a primacy derived from the ontology to the methodology (Burrell & Morgan, 1979; Crotty, 1998; Guba & Lincoln, 1994).

This research adopts a constructivist-interpretivist research paradigm which is focused on the understanding of social phenomena within the frame of reference of the participants rather than explaining and generalizing (Burrell & Morgan, 1979; Guba & Lincoln, 1994). Herein understanding must be based on the experience of people in organizations (Bryman & Bell, 2015). Ontologically it asserts that no one reality exists, as reality is relative. The epistemological position is subject to subjectivism, implying that knowledge is a result of interaction between actors. (Guba & Lincoln, 1985). Consequently, knowing and understanding is based on one's own construction in mind, but socially mediated through interaction. So, this paradigm postulates intersubjectivity, which refers to shared understanding (Anderson, 2008).

The adopted research paradigm implies a qualitative research strategy. A qualitative research strategy is being opted to get a clear understanding of the practices of employees. Here theory is generated out of research, which denotes an inductive view (Bryman & Bell, 2015). All these views coincide with this research as an interpretive approach is needed to comprehend and interpret the meanings of the behavior of the people under investigation in this research. Arriving from the chosen ANT infused practice-lens, Orlikowski (2010) states that the chosen mode of practice theory guides the logic of a researcher's inquiry, which is why it can be stated that practice theory may not only have a theoretical agenda, but also a method one (Miettinen et al., 2009). Miettinen et al. (2009) indicate that the empirical research program for practice theory is "*ethnographic in its sensibility*" (p. 1312).

3.2 Ethnography

Ethnography finds its roots in anthropology (Crotty, 2003). It has received increased attention in different fields, both practical and theoretical (Hammersley & Atkinson, 1983). Especially in social sciences it is becoming popular (Scott-Jones & Watt, 2010). Ethnography is seen as an important part in organizational studies (Van Maanen, 2011; Ybema, Yanow, Wels, & Kamsteeg, 2009). Erickson (1973, p. 10) states that ethnography literally means: *"writing about the nations"*; "*graphy*" from the Greek verb *"to write"* and *"ethno"* from the Greek noun *"ethnos"* which translates to "*nation*", *"tribe"* or "*people*". So, ethnography deals with people in the collective sense, studying people in organized groups

(Angrosino, 2007). Rosen (1991, p. 12) argues that "*the goal of ethnography in general is to decode, translate, and interpret the behaviours and attached meaning systems of those occupying and creating the social system being studied*." This is why he refers to it as it being largely an act of sense-making where a dyadic translation from action in relationship to meaning takes place.

Carrying out ethnography comprises two distinct activities, which comprise the core of ethnographic research (Emerson, Fretz, & Shaw, 1995). Firstly, the researcher enters a social setting, referred to as "the field" and gets to know the people involved in it by participating in the daily routines of this setting. Operationally, fieldwork requires the full-time work of researcher over a long period of time, watching what happens, listening to what is said, and asking questions, so it consists mostly of ongoing interaction with the actors of study in their everyday life (Conklin, 1968; Hammersley & Atkinson, 1983, Rosen, 1991; Van Maanen, 2011). Ethnographers have to deal with three fundamental aspects of human experience, namely: what people do, what people know, and the things people make and use (i.e., cultural artifacts) (Spradley, 2016). Recording of what is observed is done by taking field notes. Field notes are the foundation on which ethnographies are formed (Walford, 2009). The second activity is where the researcher produces a written account of what is observed and learned by being immersed in the world of the people. Thus, the result of fieldwork is texts, based on the recordings of field notes (Sanjek, 1990).

Ethnography has multiple perspectives and practices (Atkinson, Delamont, Coffey, Lofland, & Lofland, 2007; Hammersley & Atkinson, 1983). So, even though there are differences, many traditions in ethnography share common features in which they are grounded in the commitment to the first-hand experience and exploration of particular cultural or social setting by participant observation, although it is not restricted to that collection method only (Atkinson et al., 2007). Likewise, Crotty (2003) states that ethnography has its methods of preference referring to participant observation. Hammersley and Atkinson (1983) even mention participant observation as a cognate term of ethnography.

Ethnography is employed in this study as a methodology (Crotty, 2003). Guided by a practice lens, working practices of employees are investigated in organizational setting. Hence, this research is devoted to organizational ethnography, particularly the research strand which comprises the following of actions, actors and artefacts (Yanow, Ybema, & Hulst, 2012). A primary objective of organizational ethnography is to "*uncover and explicate the ways in which people in particular work settings come to understand, account for, and otherwise manage their day-to-day situation*" (Van Maanen, 1979, p. 540). So, to get close to the ordinary everyday acting of people, empirical investigation should be directed to getting as close as possible to this "lived experience". Ethnography provides this proximity to practice as it is directed to the commitment to understanding in natural settings. Not only are practices in which actors are engaged, most appropriately investigated trough ethnography, ethnography provides deeper understanding in business-to-business markets. It is said that business research may benefit from more interpretative methods as means to understand the complexity of the business world (Visconti, 2010), certainly considering that interpretation is evident in every scientific study (Gummesson, 2003). The applied ANT-infused lens of practice theory emphasizes the sayings and doings of people in organizational life while asserting importance to the entanglement of social and material elements in employees' practices (Orlikowski, 2007). Naturally, while being involved in the understanding of how employees manage to solve customer problems, attention is also devoted to the materials, ICT-systems, and other technologies they use and lead into solving problems.

3.3 Ethnographic Case Study (ECS)

Visconti (2010) provides a comprehensive framework for conducting ethnography in case setting, combining organizational ethnography and case study research. The ethnographic investigation is carried out following alongside of the six steps proposed by Visconti (2010). The six steps entail: goal setting, sampling, immersion, data collection, data interpretation, and reporting. Visconti (2010, p. 29) defines Ethnographic Case Study research as "*the application of the ontological, epistemological and methodological features of ethnography to a theoretically selected set of business cases*."

The current investigation takes place in an industrial steel CNC machinery manufacturer. The organization serves two types of processing industries, namely the beam processing industry and the plate processing industry. Herein, the organization distinguishes five types of branches: machinery & equipment, tower industry, oil, gas and energy, steel fabrication, and steel processing and supply. With over 250 employees, the organization is considered a large enterprise. Over 90 percent of all machines are sold abroad, indicating the international and dynamic environment the company is operating in. Departments who are mostly directly involved for customer inquiries are: Sales, Product Management, Projects, Field Service, Support, Engineering Beams, and Engineering Plates, Software, Parts and Consumables. Daily operations in the organizations mainly consist of acquiring new customers, carrying out new projects and by doing so, involve a lot of engineering, and providing after sales services as support, maintenance, and sale of parts and consumables.

3.3.1 Goal setting

The goal of this study is to explore and uncover the way of how customer-driven heterogeneity manifest in handling customer inquiries. In other words: how is this heterogeneity in the organization is homogenized; how does the process unfold into stabilization. The study draws on ANT to understand how the practices through which the controversies that emerged in action eventually led to reaching consensus on how to solve the customer problem. Hence, the study partly draws on a process view, to

underwrite the practices as de-stabilizing and stabilizing over time. (Pettigrew, 1997; Van de Ven & Poole, 1995). Further, governed by ANT, attention was devoted to occasions of controversy where actors where engaged in practices that were clouded. In extension, it was undertaken to trace the connections between the heterogeneous social and material elements in actors' practices (Orlikowski, 2007).

3.3.2 Sampling

The range of following a process was delineated from the moment that a certain customer inquiry entered the organization until the moment when the involved employees reached a solution for the specific inquiry. Customer inquiries were investigated from the beginning as much as possible. This means that investigation took place in real time, but sometimes entailed retrospective episodes. Followed customer inquiries will be referred to as "events".

Purposive sampling as a technique of non-probability sampling was used to preliminary select the organizational departments and the key informants involved in the departments (O'Reilly, 2012; Visconti, 2010). The investigated departments are considered to perform front-line operations and as such, handle incoming customer inquiries. The inquiry handling processes may or may not be visible to the customer. Additionally, theoretical sampling was relied on. While this means to select cases which probably extent, replicate or illuminate the emergent theory (Eisenhardt, 1989), in this research theoretical sampling meant to start the fieldwork at the departments where heterogeneous customer inquiries are mostly apparent and required inter-departmental handling. From there on customer inquiries where followed into the organization. Thus, the theoretical notion of heterogeneity and interfunctional coordination, where the research is based on, guided the scope of where data collection took place. Furthermore, by using a snowball technique, employees that were already observed by being involved in an event, were asked to propose other interesting events that could be investigated (Gehman et al., 2013).

3.3.3 Immersion

Visconti (2010) states that in this stage, the researcher gradually naturalizes in the inquired culture of an organization's everyday life, providing sensitivity to interaction (Emerson, Fretz, & Shaw, 1995). In order to grasp what people experience as meaningful and important, an ethnographer seeks deep immersion in people's world (Emerson et al., 1995). Immersion into the culture allows for seeing from the inside how people carry out their daily activities, or in this case the daily tasks of employees. Here the researcher either is part or detached from the inquired context. The degree of the role of an observer suggests the scope of immersion, namely what the researcher is able to see and hear is decided by "*the extent to which the observer participates and is involved*" (Shkedi & Harel, 2004, p. 161). Gold (1958) poses types of observers. The researcher in this study is partly detached from the context, following the role of the observer as participant role, mentioned by Gold (1958). So, the actors were aware that they were being studied, with some connection to the setting. Although there was little involvement in the natural setting, the reseacher was naturally and normally not part of the case setting (Gold, 1958). Deep immersion was especially achieved by a period of initial familiarization in the organization before actual recording of events took place.

3.3.4 Data collection

According to LeCompte and Schensul (1999) essential methods of data collection for ethnography are: observation, tests and repeated measures, surveys, interviews and content analysis. Without observations and interviews no researcher can conduct an ethnography (LeCompte & Schensul, 1999). This is line with Arnould and Wallendorf (1994) as they state that observations should be supplemented by forms of verbal accounts. Underlying this conception is the fact that observational data alone "*do not provide direct access to the perceptions, values, and beliefs of informants and reveal little about informants' internal states*" which is related to an *emic* viewpoint (Arnould & Wallendorf, 1994, p. 488). Emic viewpoints are engaged with meaning as seen by the informants themselves, and in such a way are associated with the interpreted subjective experience of the informants that provides understanding of their lived experience, which of course, is better elicited by forms of verbal accounts (Arnould & Wallendorf, 1994; Borghini, Golfetto, & Rinallo, 2006). Etic viewpoints however, are the interpreted understandings of the informants' experiences on basis of the outside viewpoint of the researcher. Subsequently, to balance the development of data that would allow for both emic and etic viewpoints in the interpretative stage of data, several data collection techniques were used in this research. Hence, observations, informal and unstructured ethnographic interviews were used for data collection, with observations being the dominant source of information (Arnould & Wallendorf, 1994; Bernard, 2002; Spradley, 1979). An overview of the used data sources and corresponding key informants per event can be found in **table 1**.

Czarniawska (2004) poses "shadowing" as a method to follow key informants in their everyday work. Even though, an artefact is being followed in this study, namely the process of handling a customer inquiry, shadowing appropriately elucidates to follow and move from one point in the "action net" to another (Czarniawska, 2004), meaning the different settings in the organization which resulted in engagement of other actors and non-human actors as the process unfolded. Informants were followed during their activities and were asked to clarify the reasons behind their behavior if necessary which contributed to understanding how they saw the subsequent course of the inquiry (Borghini et al., 2006). Thus, while observing informal interviews were held with informants. The observations are mostly seen to serve as an etic foundation. However, while in the process of observing, statements of informants contributed to elicit how they perceived certain situations and importance attributed coming to terms of finding a solution for a customer problem or desire.

	Data Sources	Key informants/Departments	Timeframe of reaching solution +/-
Event 1	Observations, informal interviews	Support Engineer (Support), Service Coordinator (Field Service), Field Service Engineer (Field Service)	1 day
Event 2		Support Engineer (Support), R&D Engineer (Engineering Plates), Service Coordinator (Field Service),	2 days
Event 3		Field Service Engineer (Field Service), Support Engineer (Support), Software Engineer (Software)	1 week
Event 4	Observations, informal interviews, meeting	Dealer and Sales Manager (Sales), Product Manager (Product Management), Product Support Engineer (Engineering Beams), Software Engineer (Engineering Beams)	1 week
Event 5 (Retrospect)	Unstructured interviews	Product Manager (Product Management), R&D Engineer (2) (Engineering Plates), Project Leader (Projects)	2 weeks
Event 6 (Retrospect)	Unstructured interviews	Product Manager (Product Management), R&D Engineer (2) (Engineering Plates)	6 weeks
Event 7	Observations, informal interviews, meetings	Product Manager (Product Management), Team R&D (Engineering Plates), Project Leader (Projects)	5 weeks
Event 8	Observations, informal interviews, meetings	Product Manager (Product Management), Team R&D (Engineering Plates), Project Leader (Projects)	8 weeks

Table 1. Overview of used data sources, involved informants/departments, and timeframe.

Observations and statements of informal interviews were recorded in field notes. "*Fieldnotes are distinctively a method for capturing and preserving the insights and understandings stimulated by these close and long-term experiences*" (Emerson et al., 1995, p. 10). Unstructured interviews were digitally recorded and transcribed. Combined the three data sources generated 138 pages (common standards) worth of data. Immersion in the field took nearly three months in which the first two weeks no concrete recorded observations took place of specific cases, but was intended to get familiar with the employees, the environment, the context specific branch of the company and its general technological systems that were used in everyday use. In this way, understanding of the later followed processes occurred in a much easier way. In addition, this may have resulted in receiving richer details as actors became accustomed to the presence of the researcher in the field. A total of eight cases, in which either the customer inquiry counted a specific customer desire or a specific customer problem was followed to see how this social process of finding a solution for the customer was established.

Rigor and credibility was established by using a variety of data sources in each of the eight cases (Denzin, 1989). In addition, for the two retrospective inquiries, information was derived from multiple actors and member-checked among the involved actors. Moreover, "thick descriptions" of the events ensure transferability of results (Geertz, 1973; Guba & Lincoln, 1985).

3.3.5 Data interpretation (Data analysis)

Analysis is where meaning attribution (i.e., interpretation) takes places (Visconti, 2010). When analyzing the data of this study, a distinction is made as proposed by Van Maanen (1979) which adheres to the emergence of first and second order data. Van Maanen (1979) describes that the collection of ethnographic data results in two main sources of information, namely first order and second order data. First order data are the "facts" achieved by conducting fieldwork of observations and interviewing (Van Maanen, 1979; Visconti, 2010). Observations represent operational data whereas interviews portray presentational data (Visconti, 2010). Second order data are the "theories" an ethnographer uses to make sense of the facts (Van Maanen, 1979). Here the researcher is more distant from informants and sense-making occurs on ground of knowledge of previous literature (Borghini et al., 2006). Basically, it is the notions used to explain the facts related to the interpretations formed by the researcher based on the first order data (Van Maanen, 1979; Visconti, 2010). This means that the interpretative process of data deals with etic and emic information, resulting in rich data accounting for both the insiders' as well as the outsider's view (Pike, 1967).

In this study the emergence of first order findings was achieved by thick descriptions of each respective event by constructing narrative accounts (Geertz, 1973). Thereupon, these narratives where categorized in terms of the extent of controversies present driven by heterogeneous customer inquiries. Or in better words, this lead to the construction of three types of customer inquiries: low controversial, moderate controversial and high controversial. Although some events represented considerable instances of controversies or tensions, some were not particularly driven by the heterogeneous customer inquiry itself but emerged as a consequence from that internally. Open coding then was conducted on each category to identify the associations. Taking customer-driven heterogeneity as the primary unit for analysis, classifications and patterns could emerge on basis of tracing connections and translating between subsequent actions in each narrative related to the category (Callon, 1986; Lindberg & Czarniawska, 2006). In the second stage of analysis suggestions by Gioia and Chittipeddi (1991) were followed to establish second order findings which adheres to finding theoretically explanatory dimensions. This stage eventually provided the emergence of a theoretical framework based on the theoretical processes proposed from the initial conceptual model in the second chapter (Figure 1). A delineation of all events in the classification of types of controversies and the subsequent nature and characteristics of the controversy is illustrated in **table 2**.

3.3.6 Reporting

The written narrative accounts of the events are subject to the adoption of realist account writing (Van Maanen, 1979). Hence, the situations are described as objectively as possible. Meaning, that the accounts were written relating to the highest detachment of the researcher, as if the researcher did not influence the situations observed.

Inherently, this means that even though a complementary approach of integration of both etic and emic viewpoints was embraced, these accounts do emphasize the etic view a bit more.

4. Case study: from problems to solutions

As one might expect in an industrial manufacturing organization or any organization, a wide range of diverse incoming customer inquiries were present. All studied events are idiosyncratic, but focusing on heterogeneity and drawing connections between the subsequent actions that took place allowed to trace patterns in the different events. The overall findings imply that the amount of customer-driven heterogeneity drives the intensity of collaboration and tensions present. Inevitably, to eventually reach solutions unfolds in different processes when actors are confronted by uncertainty prescribed by the customer inquiries which drive direct and indirect controversies. We attended to moments of controversies present in the events by asking why tensions and uncertainty were present. Subsequently, we could distinguish three types of customer inquiries, namely: low controversies, moderate controversies, and high controversies. The events differ in their nature on the interaction between the social and material elements that takes places. Consequently, applied to conceptual model, it means that each of these three types of inquiries travels through a different kind of dynamic in the **"dealing with pockets of concern"** and **"knotting the solution"** process.

In event 1 and 2 we found a low degree of controversies present. This was because actors relied on their own accumulated know-how and experience to shape the solution, and followed standardized routines in order to mobilize the solution, showing serenity in executing their tasks. Although, event 2 did show a little tension which was caused indirectly, but did not alter the way how the solution should have been reached.

More apparent complexity in customer inquiries were classified as causing moderate controversies. These controversies were subtle relating to shared uncertainty. This was found in event 3, 4, and 5. Although these three varying customer inquiries were recognized to be rather routine questions, all had in common that it did not turn out to be the case as the process enfolded. There was the need to consult one or multiple times with different actors to establish a solution for the customer. These collaborations either were needed to brainstorm about possible solutions or to complement knowledge that was missing. As such stability was reached and actors could proceed with arranging a solution for the customer.

In high controversial inquiries, shared uncertainty is also the underlying motive of the controversies but manifests in a different way than moderate controversial inquiries. High complex inquiries caused intensive collaboration, but most apparent for discussion with visible disagreements, latent reactions of concerned employees and interventions. Event 6, 7, and 8 carried high controversies. In comparison with the other three events that were classified as having moderate controversies, the difference in these three events is that the controversies here took more shape of disagreements. Thus, noticeable various ideas to tackle a problem were present. Below, descriptions of the event are illustrated which elicit how actors cope with the imposed customer-driven heterogeneity. After each category of customer inquiries, a small aggregate analysis is given to comprehend the emerging narrative themes and subsequent theoretical processes present in each category.

Narrative analysis	Classification of customer inquiries by controversies present	Nature of controversy	Characteristics of controversy
Event 1 – Valve Problems: A customer had a problem and felt this was the organization's fault, after investigation by a Support Engineer he concluded that a broken wire connected to a valve should be replaced. Therefore, the inquiry was assigned to the Service Coordinator who sent over a Field Service Engineer to fix the issue that same day. ***Event 2 – Valve Problems 2.0:*** A customer had a broken valve. However, the Support Engineer could not assign the inquiry to the Service Coordinator, simply because he could not find the article number in the designated manual. Consequently, it took some extra time to find article number, ensure an updated manual by the supplier and supply of new stock of these specific valves by the Support Engineer in consultation with a R&D employee. Hereafter, the inquiry was assigned to the Service Coordinator who planned a visit by a Field Service Engineer.	Low controversial inquiries	N/A	N/A
Event 3 – Software Problems: A Field Service Engineer was on-site with a customer and encountered a problem with a lacking infeed roller conveyer. He contacted a Support Engineer who concluded that it probably was a software issue. As such, the inquiry was assigned to a Software Engineer. Soon the Software Engineer came up with a temporary solution, by changing a specific parameter. However, a total solution could not be established, as the Field Service Engineer did not provide adequate information for the Software Engineer to reproduce the problem. Thus, it led to great frustrations of the Software Engineer. ***Event 4 – Integration Of New Machine System:*** A customer in Australia wanted integration of a new drilling and saw system into his existing system setup and requested a proposal. Thus, the dealer contacted a Sales Manager who then assigned this task to a Product Manager to create a lay-out. In consultation with Product Support Engineer and a Software Engineer respectively, a final lay-out was established after some alterations in response to the Dealers' and customers' feedback. ***Event 5 – Plasma Center Marking:*** A customer wanted to have the functionality of plasma center marking. Due to poor coordination in the project phase by the original Project Manager and the functionality that was not documented in the Order Checklist, it was no surprise that this functionality came up during the commissioning phase as employees went through the acceptance protocol with the customer. After a new Project Manager was assigned to this project, the inquiry was soon followed up by Engineering Plates and Product Management who developed and integrated the functionality for the customer.	Moderate controversial inquiries	Shared uncertainty on how to approach the problem	"Cold" – no disagreements, ends with consensus
Event 6 – Countersunk Holes: A customer wanted to be able to cut countersunk holes, although this functionality was already on the priority list of R&D, it was not in its final form at that point. It was not documented well and not fined-tuned yet. During training the customer indicated that he wanted the quality of the cuts to improve, but did not indicate too much rush into this. Engaged with other running issues and developments lead to a lack of anticipation by R&D employees to follow up the current issue and as such, resulted in a frustrated customer. Immediate action then was undertaken and the functionality was fine-tuned and integrated into the customer's software. However once implemented, there were tolerance problems. This then caused some frustrations and concerns with the Management as again there were some problems. Hereafter, the involved employees came up with an idea and tested thoroughly in which then the functionality finally was solid and integrated into the customer's software. ***Event 7 – Countersunk Nib Holes:*** A newly assigned Project Manager had the difficulty in restoring the relationship with this customer. After investigation, together with a R&D employee, a Product Manager and the customer, the customer indicated that he wanted to cut countersink holes with a nib as the customer would insert nib bolts herein. The Project Manager kept adequate overview at all times and after a proposed meeting with the R&D team and a Product Manager they came up with a proposal. Hereafter an assigned employee was responsible for the execution of this proposal. However, the Product Manager had some concerns about the execution of the proposal. As such, together with the Product Manager the proposal reached its final form after some time and then was communicated to the customer by the Project Manager. ***Event 8 – Establishing Correction Values For Bevel Cutting:*** A customer wanted to be able to correct values for specific type of bevel cuts in the organization's own Operating Software. But, this was not clear to the employees as they only found this out during the discussing of their proposal, which was actually to integrate the functionality in the Nesting Software and not the Operating Software. The involved employees came up with this solution because this would have meant the most efficient way of establishing this functionality for the customer considering the amount of work and time that would have to be put into this. Yet, as the former Sales Manager actually promised the integration of the functionality in the Operating Software, it left the employees with no other choice than to do that. However, a R&D employee leaving the company impeded the scarce R&D capacity even further and caused concerns with employees. As such, there was decided to recruit two R&D employees to ensure that the set deadline for this functionality would be met.	High controversial inquiries	Shared uncertainty on how to approach the problem	"Hot" – apparent disagreements and concerns, ends with adjustments

Table 2. *Illustrative narrative analysis*

4.1 Straightforward logic: relying on past experiences and knowledge

Event 1 – Common valve problem

A customer's valve had been exchanged by a Field Service Engineer (FSE), but encountered lasting problems. When customers experience problems with their machines, a Support Engineer (SE) will try to solve this remotely by phone in combination with TeamViewer to view and control the organization's own Operating Software (OSW), before a FSE will be sent over on-site. After some investigation by phone with the customer and checking the machine's system via TeamViewer , the SE came to the conclusion that a connected wire of the valve was causing the problem. The SE indicated the commonness of the problem, and thus the amount of heterogeneity present: *"These are no special things. That the switching wire is broken, happens quite often"*. Even tough, it was a common problem, there was a little pressure on handling this inquiry quickly: *"He immediately wants to have an engineer on-site, without having to pay money of course."* As such, the SE immediately called the Service Coordinator (SC), who is responsible for planning the FSE employees and informed him on the situation. The SE pointed out to the SC that the customer feels as it is "their" problem as the FSE did not test the newly exchanged valve which explains the rush in solving this quickly. After following a standardized recording of the data in the ERP software SAP, and sending a standard mail to the SC which contains the number of the needed part, the inquiry was assigned to the Field Service Department (FS Department). Scheduling a FSE is normally a simple *routine practice*, however, this time the fact that the specific wire had never been replaced before in the past, and thus not in stock, lead to the SC having to search for an alternative solution. Even though the SC was not too happy about this fact, he remained calm. He looked up a module drawing where the SC found out that another cable next to the original cable could be transferred to replace the faulty wire, continuing with finishing this inquiry. After informing the customer that a FSE would come over and updating information in SAP, in conversation with the assigned FSE, the FSE expressed his concern as he was not too sure if the wire would be long enough to reach and replace the faulty wire. The SC assured him that it would, which did not cause any discussion. Thus, the FSE was ready to leave after all required information. The question remained what would happen to the fact that the customer clearly indicated that this problem is the organization's fault. The SC clarified: *"(…) I have to wait and see what will happen there. The mechanic could not test the valve yesterday as the roller conveyor was running. So, I have yet to see what I will do"*. After the visit, the FSE confirmed the faulty wire was the problem and was fixed by replacing it. It seemed a consensus was reached with the customer, as the customer was going to pay for the service costs, although travel expenses could not be charged.

Event 2 – Valve problem 2.0

A customer experienced problems with a valve connected to a cutting table. Through examining the situation via the phone and looking with TeamViewer, a SE inferenced that either the valve itself or connected parts to the valve were causing the problems. Thus, a FSE had to come on-site to replace the parts and solve the occurring problems.

There were no uncertainties present that might altered the way in which the SE would have come up with a solution. The handling of this inquiry was simple in its essence, governed by held knowledge of the SE. Yet, there were some difficulties present in this routine. However, these were related to the fact that the resources for handling the inquiry adequately were not easily uncovered, not directly associated with the kind of problem the customer has. For this reason, this customer inquiry was also appointed as a simple *routine process*.

Before handing the inquiry over to the FS Department, the required parts with their corresponding article numbers had to be identified. The article numbers of the connected parts of the valve were findable. But, the SE could not find the article number of the valve in documents. The clearly irritated SE explained: *"The manuals are not up-to-date. With new machines the parts are not findable."* When he was asked why this is the case, he answered: *"No, idea. You have to ask the other people. (…) Everybody that is located before this department, Parts, Plates, Beams. (…) No one feels responsible [to have things sorted out, like up-to-date manuals]".* The SE undertook several search attempts in several documents without any result. Hereupon the SE brought in help of the Engineering Plates (EP) Department for them to found out the article number via a task in SAP, which had not been picked up. As such, later on the SE called the SC for him to find the article number of the valve, in which the SC eventually succeeded. An R&D employee of the EP Department, who had been informed about the situation, came over to the SE and brought the needed valve with him. After some talk it seemed that the SE had to ensure the provision of a new valve, as the valve that would be used for this customer, was the last one in stock. The SE also took care to receive an updated version of the manual with the right article numbers from their supplier. The SE later explained: *"Normally, they [EP Department] have contact with suppliers. (…) Typically we [Support Department] do not. But in this case…. Otherwise we cannot proceed. (…) It will take too long for the customer".* Though he took extra effort to do this, he was not pleased with the situation: *Why do we have to do these things at Support [Department]? We must help customers, not help our guys".* Shortly after finding out the other numbers of the other parts, the standardized recording in SAP and sending the standard mail to the SC followed, which marked that the inquiry was assigned to the SVC department. Hereafter, the inquiry run very smoothly, since scheduling a FSE is routine work. The SC contacted the assigned FSE and customer, made a service order in SAP, sending a mail to the warehouse to order pick the other needed parts and scheduled the FSE for the inquiry in the planning system.

Aggregate analysis of events

Very evidently, in all inquiries the problem is framed immediately. The situations for event 1 and 2 are not particularly new, so through interrogation the employees could identify what was causing the problems in the customers' machines. Interrogation is based on **ruling out options**. As the inquiries are literal technical problems that arise on machines, framing happens as a **diagnostic process**. This is constituted by an entanglement of past experiences resulting in held knowledge by the employees. As such, the process after framing enfolds into following **standardized routines** to mobilize the identified solution.

4.2 Many heads are better than one: consultation between different actors on intra- and interdepartmental level

Event 3 – Software problems

A FSE was abroad on-site with a customer to handle some problems, but during his visit he encountered another problem: some of the in-feed roller conveyors were not working properly as they did not move material any further. As the FSE could not fix this problem by himself, he contacted a SE from the Support Department. Remote control was offered via TeamViewer by the SE for the situation. After some initial investigation, the SE suspected that the cause originated in the software. Accordingly, a Software Engineer (SWE) of the Software Department was brought into the inquiry by the SE. Since the SWE corroborated that the problem was probably being caused by a bug in the organization's own OS, the SE assigned a task in SAP with attached the needed documents (i.e., screenshots of parameters and a backup of the system) for the SWE to reproduce the situation in the software and follow-up the inquiry further. Although, bugs in the software occur more often, the SWE could not reproduce the problem showing a more complex inquiry that was present. After contacting the SE again for some extra information so he could match the situation (i.e., all same variables) as best as possible, the SWE still was not able to reproduce the problem: *"Since everything is working here, we cannot do anything right know"*.

Quickly, the SWE stopped by the SE, to ensure smoother communication, as previous communication happened via chat with the FSE, the SWE suggested to call the FSE. The conversation between the three employees came down to the fact that the FSE had to try to reproduce the situation on-site again, otherwise there was no progression in fixing the problem. Soon, the FSE was able to reproduce the situation in a similar matter whereupon the SWE and SE came up with a temporary solution, by changing a specific parameter in the OSW that would allow for immediate material detection, the material did ran over the roller conveyer. However, even if this setting is not on, the problem should still not occur. Thus, further investigation by the SWE was still needed.

In *consultation* with each other (i.e., SWE and SE), the SE asked the FSE to undo the temporal solution and to make a video of whole infeed cycle when the problem would arise. In this way, the SWE would have more clues that might uncovered the root cause and to finally solve the problem. Until this point, everything ran quite easily, even though the heterogeneity of this problem was reasonable. However, after the SWE received some videos that the FSE had made, frustrations began to came up. There was already some annoyance present with the SWE as it took very long to receive the videos. The FSE made three videos of which only one showed the problem of the roller conveyer of the machine, and even that video was of very low quality and shot very shaky. Thus, the videos did not add anything to convey more information so that the SWE could solve the problem. The SWE made some very mocking comments when reviewing the videos, and said: *"I'm going to call him, I'm getting really bothered by this".* In the conversation with the FSE the SWE clearly expressed his dissatisfaction and continued to interrogate in which situation the problem happens as he articulated that software always reacts uniformly. As soon as it would happen again the SWE asked him to provide as much information as possible about the situation. The ongoing frustration with the SWE was voiced to the SE and both found it clear that the next move was up to the FSE. Then the SWE tried to replicate something he saw in the video and shared this with the FSE via mail. He stressed yet again in that mail that the FSE should provide him with more information as he was still not able to detect the problem and solve the issue.

After several check-ups by the SWE and SE on the FSE, he still had not encountered the problem anymore in the following days. So, there was decided to close the inquiry. The SWE was not happy about the situation as he explained that this case was special, since he normally solves 90 percent of all tasks mostly in a short amount of time while this one has a really long lead time and this issue had not even been solved.

Event 4 – Coming to the right machine system lay-out: back and forth

A Dealer (DLR) in Australia had a customer who wanted a new machine system added to his existing machine set-up. The dealer in Australia contacted a Sales Manager (SM), which then went to Inside Sales and came to the Product Manager (PDM) Beams. The request had a high priority as the customer was awaiting the forthcoming proposal. The fact that several people were involved in this inquiry and thus could give an opinion on the lay-out made this an ambiguous process.

The PDM explained the common procedure for quotations: *"What we actually normally try is to firstly have the lay-out completely correct, and then we will start with making quotations. "So, you actually want to capture as much have as much as possible, before you start with the quotation".* He had a reasonable idea of how to integrate the new system into the current system lay-out based on the provided information via the dealer, but *"There are still a few snags. And that is actually particularly mechanically and electrically related. So, I'm going to propose those questions to Product Support of the R&D Beams Department".* So, he needed some *consultation* of other employees. The dealer

already made a simple sketch of the new lay-out which the PDM tried to resemble as much as possible in a Computer-Aided-Design (CAD) software application. In the process of drawing the expressed the reasonable amount of heterogeneity present in this customer inquiry: *"It's quite a complex situation, the longer I'm working on it"*. After he followed the guidelines proposed by the dealer in his mail, the initial new sketch and his own insights he came up with a new lay-out. After he had received feedback on his questions by Product Support he altered the drawing and had sent it to the DLR. While the DLR already sent the drawing of the lay-out to the customer and was awaiting the input of this, the DLR contacted the PDM to draw his attention to something which he had forgot, which was related to the flow path of material to the other machine system. Therefore, knowledge of Software Engineer employees had to be joined. Subsequently, a meeting between a SWE and the PDM followed to tackle the remaining questions the PDM had. Hereafter, the PDM integrated both the insights of the meeting, the feedback of the dealer and the customer who also drew a sketch. At this point it was just *"trying and seeing where it leads too"* (PDM) as he was a bit concerned if the whole set-up would fit as the dealer also proposed some complex ideas to the customer. While drawing the second lay-out, the SM checked-up on the progress several times. The PDM said it would be better if the SM would mail the drawing. Later on he explained that is how the flow of information normally works. Following, the DLR had discussed the new drawing with the customer which resulted in a few adjustments that had to be implemented by the PDM. Eventually this lay-out was approved by the customer and the inquiry unfolded into the stage of financing issues.

Event 5 – Plasma center marking

A new customer wanted to be able to do center marking with his new machine system, making this inquiry actually more a customer wish than a customer problem. A customer's wish always entails a machine feature that has yet to be developed. Customer desires are normally captured by Sales and/or Inside Sales in an order checklist which then serves a prominent role in leading the project. However, this was not the case here. Poor coordination in the project phase and emerging problems aggravated the course of this project. Even though the feature that had to be developed was not too complicated, rather simple, is that what makes up the context of this whole project impeded the flow of handling the inquiry. It was kind of a routine practice, as all involved employees knew what to do beforehand but had some little ambiguity. The development was not complicated however, it needed some alterations throughout the process.

In some way in the early stage of this project, it was articulated to employees of the R&D EP Department that they had to add this feature in the software. Employees of the department *discussed internally* about how to undertake this inquiry, where they had an adequate prior idea how to establish this functionality for the customer. After completely discussing some ideas and setting out what to do, one R&D employee established one phase of the feature in the Nesting Software (NSW) of the machine. However, as inadequate coordination was present, this to be added feature was *"forgotten"* somewhere *"in the organization"* (R&D Employee 1) and only later came up during the commissioning phase while going through the acceptance protocol where all outstanding issues were discussed between the customer and the organization. What makes it difficult is that *"(…) especially with customers where you have a lot of hassle already, you cannot have a situation where the customer expects certain things [features] to be there and then they are not" (PM).* So, *"you are already lagging behind events, being one-nil down so to speak. That just causes irritations, both here and with the customer"* (R&D Employee 1). These frustrations were present because: *tension, at that moment… Everyone is busy with other things and then all of a sudden that immediately has to come in between. So, that suits no one"* (R&D Employee 2). Despite these irritations, it did not escalate in the organization, as *"it is just simply what the customer wants"* (PM). Soon, a newly assigned PL together with exerted pressure by the customer induced ad hoc handling. Thus, the other phase of the software feature was added in the OSW, subsequently tested, and then delivered to the customer in only a few days. However, it was a *"quick fix"* (PM) as not all scenarios with different amperes (strengths) were tested.

Aggregate analysis of events

The customer inquiries were quite idiosyncratic and new for the employees, but visibly, the employees did have some prior knowledge on which they could depend. Herein, the employees framed the problems in a **prognostic** way. They had some sort of **plan of attack**, but no complete overview of the needed outcome beforehand. Consequently, they had to exchange information within or on other departments to integrate the missing knowledge and brainstorm about a complete solution for the inquiries. Subsequently, the process after framing the problem unravels in **consultation on intra and interdepartmental levels**.

4.3 Dynamics: high complexity gives rise to different opinions

Event 6 – Countersunk holes

A part of a customer's purchase of a machine, was that it had to feature a functionality of cutting countersunk holes. This functionality already was part of the determined development list by R&D EP Department, meaning it was not especially developed for this particular customer. However, at that particular stage of time it still was not in its final form. The whole process of meeting the requirements of the customer and delivering good quality, extended over a period of several months. Ironically, this functionality was also not captured in an order checklist, but nonetheless still reached the R&D department.

Before making the official purchase, the customer came to visit the organization and also wanted to see this functionality. Even though, this functionality still had to be

developed and thus was not fine-tuned, for reference purposes it was manually engineered and shown on a test machine during this visit. Sometime later the functionality was ready and was shown again when the customer came to visit for training purposes. Although the customer was pretty satisfied with the outcomes, he remarked that he would like the quality of the countersunk holes to improve (as it had a dent in the cutting surface) as he would also sell materials to other parties and not have it for internal use only. The customer did not really indicate too much rush into this, which lead to lack of anticipation on this which was intensified by reluctance by the R&D EP department as *"customer requests like these have to be done in between [while working on the determined development list], it happens ad hoc as it is already too late, it is not scheduled"* (R&D Employee). Subsequently, the thought with the R&D employees was that although they recognized that the functionality was not delivered in its optimum form, *"it had to be put back on the priority list [determined development list], so it would be picked up later on*" (PM). The PM was faced with a duality "*on the one hand I was like, this is a poor delivery, otherwise I cannot do anything with this [functionality]. Then it is just not a good functionality. On the other hand, I was like, yes; you cannot constantly keep shooting things in it, all these little things [customer requests] because then you'll never get something done."*

While the customer already had his machine running in the field for some time after his remark during training, the PM and the R&D EP department were confronted with immediate undertaking of action as the customer did not want to pay his final payment. Soon they and the R&D tester reached consensus in running some tests and adjusting the algorithm so that the NSW and OSW were able to perform the functionality correctly. It appeared that the first time the input for the algorithm derived from the tests were not checked *"So, no one has verified: is this what we want or does this meet the quality?"* (PM). Likewise, an R&D employee indicated: *"It stayed at that [a test and a description]. It had no follow-up [for further testing and fine-tuning]*. Hence, it was assumed and accepted that the functionality was okay at that time.

After tackling the problem and updating the customer's software with the new improved functionality, another problem began to emerge: there were some tolerance problems of the cuts, i.e. positioning and sizing. During a meeting *"hot projects"*, where Product Management (the PDM), R&D (R&D employee), Support (SE), and the Management of Customer Service (Manager Field Service and Director Operations) were presented, ongoing issues or requests of customers that had this specific machine were discussed in order to come up with solutions. Tensions were present during the meeting. The Management stressed adequate testing and solving the issue correctly by the R&D Department, instead of delivering *"half a solution"* like last time (PM). The R&D employee and PDM knew that there were some possibilities in correcting values in the software, which then would be tested if it could be applied to this customer as well. In spite of the proposed solution, there was a disagreement between the two parties (R&D plus PM and the Management) on how this solution, if functioning, would be implemented. The Management, approaching from a customer's perspective, wanted that a FSE would come on-site, explain the correction values for the functionality while cutting some countersunk holes for the customer. However, Product Management and R&D did not found this necessary, reflected from a time and money perspective and had appropriate trust in the proposed solution. After extensive testing and informing every concerned employee, the team still justified the option for rolling out the update and explaining the correction values remotely. This then was accepted by all involved employees. Although, both iterations of improving the functionality turned out to work, the PM remarked that: *"In the end it came to a very simple solution, but it could as well have been something else. Because for both solutions there was some uncertainty whether we knew if we could solve it anyway"* indicating the high heterogeneity present in this inquiry.

Event 7 – Countersunk Nib holes

A customer bought a machine which had to be able to do countersunk holes, but this time with a nib. This request was captured in an order checklist. However, handling this customer inquiry did not start on good terms, as the original SM and PL were no longer employed at the organization which led to severe deterioration of the business relationship as occurred problems and requests were not followed up consciously. The newly assigned PL had the difficult task to restore the relationship and coordinate all requests and problems satisfactorily. After a visit by the customer where all ongoing issues were discussed and identified together with a PM and an employee of R&D EP Department. The PL drafted a "punch list" online in accordance with the customer, so both parties could update and see the status of this list anytime. The paradox in the customer request was related to another customer with countersunk holes (event 6) the form of that initial functionality actually had a dent in the cutting surface which possibly could substitute and solve this request in a way. This means that involved employees could rely on some prior knowledge and experience in handling the inquiry.

Handling this inquiry started off by a meeting between the PL and a R&D employee where the punch list was discussed. The PL stated that the goal was to appoint owners to each issue so that it could be followed up properly. The outcome of the meeting was that the bigger development issues (i.e., including this inquiry) had to be discussed together in a group of R&D employees (five) and the corresponding PM. Unfortunately, the PL could not attend this meeting, which is why the first involved employee would be the chairman of this meeting. This R&D employee clearly emphasized adequate handling with special requests and elaborated on some other customer history of countersunk cutting (event 6). The PM stated that they only have two options: either integrating the feature in their OSW (making it customer specific) or in the NSW. It seemed that all employees favored the non-customer specific option more. An alternative route of cutting square holes in the

NSW to solve the request was suggested by a R&D employee in which most employees recognized the potential. Yet, another R&D employee proposed a different solution that would allow the specific holes to be cut as meant as another colleague already established a basis for this in the NSW. As several employees expressed their preference for the square cut holes, the other R&D employee disagreed: *"I believe the first option is easier"*. The PM complied and set out the course of action: first testing the regular option, then the alternative. The chairman recapped and articulated that the chosen route would be their answer for the customer for now. Hereupon the R&D employee informed the PL by mail about the proposed solution and to which R&D employee this was assigned to. Sometime later the PL scheduled a meeting with the R&D employee and the assigned R&D employee that would carry out the task to discuss the status of the different issues so he could inform the customer as well. The assigned R&D employee did not have time to follow up the inquiry but intended to that the following day. On this next day the PDM was asked some questions relating to the preliminary phase of this inquiry, during this conversation information was conveyed that the assigned R&D employee would test the solution that day. The PDM seemed *concerned* and immediately anticipated on this information as he wanted to prevent jumping to conclusions and recurrent testing. He contacted the R&D employee via chat: *"Because I do not know what he will do, and I do not know if what he is doing, he will do well. (…) He has to program correctly, because it stands or falls by that. Look, if he 'just' misses something, he can just say so; no, this is not going to work.* Hereafter he decided to just stop by and share his approach. The R&D employee was already working on it, and could not establish a very good quality cut. Both the PM and R&D employee tried to change parameters in the NSW, but it seemed that it produced the wrong G-code for the OS. After involving another R&D employee into this inquiry because of the faulty G-codes, this particular R&D employee stressed a structural solution for the customer. Nonetheless, the PM remarked *"I know you want the best, but this is just a one-time thing."* The conversation between all three ended where they agreed upon further testing after the finding out the exact measurements of the cuts. The following day the assigned R&D employee called the PM to inform him on some testing he did together with the R&D tester. He then stopped by the PM to show this test cut. As the PM interrogated they filled in the different parameters in the NSW to reach the desired nesting image. The PM expressed his satisfaction multiple times by mentioning *"nice solution"* and *"learned something new again".* The R&D employee answered that they (he and the R&D tester) just simply tried some things out. This interaction ends when the PM articulated that he approved. Hereafter the R&D employee stopped by the R&D tester to see if he made some alterations and gather some extra information. After this, the R&D employee came over to the PL to show him the test cut and explain how this was reached. The PL was content. The R&D employee articulated that he will draft up a document description and that another test will be run at another location which will contain the most updated version of the OS which would allow the best quality countersunk nib cut. The PL exerted extra pressure by planning an extra meeting in which the status of inquiries of the punch list of this customer and others were discussed with R&D. He explained *"it [exerting pressure] is necessary, but it is unfortunate that it is needed."* In that meeting it was explained that a new test by the R&D tester was performed and the only thing left was a manual of the functionality. The PL asked for a good description of the functionality for the customer from the assigned R&D employee. Later that day the R&D employee mailed this to the PL for him to send it to the customer. In the mail he added that if the customer wanted, the R&D employee could remotely look with him for them to make a nesting together. Following, a week later a phone call to discuss the punch list with the customer by the PL was planned. Before this meeting the manual was sent to the customer and the proposal was finally ready to be implemented for the customer.

Event 8 – Bevel cutting with correction values

A customer wanted to do certain types (X, K, and Y) of bevel cutting (i.e., angled cuts) which would require being able to correct parameters either in the NSW or in the organization's own OS to reach the desired type of cuts as these cuts are not made out of a single cut. The former SM sold the machine to the customer which included this functionality as a buyer criterion. However, this functionality was not established yet and the fact that it was a buyer criterion was not communicated well. Together with a difficult installation and commissioning phase and the involved SM leaving, this all left the customer relationship to be unfavorable. The customer request was rather heterogeneous, concerned with high technological issues and invested time to come up with a proper solution for the customer request.

The assigned PL came to the R&D EP department for this customer request and had communicated to the customer that they could expect a proposal in some time. Two R&D employees gathered some extra information from both the customer and the possibilities with the NSW party through a conference call. Hereupon these employees decided to opt for a partial execution of the functionality as the biggest priority for the customer lied with cutting X type bevels. To discuss this jointly, a meeting with the R&D department and the PDM was planned to discuss the possibilities on how to solve this issue. As some of the R&D employees favored the partial execution of implementing the total functionality in the OS, the PDM disagreed *"today they want X, but tomorrow they want K"* indicating the inefficiency of time-consuming partial execution due to extra testing and R&D capacity. The R&D employees felt that it would not cost them much extra test work and elaborated on arguments in favor for the partial execution. In the end, The PDM made the final decision to eliminate that possibility, which left them with two other options: either integrate the options to correct the bevels in the NSW or in their own OS. Eventually there was chosen to propose to integrate the functionality in the NSW, although some of the R&D employees did not found this to be the best option in terms of convenience for the

customer. Relating from the most efficient option taking R&D capacity into account, the PDM and Manager R&D determined to go for that option. Hereupon, this option was elaborated into a proposal by a R&D employee which then was discussed during a conference call with the NSW party, the customer, two R&D employees and the PL. Although, prior to the conference call the intention was to steer towards the option for integration of the functionality into the NSW, the customer did not want this and remarked that the SM said this functionality would be integrated into the OS. This left the involved employees with no choice, but to integrate it into their own OS, as they could not *"get out of this anymore"* (R&D employee 1). During a break in the conference call to discuss about a date for the functionality to be ready, concerns with all employees were visible. The PDM stated *"(…) we can continue to talk about this, but this is our only solution."* After the conference call, ongoing concerns were present: *Is it really necessary to require a new OS version?"* (PL). *"Yes, there is no other way"* (R&D employee 2). The involved employees had some doubts in the complexity of establishing this solution as well as how the set deadline would be met.

Following, the fact that a R&D employee left during this process, after this conference call, impeded the scarce R&D capacity even further. In the coming general weekly meeting of R&D employees and PL's, R&D employees expressed their concerns into meeting the set deadline for the functionality to be ready and all involved employees agreed to share these concerns with the management. Thus, the Manager R&D calculated the needed hours for this functionality which resulted in attracting two new R&D employees. Hereupon the Manager R&D came to the management with this problem, and eventually this request was honored to recruit the needed employees. Finally, the employees could continue to establish the functionality for the customer as projected.

Aggregrate analysis of events

These customer inquiries were of higher technical nature with more ambiguity. Employees clearly had a lesser extent of how to deal with the inquiries beforehand. The nature of framing the problem is more **experimental**, fewer boundaries are set a priori. To further refine how to tackle the issues, employees also engage in **conversations on inter- and intradepartmental level**. Apparent herein, is the underlying conception of **diverging opinions** of involved employees. Subsequently, **latent concerns** with employees provoked that **alterations** throughout the process of establishing the solution had to be taken.

5. Theorizing customer-driven heterogeneity in organizations

The analysis showed that each type of classified customer inquiry represents its own type of dynamic to reach a solution for a customer. Three distinct processes were identified: low controversial, moderate controversial, and high controversial customer inquiries. Varity in these dynamics are evident in everything that happens between framing the problem and reaching the solution for the customer. The proposed conceptual model initiates the three involved key processes in the emergence of customer solutions in organizations: dealing with pockets of concern, knotting the solution, and implementing the solution. To theorize about the manifestations of customer-driven heterogeneity in handling customer inquiries, the identified processes of each type of customer inquiry are discussed below. Informed by the ANT-infused practice lens, the practices in which actors engage as well as how the composition of the actor network emerges are discussed. Lastly, the role that materiality played in reaching solutions or provoking controversies is highlighted. In **figure 2** an extension of the initial conceptual model is illustrated combined with the insights of the analysis and the three identified distinct inquiry processes.

5.1 The three key processes to solve customer problems

A. Dealing with pockets of concern

The first process entails the continuous incoming heterogeneous customer inquiries for the organization. Composed of a pocket of unique social and material elements, each customer inquiry is heterogeneous and represents potential concerns that needs to be black boxed, as the customer problem needs adequate undertaken by a network of actors. In this process, the pockets of concern take shape as customer describe which problems they are facing. Subsequently, actors inscribe the problem for it to become clear what to do next, and which dependencies are required (Callon, 1996). As such, it is very important for actors to interpret the setting in which they are located (Latour, 2005). Dealing with these pockets of concern happens by **framing the customer problem**. To frame is to make sense of the situations (Benford & Snow, 2000). The way actors frame problems define the preconditions for coupling of material and social elements on which they act. So, problem framing structures how the process of handling the customer inquiry enfolds.

<u>Low controversial inquiries</u>

Diagnostic problem framing

Problem framing in low controversial inquiries happens as a **diagnostic** process (Benford & Snow, 2000). Identification of the problem through elimination of possible causes of the problem will innately propose the solution for the problem. So, framing occurs only once. There is no sign of uncertainty on how to approach the problem since the situations are common for actors. Hence, controversies are not likely to happen.

<u>Moderate controversial inquiries</u>

Prognostic problem framing

Problem framing in moderate controversial inquiries takes place in a **prognostic** manner (Benford & Snow, 2000). Customer inquiries are complex, but contain relatively common elements for actors. Therefore, problems can be framed in a way where actors already have some sort of idea

on how to solve the issue, a probable outline. Thus, problem framing in moderate controversial inquiries involves the articulation of proposed solutions and tactics for the problem (Benford & Snow, 2000). However, actors share uncertainty as there is never complete knowledge on how to approach the problem. Accordingly, controversies are present and the problem continues to be re-framed in the "knotting the solution" process.

High controversial inquiries

Experimental problem framing

Experimental problem framing is what occurs in high controversial inquiries. High controversial inquiries are of the most complex order. The problem is framed through more loose outlines for possible solutions than moderate controversial inquiries. Suggestions for solutions are based on trial-and-error motives. The nature of framing is seemingly preliminary. Actors share *substantial* amounts of uncertainty on how to approach the problem. Similarly as for moderate controversial inquiries, the problem proceeds to be delineated in the next main process to further refine the plan of attack whereas for low controversial inquiries the problem only is framed once and becomes black-boxed immediately.

B. Knotting the solution

The second process is called "knotting the solution". As the problem is framed, it becomes knotted in a context of heterogeneous elements and relations. The problem is no longer isolated, but involved in a network where actors interact with computer systems and cognitive practices to take action and establish solutions. Thus, the network becomes an entanglement of interactions (Latour, 2005). As the pockets of concern vary (i.e., customer inquiries), so is their involvement in the network (Gehman et al., 2013). Hence, the amount of uncertainty leaves room for flexibility in managing the specific customer inquiry. The extent to which large these pockets of concern are, constitutes the establishment of a larger and stronger actor network as the process enfolded. This is due to participation of multiple actors, their subsequent knowledge, and interaction with systems as the shared uncertainty of the pockets has to be imbedded even further into a larger network. In addition, the extent of involvement of different actors is never consistent over time, through negotiation between actors it is decided how to proceed and how the networks take shape as the social and material circumstances changes (Gehman et al., 2013).

Low controversial inquiries

Performing routinized practices

In low controversial inquiries the sub-process in the knotting the solution process is called "**performing routinized practices**". After framing the problem, the problem enrolls into the network of actors, in which their cognitive assessment of the provided information in systems in dictates their action on how to solve the problem. Following a routine resulting from an accumulation of past experiences guides their logic (Levitt & March, 1996). Hence, **standard operating procedures**, which ultimately are elements of knowledge and systems govern actors' practices. What is clear in low controversial inquiries is the absence of any trace of uncertainty. Even if there is any uncertainty it is reduced immediately. For example, in event 1 the FSE had his concerns about the proposed solution (i.e., using a substitute wire), however the SC immediately removed the concerns as his own knowledge ensured that the proposed solution would be right one. Evidently, lack of controversies results in no need to anchor the problem further in the organization. That is why the network is considered to be relatively small entailing small heterogeneous social and material elements. It also means that the network is stabilized in a fast rate and would take form in relatively the same shapes, as the routine practices inherently are composed of little actor networks of specific employees and systems.

Moderate controversial inquiries

Performing knowledge practices

Instead of a network that is reasonably a priori defined through routinized processes, for moderate controversial inquiries there is stronger and more interaction between the social and material elements to eventually enfold into stabilization and thus present the solution for the customer. The present controversy is related to *shared uncertainty on how to approach the problem*. To stabilize these controversies, new actors are brought into the network as knowledge of other actors is needed as there is no one person in who all knowledge comes together (Tsoukas, 1996). This was very evident in event 4 where the PDM had to consult with two different employees of the Engineering Beams Department for him to be able to construct a lay-out for the customer. Hence, actors are "**performing knowledge practices**", meaning that they try to accumulate information through **consultation** with other actors. Herein, knowledge among actors in organizations is related to their tasks through interaction of various social and material elements. Stabilization of the shared uncertainty is reached on basis by building formats through the exchanged information that could lead to a solution (Latour, 2005). Notably, in these networks, controversies never take form of heated discussions and large tensions between involved actors. The controversies end with "**consensus**" between actors in consultation with each other. Therefore, moderate controversies can be referred to as "cold" controversies.

High controversial inquires

Performing knowledge practices and uncertainty practices

Larger networks of even more heterogeneous social and material elements are present with high controversial inquiries. Same as for moderate controversial inquiries, becoming knotted into a larger network happens when actors need to integrate knowledge of others or discuss about possible routes that can be undertaken. As such, here actors do engage in "**knowledge practices**". However, as controversies vary, the *shared uncertainty on how to approach the problem* is of larger extent and so results in **apparent disagreements** between actors. So, instead of

reaching true consensus after consultation between actors to negotiate how to proceed, **concessions** are realized. Thus, the network remains somewhat unstable. Clearly, uncertainty is not only caused by the complexity and nature of the problem, but also by the diverging perceptions of actors involved (Koppenjan & Klijn, 2004). Subsequently, as still some uncertainty is present, it leads to **latent reactions of concerned actors** which evokes new actors and heterogeneous elements to become enrolled and thus creates an even larger network. Interaction between actors than take place on basis of "**uncertainty practices**". For instance, in event 8, Management has been brought into the process by the concerned employees to ensure that the set deadline for establishing the functionality for the customer would not be at risk. This was due to the high complexity of the problem and further impediment of scarce R&D capacity. Consequently, **adjustment** of the situation takes place and marks the end of the controversy. Hereafter the boundaries are set for the construction of a solution by employees and the network of large actors and material elements becomes stabilized and can act as a durable whole (Latour, 2005).

C. Implementing solution

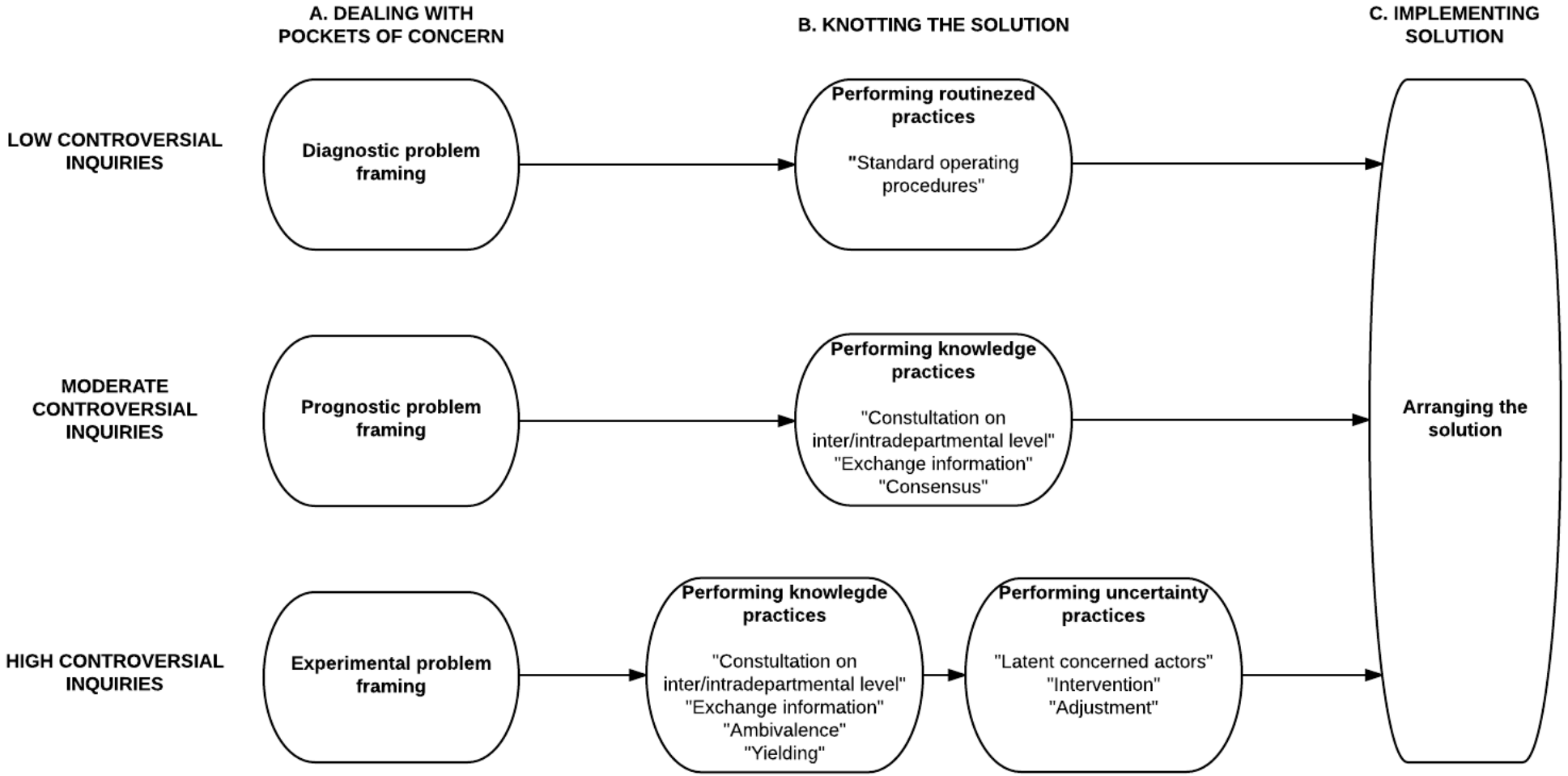
The last process involves the establishment of a solution for a customer. As the network is stabilized by ending controversies, the last elements of constructing the solution can be undertaken by actors. Those are the various practices that actors have to perform to **arrange the solution** and for it to be ready to be implemented for the customer. For instance, in event 5 this is done by executing practices that deal with updating the customer's machine Nesting and Operating Software that allowed the functionality to be ready and used.

5.2 The role of materiality

Various materials are used by actors to organize their actions influenced by their interpretative schemes, technology design and organizational standards (Orlikowski, 1992, 2007). The range of the role that materiality plays in different type of customer inquiries varies in terms of facilitating and constraining involved actors to perform actions and to eventually solve the problems (Orlikowski, 1992, 2007). Most apparent technologies used in these events, apart from the typical communication technologies as the phone and email system, are the ERP system SAP, to document what is done to solve a particular problem and to appoint tasks for other actors, Computer-Aided Design (CAD) Software for machine lay-out drawing, the organization's own Operating Software for its machines to check and alter system settings, Nesting Software for inquiries that involves issues on cutting, and lastly the software application TeamViewer, which offers remote control.

It can be stated that the use of materiality is mostly influenced by actors' interpretive schemes, i.e., problem framing. As customer inquiries are conceptualized to be framed in a diagnostic, prognostic, and experimental manner, their practices in using materiality accordingly follows. In low controversial inquiries materiality facilitates actors' practices. Low controversial inquiries are unambiguous and not that complex. Logically, actors hold the same meanings on how to use the various software systems as they can draw on existing knowledge to solve the problem. The way how technology is used is integrated into the routinized practices of actors. Hence, the standard operating procedures prescribe how to use the technologies and already are adjusted and designed to known situations. For moderate and high controversial inquiries, materiality both constrains and facilities. Here no clear classification can be made. This is contingent on how ambiguous the situation is, not necessarily related to shared uncertainty on how to approach customer problems. For instance, while the actors in event 4 did not completely knew how to establish a system-layout based on the customer's wishes, and thus refers to a controversy, the CAD software application perfectly afforded the desires for the PDM to construct multiple system lay-outs based on acquired knowledge in consultation with other employees and additional information from the customer. In another sense, in event 3, the SWE could not reproduce the customer's faulty infeed roller conveyer situation in his software based on the information provided in the OS, to find the cause of the problem. This means that if the software had other possibilities for needed parameters, perhaps the SWE could reproduce the situation. So, in this case it partially did constrain the SWE's actions and in response to this, he asked the FSE to send him more information (parameters) about the situation. Furthermore, for high controversial inquires it is even more apparent as they approach the customer problems in an experimental manner, their practices in using technology correspondingly follow. For example, in event 7, the PDM and R&D employee experiment with some possibilities in the NSW and OS to establish the functionality for the customer. Eventually the employees succeed through trial and error.

Figure 2. Processes of solving customer-driven heterogeneity.



6. Conclusion

This study intended to gain an in-depth understanding of the coordination issues of departments arising from heterogeneous customer inquiries that provide support for the co-creation of value. This research sought to answer the following research questions: *How does customer-driven heterogeneity manifests in the process of handling customer inquiries? Does this lead to tensions? And how are the tensions resolved in the organization and lead to solving customer problems?*

This study argued that coordination remains imperative to contribute to the creation of value for customers. However, due to the change in the locus of value creation brought by SD-logic, exchange processes, markets, and customers are perceived and approached differently (Vargo & Lusch, 2004). Consequently, attention is devoted to the dynamic nature of value creation which is very customer and context specific asserted by the notion of value-in-use. As such, imposed heterogeneity of customers has implications on coordinated practices of departments that support the co-creation of value. Through the investigation of handling customer inquiries, this study showed that an ANT-infused practice lens is an appropriate way to study interfunctional coordination approached from an SD-logic perspective. The applied lens provided the means to understand the dynamics and the relationship between social and material elements in actor's everyday activities. To immerse in the working practices of actors, close proximity was ensured by using a variety of ethnographic methods to observe handling of customer problems in a steel machinery manufacturer (Visconti, 2010). The results elicited that the complexity of the customer problem greatly affects the way how actors solve problems. The study found that customer-driven heterogeneity manifests in distinct ways with its own dynamic of reaching a solution for customer problems. Governed by the ANT-infused practice lens, we attended to moments of controversies and by doing so, a distinction was made in low controversial, moderate controversial, and high controversial customer inquiries. Tensions between actors are provoked by the nature of the inquiries' complexity and thus heterogeneity. Hence, findings showed that tensions materialized differently and lead to solving customer problems in these types of inquiries based on the variance in shared uncertainty on how to approach the customer problems. Low controversial inquiries are characterized by a lack of controversies, while moderate and high controversial inquiries assign controversy to shared uncertainty on how to approach the customer problems. We constructed a framework which delineates the three key inquiry processes in how actors frame problems and how they engage in practices that eventually enfold into finding and arranging the solution for the customer. Customer problems in low controversial inquiries are framed in a diagnostic manner where actors employ routinized practices. Moderate controversial inquiries are framed in a prognostic manner where actors employ consultation practices to further refine the plan of attack and reduce uncertainty. Further, high controversial inquiries are characterized by experimental framing and also leads into consulting practices as well as apparent discussions and adjustments. From here it can be seen that customer-driven heterogeneity and its subsequent emerging internal tensions are resolved in interaction between actors. Thus, coordination is more achieved by mutual agreements and adjustments than it is achieved through standardization (Schembri, 2006).

7. Discussion

To highlight the dynamics in interfunctional coordination in supporting practices of suppliers we studied the manifestations of customer-driven heterogeneity in terms of how interfunctionally coordinated decisions are made and executed unfolding over time. In particular, we focused on the emergence of controversies as a result of customer calls that need to be resolved internally. While increasing efforts are made to understand the practices in value co-creation and alignment herein, not much is known about suppliers own value creating process and the practices that help support value co-creation. While handling customer inquiries, actors are involved in executing "marketing practices" as they contribute to supporting of what value the customer manages to create out of core offering (Grönroos, 2011). To comprehend the ambiguity in these activities is congruent with using a practice lens to focus on the doings and sayings of actors (Schatzki, 2002). Actors' organizational practices are composed of social and material elements importance is appointed to use of ICT-systems, tools and other material (Schatzki, 2006; Orlikowski, 2007). Therefore, it was important to embrace the role that materiality plays in solving customer problems in this research (Orlikowski, 1992, 2007). To create an in-depth view of what actors do, how materiality is enacted in their practices, and how these elements are linked with each other was achieved by combining practice theory with ANT. Ethnographic methods, observations being the main collection method, ensured to understand actors' "lived experiences" (Geertz, 1973) and firsthand findings that were based on etic as well as emic approaches. Use of only etic data collection techniques cannot fully in-depth grasp what actors do and probably resulted in potentially biased and less rich findings based on information on "what they say they do" (Pickering, 1992).

In this research we present a framework based on Gehman et al. (2013) that introduces three key processes for the emergence of solutions: dealing with pockets of concern, knotting the solution, and implementing the soltuon. We make a distinction in three types of customer inquiries on basis of the complexity and tensions in the inquiry, which we named: low, moderate and high controversial inquiries that differ in three key processes for the emergence of solutions. As expected, the identified types of inquiries greatly differ in the first two key processes: dealing with pockets of concern and knotting the solution. We showed that each type inquiry leads to distinct ways how solutions are achieved for customers. We described the

characteristics of the practices in which actors engage depending on the type of inquiry as well as highlighting how the network of actors, with its social and material elements, is composed and stabilizes. The more complex an inquiry is, the more controversies are present and lead to establishments of bigger actor networks in congruence with the rate of stabilization of these networks.

To deal the customer inquiries, problems are firstly framed by actors and are conceptualized to be framed in a diagnostic, prognostic, and experimental manner. Postulated by Orlikowski (1992), the findings correspondingly show that actors' use of technology is influenced by their interpretative schemes. That is, the way that actors frame the customer problem affects how they go about using their ICT-systems and other software applications. In this sense, it was argued that materiality facilitates actors' practices in low controversial inquiries. In addition, the findings show that organizational knowledge is leading in the employment of the different practices of actors in solving customer problems and so are mostly situated in materiality and interaction, rather than standardization (Schembri, 2006). This is evident as actors immediately opt for interaction with other actors when uncertainty is present on how to approach the customer problem. Hence, actors are engaged in "knowledge practices" where they consult with each other to accumulate knowledge and use capabilities and resources of other departments (Day, 1994; Slater & Narver, 1994). This also coincides with the emphasis on operant resources in SD-logic as knowledge and skills are a paramount source in everyday organizing and a provide a competitive advantage in organizations (Vargo & Lusch, 2004).

This study shows that approaching interfunctional coordination from an SD-logic postulates the importance on understanding the dynamic nature of value (co-)creation with its focus on business processes and operant resources. Black boxing customer-driven heterogeneity clearly has impact on organizations internal processes and behaviors. Our approach in combining ethnography and an ANT-infused practice lens provides us with an elaborate insight into the micro processes of interactions between actors and group dynamics as well as the consequent behaviors of actors in response to reduce imposed customer-driven heterogeneity. We argue that interfunctional coordination is complex and the role that materiality plays in enacting actors' practices should be embraced as one can only understand this complexity thoroughly by tapping into the influence that materiality has on routines and practices. Irrespective of the engaged practices of situated actors, material elements remain inseparable from social elements. We believe that our study, and its proposed framework with the classification of types of customer inquiries and practices, advances the insight into the implementation of value co-creation practices by demonstrating how coordinated efforts of departments are affected by the dynamic nature of value. Hereby contributions are made to co-creation literature focusing on the alignment of practices between suppliers and customers (e.g., Grönroos, 2011; Grönroos & Helle, 2010, Payne et al., 2013). Especially the studies concerned with the value creating process of suppliers in the understanding of organization and employee issues related to successful service provision (Ostrom et al., 2015).

Managerial implications

Organizations should understand the complexity in handling customer inquiries in order to employ efforts into continuous learning about their actions (Vargo & Lusch, 2004). This is especially important since organizational learning can turn into organizational knowledge, while also being aware that customers and markets constantly change. The practical importance of this study is that the presented framework provides organizations with a comprehension of how actors deal with distinct customer inquiries and how they reduce uncertainties on how to approach problems to solve these. Subsequently, the framework shows managers the aspects throughout the process that need to be monitored thoroughly. While most coordination among actors is achieved through the dissemination of quasi-standards (Latour, 2005), this study explicitly shows that it is very difficult to capture and manage the idiosyncratic nature of customer inquiries in business. As complexity of inquiries rises, so does the dynamics in handling these inquiries. The findings elicit the instances where actors have to travel through considerable dynamics in terms of apparent discussions and interventions to reach a solution. Consequently, organizations should also understand and accept that not all situations can be captured into standard operating procedures. This is not meant to imply that standards are not important. However, instead of focusing too much on implementing standards to get a grip on heterogeneous situations, organizations need to leave enough room for these ambiguous situations to evolve. Certainly, considering that organizational knowledge is situated in ongoing practices, rooted in interaction and mediated by the technologies actors use, rather than standardization, control, and measurement (Schembri, 2006). Controversies should be embraced as it is needed to unveil the heterogeneity present: what exactly is the customer's problem/wish? Are there difficulties expected while handling the inquiry? Herein through the entanglement of social and material elements and internal tensions between actors, solutions for customers will be found.

Limitations and future research

Every research is concerned with limitations. This research is no exception. While we believe that the findings are rich and in-depth, this research is based on a limited number of events. Further research, also adopting unobtrusive collection techniques, would contribute to eliciting stronger characteristics that are distinguished in the three conceptualized inquiry processes. In addition, the retrospective events may be more inclined to response bias. Although to remedy this possible limitation, credibility was tried to be enhanced through verification of statements among the different key informants in those events as much as possible (Guba & Lincoln, 1985). Evidently, more research is needed to observe if the three conceptualized

processes could also be transferred to other industries and contexts to examine if the ways of reaching solutions for customer inquiries would result in similar outcomes (Guba & Lincoln, 1985). Transferability in this research was established by writing think descriptions. Actors in other industries might frame problems in different ways and travel through other types of controversies. Moreover, it would further improve the insights in the coordination issues of suppliers' own value creating process. Finally, to get a complete overview of the value creating process of suppliers, we also suggest that further research might look into handling customer inquiries in pre-sale and sale contexts, as this research mostly investigated inquiries related to post sale instances.

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