

# Software Product Customization: Resources and Capabilities that Drive Use and Exchange Value

*Completed Research Paper*

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## Abstract

*In customization projects, software vendors transform customer requirements into an IT solution based on an existing software product. Thus, software is not build from a scratch for new customers, but adapted based on a predefined set of functionalities. Although existing IS research has studied software development in relation to necessary resources and capabilities, research still lacks (1) a consideration of the type of customization resources and capabilities that a vendor must maintain to effectively deliver customization services, and (2) a consideration of how those affect use and exchange value on customer and vendor side. The present study aims at identifying the resources and capabilities underlying customization activities along with their impact on the various forms of use and exchange value in a customization context. By integrating vendor and customer perspectives, the resulting conceptual framework provides not only explanations from either side, but helps understanding balancing mechanisms among sources of value.*

**Keywords:** Software Product Customization, Packaged Software, Use Value, Exchange Value, Qualitative Research

## Introduction

The customization of software products to individual customers' needs has become a core business for the software industry (Cusumano 2004). Initially a purely product-oriented business with licensing fees as the primary revenue source, the software business has evolved into a full-service business with additional revenues from maintenance, consulting, and customization. For instance, in 2015 more than 50% of IBM's total revenue was generated by its consulting services, including product implementation and support (Statista 2016). Accordingly, various scholars argue that the software business has been transformed from a pure product business to a pure service business (e.g., Cusumano 2008).

In this study, we side with research that considers software product customization as a hybrid between tailor-made software and fully packaged software (e.g., Guvendiren et al. 2014, Light et al. 2007, Schaarschmidt et al. 2015a). Tailor-made software involves the service of identifying and discussing specific customer needs while the packaged software business comes close to a product oriented approach, where a product is delivered "as is". As customization may be viewed as a hybrid between tailor-made and packaged software, it may also correspond with the notion of being a mixture of product and service business (Schaarschmidt et al. 2015b; Väyrynen 2010).

In general, the customization of software to customers' requirements is provided by either a software vendor or a third-party IT consulting firm. In customization projects, software vendors transform customer requirements into an IT solution based on an existing software product (Sarker et al. 2012). Thus, software is not build from a scratch for new customers, but adapted based on a predefined set of functionalities. From a knowledge perspective, product software customization is an interactive process in which the customer and the software vendor integrate their knowledge to arrive at a solution that fulfills the customer's needs (Ko et al. 2005). In this context, Soh et al. (2000, p. 47) highlight that the knowledge gap among implementation partners of ERP software is usually significant as "only few organizational users understand the functionality of ERP enough to appreciate the implications of adoption [and] few ERP consultants understand their clients' business processes sufficiently to highlight all critical areas of mismatches."

We adopt the conceptualization of value by Lepak et al. (2007) to highlight that cooperative engagement in customization projects result in different forms of value for both the vendor and the customer, most likely use and exchange value. Use value emerges from using a new product or service while exchange value is the value that arises when a product (and associated knowledge) is exchanged (Vargo et al. 2008). Differentiating these types of value is important because different resources and capabilities needed to offer customized solutions might result in different forms of value for the vendor and the customer.

Although existing IS research has intensely studied the adoption of packaged ERP systems (e.g., Hong and Kim 2002; Howcraft and Light 2010), the provisioning of (customized) packed software (e.g., Brehm et al. 2001; Subramanyam et al. 2012), as well as knowledge characteristics of software product and services (e.g., Winkler et al. 2009) along with software development and software business resources and capabilities (e.g., Väyrynen 2010), it still lacks (1) a consideration of the type of customization resources and capabilities that a vendor must develop and maintain to effectively deliver customization services, and (2) a consideration of how such resources and capabilities affect use and exchange value on customer and vendor side (see Appendix A for an overview of related research). However, identifying relevant resources and capabilities that are conducive to providing packed software customization is important as software vendors may check which resources and capabilities they already possess and which they have to build or acquire. Thus, the present study aims to identify specific resources and capabilities that software vendor firms need to generate use and exchange values through software product customization. Our research question is formulated accordingly:

*Which resources and capabilities do software vendor firms need to generate use and exchange values through software product customization?*

The remainder of this article is organized as follows: First, we provide an overview of the existing literature on software product customization. Second, we introduce the resource-based view of the firm and the concept of value as our theoretical lenses for this study. Next, we describe the underlying research approach, including data collection, analysis and interpretation. Finally, the identified results are

discussed against already identified capabilities and resources in similar contexts. The article concludes with a short summary of the study's contributions, implications and limitations.

## **Customization in the Software Industry**

The term customization refers to the adaption of a product or service according to specific customer needs (see Kotler and Armstrong 2011). The general assumption in the literature is that customized products or services create higher benefits for customers because they deliver a closer fit to preferences (Franke et al. 2009). Based on this assumption, customization has become of strategic value for firms (Ghosh et al. 2006). It allows them to better match their offerings with customer needs, fosters customer satisfaction and loyalty, and potentially leads to increased delivery performance and profit (Fornell et al. 1996; Perdue and Summers 1991).

Not surprisingly, customization has become a central topic in information systems research (Schaarschmidt et al. 2015a). Thus far, a considerable stream of research addresses the manner of distribution (i.e., the packaging) of product software and considers customization in an “after-production” sense (e.g., Subramanyam et al. 2012). Researchers primarily focus on how software is delivered to customers in relation to distribution economics (Brocke et al. 2010; van Fenema et al. 2007; Weinmann et al. 2011), as the way software is tailored to customer needs may involve only configuring an existing software or might involve extensive reprogramming (i.e., modification of the software, Brehm et al. 2001). Packaged software, an incarnation of product software, is one particular approach to addressing the challenges of customization. For example, van Fenema et al. (2007) described packaged software as a “ready-made mass product offering users a solution-based design process aimed at generic customer groups in a variety of industries and geographical areas.” Chiasson and Green's (2007) definition of packaged software has a more general focus; those authors argue that an important question in the field of packaged software design and consumption involves determining what software can and will do to support, change, and inhibit organizational practices.

Another stream of research in the IS literature addresses the development side of software and in particular, customer integration during the development process. For example, Piller et al. (2004) state that “in mass customization, customers are integrated into value creation by defining, configuring, designing, matching, or modifying their individual solution out of a list of options and pre-defined components”. In a similar vein, Xin and Levina (2008) argue that clients not only customize software to their needs but also change organizational practices to fit software products. Additionally, there is research that has focused on tailoring software development methods. For instance, Fitzgerald et al. (2006) argue that factors such as organizational issues, distributed teams, and the existence of legacy systems require different or changed development methods. In a similar vein, Slaughter et al. (2006) describe the strategy and process fit as important to the development process. From their point of view, process customization or tailoring is important to fit the needs of specific organizations or projects. This involves adapting, particularizing, or selecting certain software processes.

In summary, a considerable stream of research addresses customization as a form of the co-creation of value (see Appendix A). As discussed, the IS literature has paid attention to customization as a way not only to realize economies of scales by adopting a “make one, sell many” approach but also to integrate customers into the innovation process. Surprisingly, the combination of both perspectives in relation to organizational resources and capabilities has somewhat been neglected by IS research. With respect to customization as it is understood in practice, that is, the service of customizing large-business software in the B2B context, customers provide knowledge in their areas of expertise and their requirements in multiple iterations (Soh et al. 2000). Thus, customers complement their vendors' knowledge at the technological and market levels not only at a distinct point in time but also continuously. Against this background, vendors in customization scenarios must develop particular resources and capabilities to be able to successfully deploy customization services because it is demanding to adhere to frequently received changes in system requirements (Schaarschmidt et al. 2015a).

## **Resource-Based-View and the Concept of Value**

The resource-based view of the firm (RBV) is one of the dominant perspectives in strategic management and acts as a basis for this research (Newbert 2007). At its core, the RBV states that the resources or the

bundles of resources a company possesses are a necessity for achieving competitive advantage (cf. Barney 1986, 1991; Conner 1991; Peteraf 1993; Wernerfelt 1984). Since its introduction, the RBV has become one of the most widely accepted theoretical perspectives for explaining the conditions under which a firm may gain a sustained competitive advantage (Armstrong and Shimizu 2007). Management scholars have debated the relative importance of internal firm resources and capabilities (cf. Prahalad and Hamel 1990) versus environmental factors (cf. Porter 1979) to sustaining competitive advantage. Evidence suggests that both internal and external factors are crucial to competitive success (cf. Hart 1995). The distinction of resources and capabilities that unfold resources' full potential has also been applied to various IS phenomena (e.g., Liu et al. 2013; Roberts et al. 2012; Wang et al. 2013).

This study builds upon three essential theoretical concepts from the RBV: the concept of resource, the concept of capability and the concept of value (see Table 1). According to the pertinent literature, *resources* are the stock of available factors owned or controlled by the firm and converted into products and services using a wide range of firm assets and bonding mechanisms (Amit and Schoemaker 1993). Relatedly, *capabilities* are defined as information-based, tangible and intangible firm specific processes that are developed over time through complex interactions among the firm's resources and used in combination to deploy resources (Amit and Schoemaker 1993). According to Day (1994), three fundamental types of capabilities can be recognized in almost all types of businesses: Outside-in capabilities, spanning capabilities, and inside-out capabilities. In this study, we predominantly focus on out-side in and inside-out capabilities as these are closely related to customization activities (i.e., vendors and clients both receive and provide product-related knowledge). Spanning capabilities, which refer to the combination of outside-in and inside-out processes to integrate various forms of knowledge, are not at the core of this study. *Outside-in capabilities* are outward facing. They place an emphasis on anticipating customer requirements, creating durable customer relationships, and understanding competitors (e.g., market responsiveness, managing external relationships). Thus, outside-in capabilities facilitate a firm's capacity to identify knowledge (Wade and Hulland 2004). *Inside-out capabilities*, on the other hand, are inwardly focused. They are deployed from inside a firm in response to customer requirements and opportunities (e.g., technological or organizational development). Thus, inside-out capabilities increase a firm's knowledge application capability (Wade and Hulland 2004).

Finally, the extended theoretical lens of the RBV includes the concept of *use value* and *exchange value* as defined by Lepak et al. (2007). According to them, *use value* refers to the specific quality of a new task, product, or service as perceived by users in relation to their needs. However, these judgments are to a high degree individual-specific and include, for instance, the speed or quality of performance of a new task or the aesthetics or performance features of a new product or service (Bowman and Ambrosini 2000). Use value may occur at vendor (e.g., log files that explain customer usage patterns) and customer sides (Vargo et al. 2008). *Exchange value*, on the other hand, refers to the amount paid by the buyer to the producer or the specific quality of customer knowledge assets, and it is realized when a product or service is sold.

<b>Table 1: Theoretical Lens</b>	
<b>Code structure</b>	<b>Description</b>
<b>Resources</b>	The stock of available factors owned or controlled by the firm and converted into products and services using a wide range of firm assets and bonding mechanisms.
<b>(Inside-out/ Outside-in) Capabilities</b>	The firm's capacity to deploy resources. Capabilities are generally used in combination based on organizational processes to affect a desired end. Capabilities can be characterized as information-based tangible and intangible firm specific processes developed through complex interactions among the firm's resources.
<b>Value</b>	Use value or exchange value: Use value refers to the specific quality of a new task, product, or service as perceived by users in relation to their needs. Exchange value refers to the amount paid to the producer or the specific quality of customer knowledge assets, and it is realized when a product or service is sold.

## Methodology

The study draws upon the work of Ulaga and Reinartz (2011) on service capabilities in hybrid offering scenarios. Regarding the overall research design, it includes the phases of qualitative inquiry proposed by Miles et al. (2013): data collection, data condensation, data display, and conclusion drawing and verification. Furthermore, to ensure research quality, the study reflects on their practical standards of (1) objectivity and confirmability; (2) reliability, dependability, and audibility; (3) internal validity, credibility, and authenticity; (4) external validity, transferability, and fit; as well as (5) utilization, application, and action orientation. From a methodological viewpoint, the findings of our research are expected to contribute to theory building in the area of resources and capabilities in software customization, so our results are subject to be generalized to theory rather than to description (Baskerville and Lee 2003).

### *Empirical Site*

Based on insights from the analysis of the software customization literature, we crafted a semi-structured interview guide that aimed at identifying the key characteristics of software customization as well as the resources and capabilities necessary to provide valuable software customization activities. Data for the study were collected through twenty-three semi-structured interviews with key informants of German small to medium-sized vendor and customer organizations operating in the business-to-business software development and implementation industry. Specifically, we conducted thirteen interviews at software vendor firms and nine interviews at customer firms (see Table 2).

The interviews aimed to gather an in-depth understanding of customization experiences from both the vendor and the customer perspectives. Informants on both sides were people with several years of experience in customization projects, such as CEOs, CTOs, Senior Developers/Consultants and Department Heads; they were identified via a snowball method. Respondents from the vendor side represent industrial companies operating in various product markets including health care, mechanical engineering, social platform applications, software for service firms, monitoring and work-flow systems, email marketing and document management as well as consultancies and business intelligence. With one exception, the sample ranged from small- to mid-sized software companies employing up to 110 people. The exception is from the health care business and is a holding company that employs 8000 people in total. The respondents from the customer side represent industrial companies operating in various service or product markets including utilities, financial services, telecommunication services, IT services in the aviation industry and consulting services. With the exception of one large customer in the aviation industry, the sample ranges from small- to mid-sized software companies.

<b>Position/Role</b>	<b>Customer</b>	<b>Vendor</b>	<b>Total</b>
<i>CEO/CTO</i>	9	1	<b>10</b>
<i>Managing Director</i>	0	3	<b>3</b>
<i>(Senior) Project manager</i>	2	5	<b>7</b>
<i>Senior Consultant/Developer</i>	1	1	<b>2</b>
<i>Entrepreneur</i>	1	0	<b>1</b>
<b>Total</b>	<b>13</b>	<b>10</b>	<b>23</b>

In developing the sample, we aimed to maximize diversity among the participating firms so that critical customization resources and capabilities could be uncovered. However, the study participants and firms also needed to share some characteristics to allow for comparability. With respect to the vendor side, we only conducted interviews in firms that develop and customize their own software product or that provide software customization based on third-party products with a substantial amount of own development and standardization activities. That is, we did not focus on “simple” software adaptation through setting parameters as described by Brehm et al. (2001). Regarding the customer side, we aimed for firms where

the software solutions used represent an important part of the company's business functionality. In a similar vein, we sought diversity in the functions and hierarchical levels represented by the participants. With the desired focus on key informants, we needed participants that were empowered to make influential decisions for their representative firms. Therefore, we invited only senior-level managers to participate. The respondents' ages ranged from 31 to 55 years. Finally, the qualitative sample consisted of key decision makers in 22 vendor or customer firms. Regarding the exploratory nature of the study, the sample size is consistent with the sample sizes recommended for such research as described by McCracken (1988).

### **Data Collection**

The interviews were semi-structured to focus on the participants' experience of customization activities and on customer integration and innovation topics from both software vendor and customer perspectives. During the interviews, informants were encouraged to talk freely about their real life experiences with customization projects. The implementation of the interviews followed the guidelines introduced by Myers and Newman (2007).

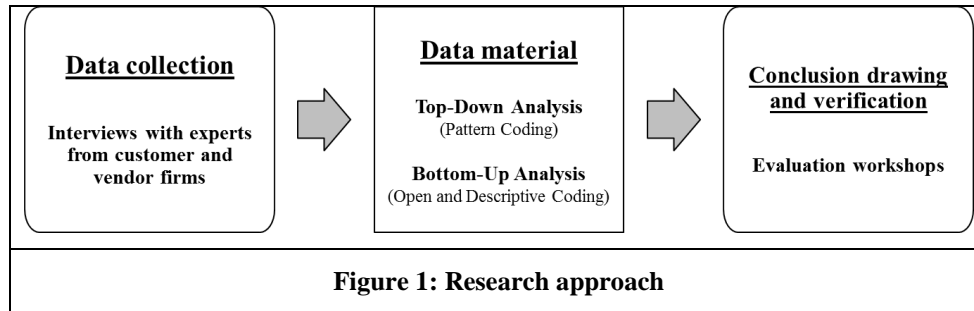
The vendor and customer interviews followed the same overall structure: In *the first part* of the interviews, respondents were informed about the topic and aims of the interview. Then, as an "ice-breaking" opening question, they were asked about their position in the company and how long they had been working for that company. This question was initially used as an easy entry question to help the respondents relax at the start of the interview and was not aimed to gather relevant data. In *the second part*, we asked the participant to talk about the products and/or services that had been adapted to meet the customer's needs and how the customer was involved and integrated in those customization activities. This part of the interview aimed to generate examples of customization activities and experiences and to develop an understanding of different types of software customization. In *the third part*, we asked participants about their own experience with customization projects in their company. In this section, we mainly attempted to understand how managers judged the efficiency and effectiveness of customization outcomes beyond revenues and margins. Finally, in the *closing section* of the interview, respondents were asked to report their views of the customization activities needed to address customer solutions. We also asked for any potential topics that they felt had not been addressed in the interview but that might also be of interest in the domain of customization.

To avoid the potential pitfalls of interview research (Myers and Newman 2007) such as "active listening" (McCracken 1988), we carefully phrased questions to elicit responses in an objective, nondirective manner. We also tried to let the interview participant choose the direction of the interview, only intervening when a topic shifted too far from my objectives. Our main objective was to facilitate the emergence of key characteristics, capabilities and resources grounded in the manager's own language rather than to capture already specified variables.

### **Data Analysis and Interpretation**

The interviews lasted between 45 minutes and two hours. Each interview was audiotaped and transcribed verbatim. This resulted in approximately 400 pages of raw interview material for this study. Regarding the exploratory nature of this study and our post-positivistic stance, we applied an analysis approach that can be characterized as hybrid top-down/bottom-up approach.

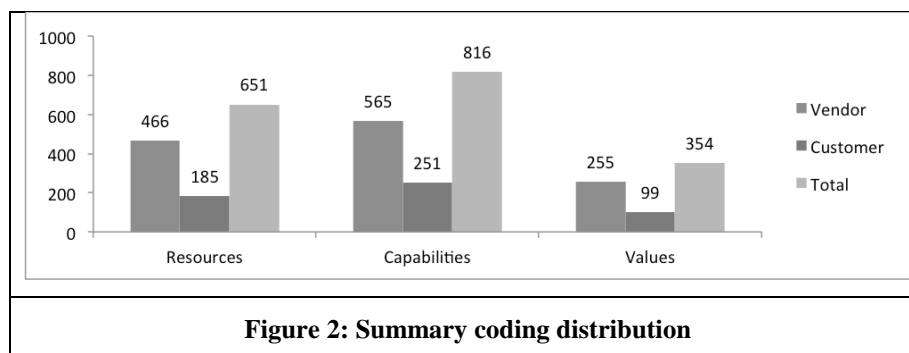
Top-down, we employed existing theoretical concepts, such as resources, capabilities, and value, as the theoretical lens. Bottom-up, we used first and second-cycle coding mechanisms to identify instances of those concepts in the interview transcripts. This approach enabled us to structure the analysis and simultaneously left us the freedom to develop finely granulated instances of theoretical concepts. The aim of the analysis was to detect variation and similarities in how informants experienced customization projects and their influence on the software vendor's competitive advantage. Figure 1 illustrates the hybrid research approach.



During the *first coding cycle*, we tried to grasp an overview of basic themes and issues in the text material. For this purpose, we employed a holistic coding approach that aimed to capture and represent the essence of text excerpts or passages (Dey 1993). Holistic coding is a very common coding technique with no preliminary restrictions. It is applicable to cases in which qualitative researchers already have a general idea of the data to be investigated and allows them to “chunk the text in broad topics, as a first step to seeing what is in there” (Bazeley 2003, p. 67). In the *second coding cycle*, we used *invivo* and descriptive coding to further analyze the holistic codes (cf. Saldaña 2009; Miles et al. 2013). Both coding techniques are very simple but helpful for developing a more specific picture of the data material. While *invivo* codes are useful to highlight interesting concepts directly in the data material, descriptive codes help summarize the data.

We coded each new transcript starting with the holistic codes most relevant to our research concerns and compared the resulting codings with preliminary coding outcomes. Thereby, we developed a coding plan that included the identified resources, capabilities and values, that specified respective properties for each of these constructs and that delivered several examples to illustrate the construct’s meaning and context. To decide whether to include a specific resource, capability or value, we followed the advice of Tuli et al. (2007) and relied on three key criteria: First, is the resource, capability, and/or value applicable beyond a very specific context? Second, did multiple participants mention the resource, capability, and/or value? And third, do the resource, capability, and/or value go beyond the obvious to provide interesting and useful conclusions? The formal coding process was independently conducted by two of the three authors.

Following the described approach, our analysis resulted in an overall amount of 1821 codings. Of these codings, 651 codings could be allocated to the concept of resource, 816 codings to the concept of capability and 354 to the concept of value. Figure 2 illustrates the distribution of codings among the theoretical concepts and interview participants. As one can see, codings related to the vendor dominate, which is a consequence of the unequal distribution of interviews (13 vendor interviews and 10 customer interviews). The figure also reveals that a comparatively large number of resources and capabilities lead to a comparatively low number of values.



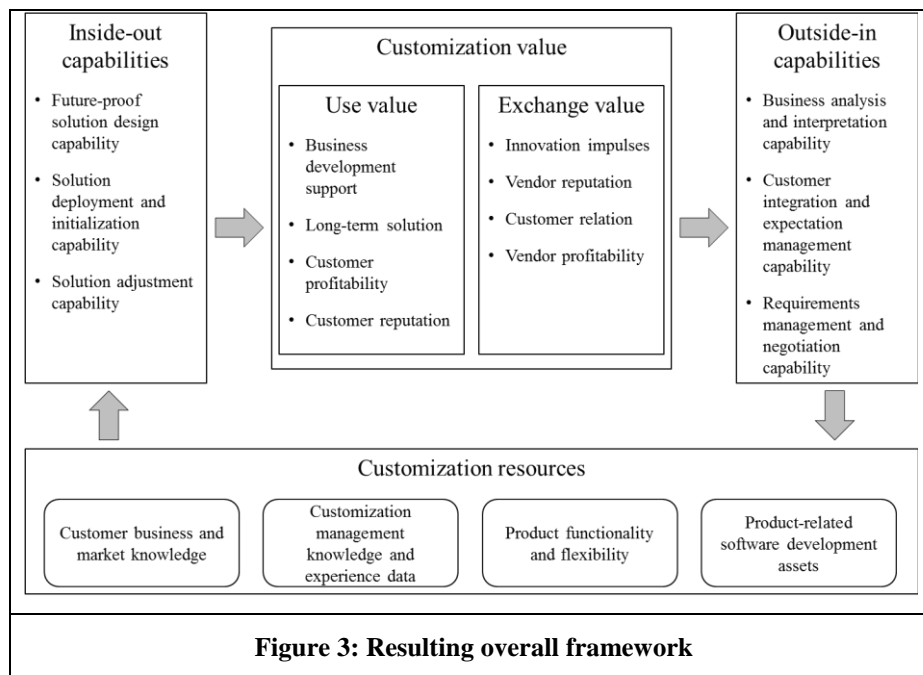
Finally, we integrated all resources, capabilities and values into an overall framework and reviewed the scheme for internal consistency and refined the wording of the definitions and the selected examples. As a check of our findings’ (external) validity, we conducted evaluative workshops with managers from two companies who individually reviewed the results and provided feedback on how actual practices are

reflected. They agreed on the overall structure of the capability framework and provided only minor suggestions regarding the wording of resources, capabilities, and value, as well as of their definitions.

## Findings and Discussion

Following the described research process, this study identified four unique resources, six distinctive capabilities and eight types of value conducive to software customization, which we provide in detail in the next sections. Crucial to this categorization is the difference between resource and capability, which we define in accordance with Amit and Schoemaker (1993) and Roberts et al. (2012). Resources relate to the stock of available assets, including knowledge, personnel, structure and processes a firm can control while capabilities relate to an organization's ability to successfully combine and recombine available resources.

As illustrated in Figure 3 the vendor's resources provide the foundation for value generation through software product customization. Employing inside-out capabilities, the vendor transforms the existing resources into a customer-specific, valuable solution. In a similar vein, through this transformation processes the outside-in capabilities absorb information and knowledge and integrate those into the vendor's existing resource base. However, financial aspects, such as customer and vendor profitability remain essential.



**Figure 3: Resulting overall framework**

### Customization Resources

The interviews revealed four resources conducive to offer customization services, which are summarized in table 3: (1) customer business and market knowledge, (2) customization management and experience data, (3) product functionality and flexibility, and (4) product related software development assets.

Software customization is not just about installing a software product in a customer's IT landscape; it includes the adjustment of technical and organizational processes on the customer side. Knowing both the customer and the business that the customer operates in is crucial for software vendors. The resulting knowledge of the customer's business characteristics as well as market knowledge represents a unique asset for most software customization vendors in our study. Therefore, we define **customer business and market knowledge** as the stock of resources invested in a firm's understanding of recent developments and needs in (potential) customers' businesses and markets.



Customer business knowledge, in particular, refers to the specific stock of resources invested in a firm's understanding of a certain customer's business implementation. It is a necessary prerequisite for identifying and defining customer value. It includes a profound knowledge of not only what a customer firm "thinks" it needs, but also what they might objectively need. As one project engineer from a customer firm explained, the responsible department might not always know how processes and structures are organized, but it still wants software to support those processes.

In contrast to customer business knowledge, market knowledge refers to the resources invested in a firm's understanding of developments in the software vendor's target market. Market knowledge is important for continuously providing state-of-the-art products and services and for identifying market opportunities for both the vendor firm and its customers. Customer firms expect the vendor company to not only provide them with a software product that fits their needs but also to enlighten their understanding of the "standard business".

In customization projects, it is not just important to know what a certain customer needs or what a market has to offer; software vendor companies also need knowledge of how to manage customization projects and of how the previous customization projects with customer firms have performed. Multiple patterns from the analysis have revealed that customization management knowledge combined with experience information from earlier customization projects is a unique asset for software firms. Therefore, we define **customization management knowledge and experience data** as the stock of customization management resources and project data collected through a firm's history of completed and ongoing customization projects.

Customization management knowledge refers to standardized customization delivery processes, project templates and best practices, and different customization approaches. Combined with knowledge about the proposed type of customization project and its affiliated risks, these resources form an important asset that contributes to successfully managing customization projects.

The interviews revealed that some software vendors offer at least two types of customization approaches, following either a sequential waterfall-like process or a prototype-oriented agile project process. While the agile process is more flexible and less restrictive with respect to project communication and milestones, the sequential process is more suitable to minimizing the risks from multiple customer changes. Depending on the customers' previous experience with customization projects and their expectations, vendor firms tend toward using one or the other. In particular, the sequential process is used for standard customization projects and the more agile process is used for innovative customization projects.

Software is a product of the human mind and therefore tacit and intangible. Understanding a software product's core functionalities and flexibilization potential is therefore essential for successful customization projects. Thus, we define **software product functionality and flexibility** as the stock of business functionalities already implemented within the software product and the flexibility supported by the service provider.

This resource refers to the product's existing business and technical functionalities that support general and anonymous market needs as well as the ability to change those functionalities according to the customer's specific requirements. While the product's existing functionality is important for realizing standard services, its flexibility enables it to react to customer specific requirements or innovative customization projects. These aspects are contradictory but crucial for successful customization delivery. For software product customization, this is the existing product's functionality and flexibility.

The third unique resource aims to capture what several interview participants described as "the (product or solution) standard". For vendor firms, a profound knowledge of their product's functionality and flexibility is important to evaluate the potential and the risks of customization projects. Customization projects that can be managed using standard functionality are usually less innovative, and the risk of not fulfilling the customer's expectations is lower in these cases. Customization projects with a higher need for flexibility also mean a higher risk for the vendor and customer company.

Software customization is all about bringing customer-specific functionality into the customer firm and providing reliable adjustment mechanisms. Software development or source-code development represents the most flexible but also the most complex customization mechanism. In B2B scenarios, sometimes requirements cannot be implemented without additional development. Thus, software

development techniques represent a unique and valuable asset for vendor companies. We therefore define **software product related development assets** as the stock of resources invested in the firm's software development infrastructure.

From a technical point of view, several techniques or types of customization activities exist. Customization can either be realized by configuring one (often monolithic) application by setting database switches, changing configuration files, or parameterizing several software modules to build the desired solution. Furthermore, customization can be realized by extension programming. Especially in complex and/or innovative customization projects, the product's existing functionality is often not sufficient to fulfill the customer's needs, and the software product provides rich development functionalities and support. In these cases, solution providers need product-related software development know-how and the associated assets to ensure support services and product update security. Table 3 illustrates the interview participants' quotes regarding customization resources.

<b>Resources</b>	<b>Example quotes</b>
<b>Customer business and market knowledge</b>	The most important things are processes. The department sometimes does not even know how their process works, but wants software to support it. The definition of processes, who works with what, when do they work with it, is there additional data need, and if where does it come from, are other departments involved? Many project engineers do not look what is going on in other departments. Filtering this is one of my tasks.
<b>Customization management knowledge and experience data</b>	Projects are evaluated up front and categorized as standard or innovative projects. Standard projects are managed by professional services. In innovative projects, the software development department is involved because a higher degree of innovation is needed. Usually, those projects are accompanied by a market analysis. Those innovative projects are initiated by the customer asking for a pilot project or a prototype.
<b>Product functionality and flexibility</b>	For me, customization is adapting a standard software product to my actual needs. For instance, usually the software product has some kind of database with standard input fields. But it is also possible to add new fields that are important for my organization and which no one else needs. [. . .] The next level of customization is the adaption of business processes supported by the software product. However, in this case, consulting activities provided by the vendor become more and more important.
<b>Product-related software development assets</b>	Our industrial services are not products in the original sense. We develop customer-oriented, customer-specific individual software solutions. Our projects always include a solution-solving process. Our software products are pre-structured and pre-developed tools provided by Siemens, SPS Software or S7. Those are [third-party] standard products that we use as a basis for individual solutions.

**Customization Capabilities**

The interviews revealed six of those distinctive capabilities, as summarized in table 4: (1) business analysis and interpretation capability, (2) customer integration and expectation management capability, (3) requirements management and negotiation capability, (4) future-proof solution design capability, (5) solution deployment and initialization capability, and (6) solution adjustment capability.

The **business analysis and interpretation capability** refers to a service provider's ability to analyze a customer's business needs, interpret them based on existing customer business and market knowledge, and reflect those needs against supported business functionality and flexibility in an existing software product. For instance, as an interview participant from the mechanical engineering industry explained. According to our interview analysis, this ability includes but is not limited to the following capacities on the provider side: (1) adapting to a customer's way of thinking; (2) anticipating future

solution usage (and requirements); (3) identifying and communicating optimization potentials when working on the customer side; and (4) actively presenting new product features to customers. The underlying primary resources for this capability are customer business and market knowledge and product functionality and flexibility.

The **customer integration and expectation management capability** refers to a provider's ability to integrate customers into the customization service and to manage customer expectations to successfully meet defined (and undefined) goals. With respect to expectation management to earn a customer's trust has been emphasized as an important aspect. Additionally, this capability also includes tasks such as (1) identifying key users and integrating them early and continuously; (2) leading customers through complex situations; (3) explicating customer expectations to reduce the risk of unsatisfying service outcomes; and (4) managing the vendor's reputation during a customization service to increase the firm's chances of being retained for follow-up projects. Although capabilities usually draw on a number of different resources, the underlying primary resources here are customization management knowledge and experience data.

The **requirements management and negotiation capability** refers to a provider's capacity to manage customer requirements during a customization project, including gathering, prioritizing and managing the state of customer requirements, along with negotiating conflicting requirements. We therefore define requirements management and negotiation capabilities as a customization provider's capacity to harvest requirements from—partially incomplete—sketches of customers' business needs and to negotiate unexpected (and conflicting) requirements to provide an optimum customer solution based on the functionality of existing products. For instance, channeling customer input is one important aspect of requirements management. According to our interviewees, this capability includes (1) anticipating future usage scenarios related to customer and product development; (2) professionally handling unexpected customer requests; (3) fostering a commitment to customer requests; and (4) using IT systems to store and track customer requests. The underlying primary resources for this capability are product functionality and flexibility, customization management knowledge and experience data.

Regarding the study's results the business analysis and interpretation capability, the customer integration and expectation management capability, and the requirements management and negotiation capability are outward facing can be related to the outside-in type of capability. They emphasize anticipating customer requirements, creating durable customer relationships, and understanding competitors (e.g., market responsiveness, managing external relationships). Thus, these **outside-in capabilities** facilitate a firm's knowledge identification capacity (cf. Wade 2004). In customization projects, these capabilities are responsible for identifying customer knowledge and integrating external resources into the vendor's existing resource base.

The **future-proof solution design capability** refers to a vendor's capacity to design a future-proof software solution based on existing product functionalities and a specific customer's needs. For instance, rebuilding interfaces of existing legacy systems might facilitate a customer's transformation from one solution to another. According to our interview analysis, this capacity also includes activities such as (1) integrating customers into the design phase, (2) respecting customers' experiences with legacy systems; (3) setting up a flexible design process (due to the non-sequential nature of customization services); and (4) managing the non-technical aspects of product customization. Because using existing templates from former projects can be considered a best practice, the underlying resources for this capacity are customization management assets and customization experience data.

**Solution deployment and initialization** refers to a vendor's capacity to deploy a designed solution to a customer and to initialize that solution by migrating data from existing sources to provide a useful system. According to our interview results, this capability includes (1) providing customers with all of the information (and competences) needed to use deployed solutions (e.g., training, support, documentation); (2) migrating data from different sources to initialize solutions; (3) having a capacity to integrate a solution into an existing IT landscape; and (4) resolving potential conflicts with third-party systems (e.g., firewalls, drivers, virus scanners) on the customer side. Data migration in particular was mentioned as an important capacity. Vendor firms often develop their own tools to facilitate customer migration to their systems. The underlying resources for this capability are product functionalities and flexibility, along with product-related software development assets.

Finally, **the solution adjustment capability** refers to a vendor's capacity to adjust a deployed solution according to upcoming requirements both during and after the initial implementation. Customers expect service providers to handle post-implementation requests. According to our interview analysis, this capability includes capacities on the provider side, such as (1) providing workarounds for requirements that have not yet been implemented into the solution; (2) providing internal training to consultants and developers that support customer solutions; (3) providing user support, particularly when a delivered solution requires process changes in the customer's organization; and (4) storing and tracking customer requests. The underlying resources in this case are the provider's customization management knowledge and experience data.

Regarding the study's results solution design, deployment and adjustment capabilities are inward focused and can be highly related to the inside-out capability type. They are deployed from inside the firm in response to customer requirements and opportunities (e.g., technology or organizational development). Thus, these **inside-out capabilities** increase a firm's knowledge-application capability (cf. Wade 2004). The design, implementation and adjustment of customer-specific software solutions strengthen the knowledge application capacity of a firm and provide use value for the customer. Table 4 illustrates the interview participants' quotes regarding customization capabilities.

<b>Capabilities</b>	<b>Example quotes</b>
<b>Business analysis and interpretation capability</b>	Our problem is not to provide software. Our problem is to understand the machines that need to be automated. How do they work? What are their technical processes? Imagine a rolling line that produces filled chocolate: the sheath must be cast, centrifuged, and cooled. The chocolate must be filled in. Once we understand how this works, we can start thinking about software.
<b>Customer integration and expectation management capability</b>	Our consultants and project managers need to earn the customer's trust to be able to do their jobs. This is essential for customization services. If our consultants make promises, they have to keep them.
<b>Requirements management and negotiation capability</b>	Some customers flood you with trivialities. Others are more professional. Depending on that, we organize interface structures for channeling customer input.
<b>Future-proof solution design capability</b>	If our system has to replace a legacy system, we start by rebuilding known processes to provide a solid foundation for future developments.
<b>Solution deployment and initialization capability</b>	We are in a very good position in regard to data migration. Our conversion tools are able to integrate data from the most important products of our rivals.
<b>Solution adjustment capability</b>	Exactly! We must actively develop the best possible solution for the customer in consultation with the customer. It is important to discuss upcoming (customer) ideas during the implementation process. One cannot expect to deliver a specification and six months after the product is developed.

### **Customization Value**

The strategic management literature defines two types of value: use value and exchange value (Lepak et al. 2007). Use value refers to the specific quality of a new task, product, or service as perceived by users in relation to their needs. Exchange value refers to the amount paid by the buyer to the producer or the specific quality of customer knowledge assets, and it is realized when a product or service is sold. The analysis undertaken revealed four types of customization use value and exchange value.

### **Customization Use Value**

The analysis of interviews revealed that use value in software customization projects can occur in different forms. In particular, we identified four types of customization use value: (1) customer profitability, (2)

business development support, (3) long-term solution, and (4) customer reputation. Table 5 summarizes interview quotes regarding customization use value.

**Customer profitability** refers to the monetary value that customer firms generate by using or implementing customized software solutions. It is one important issue that drives use value in customization projects. In B2B scenarios, software is not used without a purpose, and generally it has an economic purpose. Customer firms implement software solutions to reduce costs, optimize operationalization, or a combination of both. Customer profitability might be reached by reducing costs, for instance, by reducing person hours per task or by optimizing tasks and enabling customers to deploy more services to their customers.

Implementing information systems therefore is seen as an investment, which must pay off over time. In contrast to tailor-made software solutions, customized software is based on a product and a service “standard” that is continuously developed and maintained by the vendor firm. A customized software solution is regarded as being more profitable for a customer firm because it initially includes extensive business logic, which continuously grows based on the vendor’s installed base. However, the customization of software products is still a complex and expensive project. It includes tasks that keep the workforce from daily business. With respect to customer profitability, customization therefore must produce real customer value.

**Business development support** refers to the vendor’s support of the customer’s business development activities. Business development on the customer side has several challenges: business development is not an everyday task, and as such, it reduces the working time of employees in their original line of responsibilities. It is also high risk because of possible user frustration or resistance to change. Furthermore, business development is hard to estimate due to the uncertain number of changes during the implementation process. Thus, instead of building individual solutions, customers prefer to profit from standards for doing business. The most important step is to identify the need to do something.

As highlighted, business development is expensive and not an everyday task for customer firms. Customer firms therefore search for solutions that provide **long-term value** for their core business. Thus, a long-term solution refers to the long-term value that customized standard software provides for customer firms. Customization projects cannot be seen as individual incidents. They are often an important part of a firm’s business development strategy. Therefore, from a customer perspective, long-term standard solutions with the option to adapt to environmental changes offer important value gained through software customization. Long-term solutions also include a set of planned and ad-hoc customization approaches for a specific customer. Those customizations might occur during implementation, adaption or maintenance projects.

Finally, customer companies use software implementations to **support their reputation**. Customer reputation refers to the reputation a customer firm or employee gains by choosing a specific software solution. Strong software product brands such as SAP or Oracle are often used to communicate process maturity and stability, especially when those products and the underlying services are certificated by third-party companies or institutions. Additionally, the maturity and stability of process implementation has a strong effect on the firm’s internal and external compliance. Table 5 illustrates the interview participants’ quotes regarding customization use value.

Table 5. Selection of use value quotes	
Use value	Example quotes
<b>Business development support</b>	The most important thing is to realize the necessity to do something. In my opinion, we cannot realize that on our own. Informal discussions with vendors are a trigger to realize that there is something we can or should do.
<b>Long-term solution</b>	Our software product is now 11 years old and I think it will be here for at least 11 more years. That means it is a long-term project and no “fire-and-forget” software. Our software base has to be maintainable and also be able to react to upcoming technological innovations.

<b>Customer profitability</b>	Customization is additional work! For me, it is important that the process of customization is finished quickly and that the implemented solution helps me to realize my daily tasks better than before. Successful customization helps me to be more effective and does not mean additional work on my side.
<b>Customer reputation</b>	If we centralized customer data, it is our duty to protect that data. This is important for our customer firms. We used sophisticated software systems.

### Customization Exchange Value

The analysis of interviews revealed that exchange value in software customization projects did not only take a monetary form. In particular, we identified four types of customization use value: (1) vendor profitability, (2) vendor reputation, (3) customer relationship, and (4) innovation impulses. Table 6 summarizes interview quotes regarding customization use value.

**Vendor profitability** refers to the amount of money a customer firm is willing to pay for a specific customization service. From a vendor perspective, this amount must be higher than the expenses to make a customization service profitable. Vendor profitability is, therefore, the most important exchange value to keep the vendor company alive. In software customization, vendor companies generate monetary exchange value in many different ways, for instance, (1) licensing fees for software products or additional components, (2) service fees for project management, consulting and customization services, and (3) revenues from maintenance and support contracts that accompany professional business software. Despite these “classical” forms of revenue, vendor companies are always searching for new innovative business and revenue models, such as pay-per-use or rent-based approaches. In sum, vendor profitability must be confirmed for every customization project in one form or another.

**Vendor reputation** refers to the reputation that vendor companies gain by implementing a software solution in a customer’s company. This refers to the internal reputation within a certain customer’s firm as well as the vendor’s reputation in a market segment of potential customers. Reputation is a very important form of exchange value for vendor companies. To develop a good reputation, it is necessary to earn the customer employee’s trust. A vendor might build a reputation by delivering a project in time and on budget or by actively managing a customer’s expectations. However, a good vendor reputation is not merely a “soft skill”; it is rather essential for vendor firms’ business. For instance, as the interview participant from the aviation industry explained, customer firms maintain ranking lists of potential supplier firms to select partners for future projects.

**Vendor-customer relation** refers to the vendor and customer relationship. A good customer relationship is important to gain acceptance on the customer side and to successfully promote solutions internally. A good vendor-customer relationship is also essential for building a good business relationship. Software vendors that have good relationships with their customers might be included in strategic decisions and thereby strengthen the position of their products and solutions.

For example, as the employee from the aviation industry explained, from the customers’ perspective, a software solution should be able to react to changing requirements in their structures or processes. However, changing complex information systems is difficult. Over time, vendor and customer firms gain experience with each other’s business philosophy, and it is possible to establish less formal channels for communication. Customer firms value those channels because they allow them to be more flexible.

In software customization, **innovation impulses** refer to customer-induced need for innovation that leads to product, service or strategic enhancements on the vendor side. They may influence the vendor on a different level and lead to incremental or radical innovations. As the name indicates, innovation impulses are not innovations in that sense that they represent a direct commercial success. However, they might be the foundation for innovation potential. In software customization, innovation impulses might be in the context of (1) the product, (2) the service, or (3) the strategy.

First, product innovations might be reporting a bug, experiencing unclear functionalities or receiving customer-specific requirements that are then implemented to enhance the software product functionality or quality. According to the interview with the partner from the car service company, customer induced product innovations on this level are essential for the development of their software product. Second, service innovations influence the vendor service proposal and provisioning behavior. An important

customization service is the data conversion from one system to another. Conversion occurs during migration projects or in interfaces between different software components. Integrating and providing reliable conversion tools enhances the vendor's service offering and is somewhat expected by the customer. Finally, strategic innovations refer to enhancements in the vendor's general business or revenue model. For instance, as one vendor explained, they might be able to enter a different line of business according to the experiences from a specific customization context or could change their own revenue model from license-based revenues to a per-per-use model. Table 6 illustrates the interview participants' quotes regarding customization resources.

<b>Table 6. Selection of exchange value quotes</b>	
<b>Exchange value</b>	<b>Example quotes</b>
<b>Innovation impulses</b>	Without customer input we are helpless. Practice changes in practice outside. The requirements become more complex and sophisticated, and we have to adapt to this situation. Perhaps we even have to become a pioneer by claiming this functionality, or this technology helps the customers do their business better or faster. Then you have advantages over your competitors.
<b>Vendor reputation</b>	We have contracts with several software service providers. We maintain a list of several indicators for those suppliers, such as revenue, performance, and so on. We evaluate this list every year. When selecting partners for complex projects, we consult that list.
<b>Vendor-customer relation</b>	Now, we have a very good relation established with our IT service provider. So, we can communicate short-term change requests. Of course, we try to keep those short-term requests at a minimum. We are aware that those requests often imply a lot of work effort on the supplier side.
<b>Vendor profitability</b>	In the end, a successful customization project depends on revenue generated through services.

## **Conclusion and Outlook**

### **Summary**

The investigation at hand aimed at identifying specific resources and capabilities that software vendor firms need to generate use and exchange values through software product customization. This research aim was addressed by employing a qualitative research design based on textual data collected from 23 interviews with experts from software vendor and customer firms. Informants on both sides were people with several years of experience in customization projects.

### **Theoretical and Managerial Implications**

The results were integrated into a conceptual framework largely built upon the arguments of the RBV (Wernerfelt 1984; Barney 1991) and the concepts of use and exchange value (Bowman 2000; Lepak 2007). Conceptually building upon the work of Ulaga and Reinartz (2011), it was found that resources and capabilities are the most important factors for describing software product customization activities from a vendor perspective. Customization resources are the basis of this framework and are the basis of inside-out capabilities. During the customization process, these inside-out capabilities, which rest on the firm's internal resources, drive customization value in the form of use value and exchange value. In turn, both forms of value are conducive to outside-in capabilities, which strengthen the firm's strategic resource position in the long run. In contrast to a pure competitive advantage perspective regarding capabilities output, the applied concept of value provided a broader understanding of successful customization activities. Thus, extending existing considerations in IS research (e.g., Sarker et al. 2012; Balient 2015), by integrating vendor and customer perspectives on value, the framework provides not only explanations from either side but also helps understanding balancing mechanisms among sources of value.

The study offers at least two new important implications for academic inquiries in service-oriented information systems research. First, most previous studies have taken a limited view of customization from an adoption perspective by trying to answer the question of how software systems can be implemented in customer firms (e.g., Howcraft and Light 2010). In contrast, this study investigated customization activities from the software vendor's perspective. This study contributes to the vendor-focused customization literature by introducing six distinctive capabilities for customization activities and identifying unique properties and dimensions for each. Although previous studies have investigated capabilities in the software business (e.g., Väyrynen 2010), our study connects the identified capabilities to four underlying unique customization resources. Second, customization projects provide continuous interfaces for knowledge exchange between customers and solution providers. To date, IS research has focused on the outside-in perspective on this knowledge exchange and left the inside-out perspective mostly to disciplines such as general management or software development (cf. Roberts et al. 2012). In line with Subramanyam et al. (2012), considering software product customization from an integrated service perspective requires including both views to respect the reciprocal nature of the knowledge exchange in customization projects. The overall framework of (knowledge) resources and capabilities is a starting point for further investigations in that area.

From a managerial perspective, our findings provide insight into the factors that drive success in software product customization and their relationship to service provider innovation activities. Our study identifies four unique resources and six distinctive capabilities that customization-providing firms must recognize, secure, and grow if they wish to succeed in customization services and benefit from those services in their innovation activities. Henceforth, managers can use our framework as a guideline for how to change their existing customization practices and as a starting point for defining customization service benchmarks.

### ***Limitations and Further Research***

As is the case for any research project, the one presented here is not free of limitations. First, this research had a focus on German SMEs, however, necessary customization resources and capabilities may be different for different cultures. For example, Soh et al. (2000) report that a misfit between vendor offering and customer processes is more prevalent in Asian contexts as many ERP packages reflect European or U.S. industry practices. Second, in our research we focused on customization scenarios that involve reprogramming packed software. Results may differ if one considers parametrization and configurations of packed software only. In addition, choosing a specific research method creates characteristic limitations. For this explorative and qualitative study, generalization towards a population or description is limited, but the findings contribute to theory building. Thus, this study's generalization pertains to "generalization from description to theory" as suggested by Baskerville and Lee (2003). To ensure statistical, sampling-based generalizability, the natural next step would be an empirical validation of the proposed relationships between resources and capabilities, and between capabilities and different forms of derived value. Furthermore, future research should investigate customization resources and capabilities more deeply by triangulating vendors' and customers' perceptions with data gathered from case studies within product-developing firms. This extension would provide an interesting contrast by differentiating between service- and product-development-related innovative activities and provide deeper insight in the nature of the spanning capability in software product customization (Wade and Hulland 2004). Another possible avenue of research would be transforming the current findings to other upcoming context, such as the customization of cloud-based systems (Walraven et al. 2014). Although these limitations and future research possibilities must be kept in mind, we hope to have provided new insights on resources and capabilities in software product customization for both practitioners and academics.



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Appendix A. Related literature					
Author	Focus	Study type	Main contribution	Customization capabilities identified?	
Brehm et al. (2001)	Differences between configuration and software modifications in ERP implementation (vendor-focus)	Conceptual paper	Overview of maintenance activities and responsible actors as well as development of a typology of ERP tailoring types	no, but different ERP tailoring types may act as a basis to identify capabilities	
Balient (2015)	Fit between business processes and packaged software (vendor focus)	Simulation study	Simulation results that illustrate the conditions under which customization is likely to provide value to the organization, as well as conditions under which customization should be avoided	no	
Haines (2009)	Customization of Enterprise systems (vendor focus)	Qualitative study in five Enterprise System implementation cases	Identification of key influence factors on customization	no	
Howcraft and Light (2010)	Packaged software selection adoption by organizations (customer focus)	Longitudinal, in-depth study in SMEs	Offering multiple views on packaged software adoption by SMEs including functionalist views and critical/constructivist view	no	
Sarker et al. (2012)	Cocreation of value with packaged ERP software (cocreation focus)	Revelatory case study of the relationship between an ERP vendor and its partners	Identification of different mechanisms underlying value cocreation within B2B alliances	no	
Soh et al. (2000)	Misfit between ERP packages and customer needs (cocreation focus; although named differently)	Conceptual paper	Identification of various forms of ERP package-customer need misfit including data, functional, and output misfit	no, but several forms of misfit identified, which may be used to identify necessary capabilities	
Subramanyam et al. (2012)	Effects of component modularity (granularity) on development efforts and customization efforts (vendor focus)	Empirical analysis of design, development, and implementation of 92 business software components (from one firm)	Results suggest that components that are coarse grained are associated with higher flexibility (lower customization effort) but are also associated with lower development efficiency (more development effort and defects)	no	
Väyrynen (2010)	Software business in industrial companies (vendor focus)	Case study with interviews at two companies	Identification of 20 capabilities conducive to competitive advantage that have different impact for different types of software	yes, several, including: - Software business capability - Product business capability - Service business capability ..but no customization focus	