Digital Service Innovation

A Case Study of Web-based 3D Configurator in a Construction Context

Oscar Lundberg
Abstract

Innovating with digital technologies is becoming increasingly necessary as firms seek to remain competitive. Previous scholarship has showed how digital innovation can be managed to be competitive and gain value creation internally. However, the use of diverse digital resources in creating novel services has shaped an opportunity for research in Digital service innovation (DSI). To date, DSI have started to spread in Information System research. However, to understand DSI and its associated value creation dynamics – the relations between internal and external IT-based value creation are unreported. Therefore, in drawing on a qualitative case study of construction firm’s use of DSI capabilities through a Web-based 3D Configurator. This thesis aims to understand its role and dynamics between internal and external IT-based value creation. The results illustrate the role of the Web-based 3D configurator as a fundamental means for delivering both internal and external values. Contrasting previous research, the findings reveal how the firm first needed to achieve external IT-based value creation before internal IT-based values could be realized. This findings contributes to a deeper understanding of DSI and its value creation dynamics, which in the future can be a starting point for creation of new frameworks in managing DSI.

Keywords: Digital service innovation, Web-based 3D Configurator, Heavyweight IT, Lightweight IT, Servuction, Dynamic value creation

1. Introduction

Digital technologies have started to intertwine with business, work processes, human beliefs (Tripsas, 2009), expanding internal platforms, infrastructures (Tilson, Lyttilinen & Sørensen, 2010), and business strategies (Bharadwaj, El Sawy, Paylou & Venkatraman, 2013). This change has led to a trend of producing more digitalized products that generates external value creation intended for potential consumers (Yoo Henfridsson & Lyttilinen, 2010; Yoo, Boland, Lyttilinen & Majchrzak, 2012; Fichman, Dos Santos & Zheng, 2014; Nylén & Holmström, 2015). Digital technology have also proven to enable and increase the opportunities for innovation (Yoo et al. 2010a), provide more internal productivity, increased access for users and realize a creation of more exclusive service-based value creation (Barret, Davidson, Prabhu & Vargo, 2015). We have recently seen how several radical innovations as Facebook, Spotify, Uber and Skype utilize digital technologies for delivering values to consumers. These innovations have in common that they are not about delivering a physical product. Rather, their focus lies in creating novel experiences and new forms of value creation. Therefore, they can be categorized as digital services. This shift toward innovation in intangible goods, referred as service innovation (Lush & Nambisan, 2015) has proven to be an engine of growth that generates competitive advantage in the marketplace (Barret et al. 2015).

This realization of novel rebounding digital services have given a rise to new paradigm of value creation (Kristensson, Witell, & Gustafsson, 2014; Barrett et al. 2015), shaping an opportunity for the term digital service innovation (DSI). DSI is critical to understand. In particularly, we need new knowledge on the new forms of dynamic values and uncertain
outcomes enabled by digital technologies (Yoo et al. 2010a). However, the literature has largely overseen the new forms of value creation dynamics in DSI. Specifically, in terms of, the relationship between internal and external IT-based value creation. I argue, in order to fully understand the nature of DSI, specific attention must be paid to understand its associated value creation dynamics. To date, we lack a potential lens to understand DSI, including the perspective of how diverse relations between different forms of value creation appears. This paper proposes such lens built on Bygstad’s (2017) classification of IT; *Heavyweight IT* and *Lightweight IT*, Hoffman & Turley’s (2002) interpretation of Suurvation model grounded in Langeard, Bateson, Lovelock & Eigler, (1981), and Lush & Nambisan’s, (2015) perspectives on value creation. This combined lens are applied to a case study, asking: *What is the role of a digital service innovation in a construction context and what are the associated dynamics of internal and external IT-based value-creation?*

To explore this research question with the objective of generating a rich understanding of how the dynamics of internal and external IT-based value creation appears in DSI, I conducted a qualitative case study at Construction Corporation (CC) (fictionalized name). CC is a small firm that builds its business around DSI capabilities, using a Web-based 3D configurator (W3DC) for selling and mounting building kits. The W3DC is a digital service located at CC’s website, through which customers can create and order a building. The main source of data is eight semi-structured interviews with respondents in different roles, gender and length of engagement in the firm.

The findings illustrate that the role of DSI within CC was the grounded fundament for being competitive on the market and delivering external values. The W3DC enabled value creation dynamics that were uncertain and previously unthinkable for CC, generating both internal and external IT-based values. However, internal value creation was heavily dependent on the realization of external value creation. This thesis makes several contributions. First, it contributes with a rich empirical understanding of the role of W3DC, in value creation processes at CC. Secondly, it contributes to research in DSI through revealing a new perspective on value creation dynamics in term of the relationship between internal and external IT-based value creation. Finally, these findings may serve as a starting point for the creation of future frameworks for managing digital service innovation.

2. Theoretical framing

This chapter explains the theoretical framing used in the thesis. It starts with describing digital artifacts and digital service innovation (2.1). This is followed by a clarification of my combined lens; Bygstad’s (2017) classification of *Heavyweight IT* and *Lightweight IT*, Hoffman & Turley’s (2002) *Suurvation model*, and Lush & Nambisan’s (2015) perspectives in value creation and service innovation in the digital age (2.2).

2.1 Digital service innovation

Digital artifacts, “bundles of material and cultural properties packaged in some socially recognizable form such as hardware and/or software” (Orlikowski & Iacono, 2001, p. 121) play a significant role as firms seek to generate innovations (Yoo et al. 2010a; Barrett et al.
Digital artifacts have several fundamental capabilities which enable improved service quality, including fast information storing and sharing, self-modification and co-creation, (Nambisan et al. 2017). Because of their editable, interactive, reprogrammable, and distributable abilities (Kallinikos, Aaltonen & Marton, 2013), digital artifacts have proven to be enablers of new types of innovations (Yoo et al. 2010b). The overall phenomenon of organizations leveraging digital technologies to create innovative products or services is referred as digital innovation in Information System research (Yoo et al. 2010a). However, in digital innovation, the outcome of the innovation process does not have to be digital. In fact, digital innovation can be a leverage for improving internal work processes (Nambisan et al. 2017). Furthermore, digital innovation has proven not only to be relevant for traditional IT firms but to most industries (Yoo et al. 2010a). Some firms have even introduced new role, the Chief Digital Officer (CDO), to better understand and utilize the capabilities of digital technologies (Tumbas, Berente & Vom Brocke, 2018).

Combinational effects in digital innovation have enabled new forms of value creation in the design and use of services (Yoo et al. 2012), sparking a shift towards innovations in intangible goods referred as service innovation (Lusch & Nambisan, 2015). Here we have seen several radical innovations that are based on digital intangible goods, e.g. Facebook, Google, Skype, Spotify and Uber. Except from the radical and discontinuous nature, (Nylén, 2015) they all have in common to be services relying on the capabilities of digital technologies, realizing an opportunity for labeling them as digital service innovations. More specifically, the term digital service innovation (DSI) is defined as the “rebounding of diverse [digital] resources that create novel resources that are beneficial (i.e., value experiencing) to some actors in a given context.” (Lush & Nambisan 2015, p 161). This definition conveys an extension of opportunities for new value creation and innovations, and offers theoretical means for exploring and conceptualizing the role of digital technologies in service development and utilization (Lush & Nambisan, 2015). Still, while scholars in the broader marketing and management literature have generated important insights on the role and management of service innovation (Den Hertog et al. 2010; Gallouj & Savona, 2009; Kristensson et al. 2014), is the concept of service innovation, pointed out by Barret et al. (2015) remained somewhat ambiguous, especially as to its role and meaning in the emerging digital age.

In a nascent paper in MIS Quarterly, Lush & Nambisan (2015) try to extend the understanding of service innovation by including the effects of digital technologies in a Service-Dominant logic (S-D logic) perspective. The founders of S-D logic Vargo & Lush, (2004, 2008) defines service as a process of co-creating, utilizing knowledge and skills to generate value. However, this perspective of services is somewhat controversial: The difference in products and services do not exist, everything should be interpreted as services. Products are means, tool or equipment for creating or delivering a service (Vargo & Lusch, 2004, 2008). For example, a physical car is a tool for delivering the service of driving.

### 2.2 Value creation in digital service innovation

To understand the role of DSI, its value creation dynamics and the relationship between internal and external IT-based value creation in a construction context, I synthesize and apply Bygstad’s (2017) classification of Heavyweight IT and Lightweight IT, Hoffman & Turley’s

With the increasing complexity of internal digital technologies at different organizational levels (Yoo et al. 2010a; Bygstad, 2017), it is necessary not to black box digital technologies and comprehend what purposes different digital technologies have and what values the companies wants to create internally within the firm and externally to customers (the retriever of the product or services) (Vargo & Lush, 2008; Orlikowski & Iacono, 2001). Based on Internet-of-things and socio-technical knowledge regime research, Bygstad (2017) tries to open up the black box and separate IT into two categories: Heavyweight IT and Lightweight IT. In this context, the term knowledge regime refers to players and groups that harvest and disseminate concepts that affect policy-making. Knowledge regimes can be seen as organizational processes and technology woven in relations with solid realities engaged by work performance, the work performance itself, and the larger shared settlements that reflect and account for the suitable use of such performance. Accordingly, Bygstad (2017, p.187) argues that Heavyweight IT represents a “knowledge regime, driven by IT professionals, enabled by systematic specification and proven digital technology, and realized through software engineering”. Heavyweight IT is complex, specialized and expensive, driven by software engineering in a longer period of programming. It is characterized as internal IT that provides value-in-use inside a firm, e.g. PCs, integrated technologies, internal servers, databases, internal communication systems or ERP systems (Bygstad, 2017). In contrast, Bygstad (2017, p.181) defines Lightweight IT as “…socio-technical knowledge regime, driven by competent users’ need for solutions, enabled by the consumerisation of digital technology, and realized through innovation processes”. Examples of lightweight IT are smart phones, tablets, applications or user driven systems. This separation of IT into two categories provides a perspective for understanding how different types of IT enable different forms of value creation. However, this classification is not enough of understanding the value creation dynamics of DSI.

The servuction model is a theoretical framework created by Langeard et al. (1981) with a wide diffusion in service and marketing research (Langeard et al. 1981; Bateson & Hoffman 1999; Hoffman & Turley 2002). The framework conceptualizes services encounters between a firm and its customers, building upon two sets of components; (1) Back-end systems and work processes that are invisible to customers. (2) Front-end systems and work processes that are visible to customers. Visible systems and work processes can be further divided into three environmental zones, “the inanimate environment, contact personnel and the influence of other customers”. (Hoffman & Turley, 2002 p. 35). The inanimate environment is the “nonliving” that affects customers retrieving a service. This includes external layout and design variables, point-of-purchase and decoration variables. Contact personnel refers to the living human beings in the environment that affect the service encounter stage. Other customers simply refers to other customers that affect the retrieving of services (Hoffman & Turley 2002). Figure 1 describes the relations between each actor, and how services are encountered.
In scrutinizing Bygstad’s (2017) classification of heavyweight IT and lightweight IT, there are notable similarities to Hoffman & Turley’s (2002) explanation of survuction theory, in respect to what is visible and invisible to the customer. Heavyweight IT e.g. (PC, integrated technology, internal servers, databases, internal communication systems or ERP systems) are strongly linked to what Hoffman & Turley (2002) mean by invisible systems, which are in the back-end operations of an organization. Likewise, the user driven lightweight IT e.g. (smart phones, tablets, and applications) are similar to what Hoffman & Turley (2002) labels a visible systems. Combining these two separate scholarly conceptualizations offers a clearer view of how different types of IT affects service encounters, and what characterizes value creation dynamics in a context of digital service innovation.

However, to understand value creation dynamics, how it encounters between a firm’s heavyweight IT’s interpreted as invisible systems for the customer and lightweight IT’s interpreted as visible for the customer, applies Lush & Nambisan, (2015) perspective of value creation. Applying a service dominant perspective on value creation, internal value cannot appear in the value-in-exchange phase. This means that internal value creation only occurs when the firm has internally experienced a specific value (Lush & Nambisan, 2015). For example, a firm may have heavyweight IT in the forms of an internal and invisible ERP system for managing work. The main purpose of the ERP system is to increase the productivity of work inside the firm, generating internal values. However, value creation does not occur automatically as the ERP system is implemented and used by the employees (value-in-exchange), it is when the employees are retrieving positive experiences and benefits from it, described as value-in-use, (Lush & Nambisan, 2015). We therefore need to take into consideration that value-in-use is heavily context-driven and depending of purpose of use. Contexts are unique and differs, which mean that the definition of value-in-use can also vary. Sometimes the value-in-use is created in new forms of collaborations internally or interpreted as value-in-use differently by a unique employee. This means that value-in-use are dynamic.
and can change over time (Lush & Nambisan, 2015). The service dominant perspective is also applied to understand external value creation. External value creation is created by the firm or co-created by the retrievers (customers) to streamline the value creation process externally to the retrievers. However, value creation need to be in the value-in-use phase, when the retriever are experiences benefits from the created or delivered values (Lush & Nambisan, 2015).

The classification of IT, Heavyweight IT and Lightweight IT (Bygstad, 2017), and an understating of how services encounters (Hoffman & Turley, 2002), together with a clarification of value creation internally and externally (Lush & Nambisan, 2015), resulting in an appropriate lens for understanding DSI and its value creation dynamics. The combined lens is summarized and presented in Table 1 below.

<table>
<thead>
<tr>
<th>Theory</th>
<th>Term</th>
<th>Description</th>
<th>Term</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology (IT)</td>
<td>Heavyweight</td>
<td>Well-established knowledge regime of large systems, developing ever more sophisticated solutions through advanced integration. IT department owned. E.g. Databases, servers, PCs.</td>
<td>Lightweight</td>
<td>New knowledge regime of mobile apps, sensors, bring-your-own-device, Internet-of-Things. User owned, more available and cheap. E.g. Mobile phones, tablets, applications.</td>
<td>Bygstad (2017)</td>
</tr>
<tr>
<td>Servuction model</td>
<td>Invisible</td>
<td>Systems and work that are in the back end (invisible) for the customer.</td>
<td>Visible</td>
<td>Systems and work that are in the front stage (visible) for the customer.</td>
<td>Langeard et al. (1981); Hoffman &amp; Turley (2002)</td>
</tr>
<tr>
<td>Value-creation</td>
<td>Internal</td>
<td>Values created inside a firm that are value-in-use inside the firm.</td>
<td>External</td>
<td>Values created by firm or co-created by customer that are value-in-use for the customer.</td>
<td>Lusch &amp; Nambisan (2015)</td>
</tr>
</tbody>
</table>

Table 1: The combined lens.

3. Method

This chapter explains how the research that forms the basis for the thesis was conducted. It starts with a presentation of the chosen methodological approach, including research context, sampling strategy of the study (3.1). Next, the chosen data collection method is described (3.2). This is followed by description of how the data were analyzed (3.3). The next section
covers the ethical considerations (3.4), and finally the limitations on the chosen methods are discussed (3.5).

3.1 Research approach
To accomplish scientific research, rigorous and relevant methods must be applied (Bryman, 2011). To answer my research question: “What is the role of a digital service innovation in a construction context and what are the associated dynamics between internal and external value-creation?” I chose a qualitative research approach.

While there is no single way of doing qualitative research (Ritchie & Lewis, 2003), there are certain key characteristics. Qualitative research gives the researcher a flexible research design to explore dimensions of the social world, focus of understanding participant’s experiences and imaginations in their social context (Mason, 2002). This approach generates rich data and unique opportunities for data analysis, interpretation and outputs (Miles & Huberman 1994; Mason, 2002; Ritchie & Lewis, 2003). These qualities gave me a clear view why my research was chosen to be of qualitative approach.

Since the goal with the investigation was to explore the role of a web-based 3D configurator, and participants use, decisions, beliefs and values regarding the digital service was a quantitative approach not an options (Bryman, 2011). I chose to apply an inductive approach since the objective was to find rich data in respondent’s perceptions, experiences, decisions, beliefs and values in relation to a phenomena (Mason. 2002).

3.1.1 Research context
I conducted an exploratory case study (Yin, 2003), of a small Swedish construction firm (Construction Corporation) (CC) (Fictionalized name). CC is family owned and was initially founded in 1936 as a furniture joinery for the Swedish defense. Today it produces, sells and delivers building kits for garages, cottages, stables, carports, machine halls and villas to domestic customers through a digital service (W3DC). CC are heavily invested in digitalization and innovation which have transformed their profile from traditional construction firm, to a technology, logistics and sales firm. The technology aspect is primly the use of internal IT and digital communication. Logistics are defined as their production, where they have moved from traditional construction production to buying services and carpenters to logistically distribute, package and deliver material. The sales are how information and service are distributed to customers through a digital service.

Overall, the construction industry has been slow in harnessing the benefits of digitalization (Gerbert et al. 2016; Rodrigues et al, 2016; Agarwal et al. 2016; Roberts, 2016). CC represents the difference, and stands out from a traditional construction context, showing a dramatic position of distinct processes and operations utilizing a W3DC. Therefore, doing a case study in their context was of huge interest, resulting in what Ritchie & Lewis, (2003) refers as critical case sampling. The exploratory case study approach was used to investigate the role DSI has for CC, for understanding its internal and external value creations, and how value creations relates with each respondents work processes.
3.1.2 Sampling

I used a non-probability sampling strategy, seeking to select respondents that reflect particular features individuals or groups within the sampled population (Ritchie & Lewis, 2003). The selected non-probability sampling are purposive, the respondents had particular qualities and interests in my research question to support a detailed exploration and understanding to represent the location of research context. The Vice-CEO at CC allowed me full access to interview every employee, which made my sampling strategy easier to apply. The respondents was strategically sampled to provide rich insights and experiences to answer my research question (Mason, 2002). The selected respondents had different roles, gender and experiences in the field to ensure that all the relevant respondents in the context are covered to strengthen the research and gather as broad nuanced data as possible (Ritchie & Lewis, 2003).

The selected respondents are fictionalized and presented as respondent 1, respondent 2 etc. to maintain anonymity. The respondents were between 22-40 years old, working in different roles with different levels of experiences and engagement in the firm. The duration of interviews was approximately around 30-50 minutes. More detailed information of the respondents is presented in Table 2 below.

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Role</th>
<th>Years in Company</th>
<th>Duration (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent 1</td>
<td>Sales</td>
<td>2</td>
<td>26.44</td>
</tr>
<tr>
<td>Respondent 2</td>
<td>Sales</td>
<td>1.5</td>
<td>37.18</td>
</tr>
<tr>
<td>Respondent 3</td>
<td>Sales Manager</td>
<td>4</td>
<td>46.13</td>
</tr>
<tr>
<td>Respondent 4</td>
<td>Production preparation</td>
<td>3</td>
<td>46.03</td>
</tr>
<tr>
<td>Respondent 5</td>
<td>Production Manager</td>
<td>3.5</td>
<td>39.23</td>
</tr>
<tr>
<td>Respondent 6</td>
<td>Constructor</td>
<td>2.5</td>
<td>25.37</td>
</tr>
<tr>
<td>Respondent 7</td>
<td>System developer</td>
<td>5</td>
<td>36.45</td>
</tr>
<tr>
<td>Respondent 8</td>
<td>Vice-CEO</td>
<td>12</td>
<td>59.52</td>
</tr>
</tbody>
</table>

Table 2: List of respondents.

3.2 Data collection

Since my research was a qualitative exploratory case study with focus of respondent’s use and perceptions of the W3DC, its role and value creation processes, I chose interviews as data collection technique (Kvale & Brinkmann, 2009; Yin, 2003). Conducting interviews enabled me to collect rich data, gain an understanding of the respondent’s world, develop meaning from their experiences (Kvale & Brinkmann, 2009), and personal opinions about the phenomena (Yin, 2003). The interviews were conducted according to a semi-structured approach, enabling me to prepare a relatively specific interview guide with key themes to
address. Furthermore, it allowed the respondents to speak freely and associate within the topic addressed during the interview. This flexible approach allowed me not to have all the questions in the right order, while still having a rough structure and control of what the interview should contain (Kvale & Brinkmann, 2009). The interview guide (Appendix 1) contained both open and closed questions, were informal questions were placed in the beginning to create a natural starting point. During the interview I tried to create as good interview climate as possible by constantly listening and using follow-up exploratory questions in areas that were of interest (Kvale & Brinkmann, 2009).

To gain as deep an understanding of the phenomena as possible while managing to transcribe and analyze the data within my resources, I conducted in total nine interviews, one pilot interview (excluded in the results) to get me prepared (Kvale & Brinkmann, 2009). All the interviews were performed in Swedish, face-to-face, on location at CC’s facilities, and later transcribed and translated by myself.

3.3 Data analysis

When conducting the data analysis, I first read through the transcribed interviews several times, and after having gained a general understanding of the material, I started to apply Braun & Clarke’s (2006) thematic analysis approach. The objective was to find and describe patterns across my qualitative data.

During the familiarization of the transcripts, I started to takes notes, and highlighting meaning units and patterns in bold text. Simultaneously, I made careful interpretation to generate a broader view of the material. To create my initial codes, I used a free software called QDA miner lite, I pasted the transcripts into the software and went question by question to create codes of a variety of sizes; phrases, sentences or whole paragraphs (Miles & Huberman, 1994). The goal of initial coding (the first sorting of the data) was to get a broad overview of the data, before going to the next phase. Difficult codes to understand were sorted, renamed, merged or erased with features in QDA miner lite (Braun & Clarke, 2006).

Later, all the initial codes were analyzed and gathered in broader categories, which Braun & Clarke (2006) calls potential themes – patterns in the data pertaining to the research question. To support the process of generating themes, I created an initial thematic map (Appendix 2) as suggested by Braun & Clarke (2006). The thematic map facilitated visual thinking in the process of generating themes, while supporting an iterative analysis process. It also facilitated the identification of “traps”; too many sub-themes, emerging themes and potential unclarified themes (Braun & Clarke, 2006).

Next, I reviewed and tested if the themes generated were related or overlapping, if there was too much or too little data to support each theme. Furthermore, I elaborated on whether any of the themes were unclear. I ended up in a final thematic map (Appendix 2). The results of the thematic map were next analyzed in iteratively, by going back to the transcripts and meaning units in QDA miner to find citations supporting each theme. Finally, I ended up with three themes: (1) internal value creation, (2) external value creation, and (3) dynamic value creation. These three themes constitute the foundation of the findings that will be reported in the thesis.
Applying the approach to thematic analysis outlined by Braun & Clark (2006) supported the data analysis process in several ways: For example, it helped me to manage the data in a reasonable way, analyze it in a structured manner, work iteratively without losing important data, and produce an understandable and concrete result (Braun & Clark, 2006). These supportive benefits are all important aspects when conducting and managing qualitative research (Miles & Huberman 1994; Mason, 2002; Braun & Clark, 2006; Bryman, 2011).

3.4 Ethical statements

It is important to take the respondent’s voluntary, integrity, confidentiality and anonymity in consideration when conducting a research (Bryman, 2011). Since “any research study raises ethical considerations” (Ritchie & Lewis, 2003, p. 66), this study follows Vetenskapsrådet’s (2002) four ethical principles for scientific research: (1) Information requirement: the researcher informs the individuals involved the purpose the study, who the research team is, how the data will be used, and what demands the researcher have of them (Ritchie & Lewis, 2003). (2) Consent requirement: the respondents are in charge of their participation, researchers will never force them to participate or answer certain questions (Vetenskapsrådet, 2002). (3) Confidentiality requirement: all the given information and personal data from the respondent’s (direct attribution) (Vetenskapsrådet, 2002), and contextual information that can reveal the company or the respondent’s (indirect attribution) are managing in a complete confidential manner (Ritchie & Lewis, 2003). The respondents participation are therefore anonymized which means that their identity was not going to be known outside the research team (Ritchie & Lewis, 2003). (4) Useful requirement: the gathered data from respondent’s and contextual research site was used for the research purpose and nothing else. These considerations helped me to conduct and manage a safe and secure qualitative study to protect me as researcher, the participant’s and the company as a whole.

3.5 Method discussion

Reflecting on my choice of methods, and the practical reality of collecting data within a given timeframe, I have identified a few limitations. A potential data collection method for this thesis was observations or a combination with interviews. However, observations in a combination with interviews was not an option, as it was estimated to be too time consuming for my thesis timeframe and resources. Observations alone was also interpreted to generate less useful data and not enough knowledge to answer the research question. The rich data from interviews was perceived as a more secure and manageable approach because of its focus of participant’s experiences, feelings and knowledge about the phenomena (Kvale & Brinkman, 2009). However, it would have been interesting to combine observations and interviews to get a broader perspective of the phenomena, especially for understanding of the fit between the W3DC and the respondents’ daily work routines.

Furthermore, interviewing customers would have been interesting for my study, giving another perspectives of value creation with the use of W3DC. However, the timeframe, resources and the ability to interview customers was not reachable. Additionally, my objective was to understand W3DC at an organizational level. Therefore, was employees as respondents the focus for obtaining the data needed.
4. Findings

This chapter presents my case study findings. I start by showing how CC created preconditions for their ensuing digitalization efforts (4.1). Next, I present how external value creation occurred at CC through the use of the W3DC (4.2). This is followed by a description of the internal value creation processes at CC and its dynamic relationship with external value creation (4.3).

4.1 Systematization as a precondition for IT-based value-creation

External and internal IT-based value creation at CC builds on their historical investment in systematization that later on was connected and programmed into code in their current digital systems. Already in the early 21st century the previous generation owner created a block system. The basic logic behind the block system was that every block should be 1.2 meters. This standardization of block sizes made the internal calculation process of understanding how much material needed, time per order, and drawing foundations much smoother. However, the current Vice-CEO perceived the manual calculations and order management methods required as tedious and extremely time consuming.

Since CC produces building kits, the block system was key to their ability to digitalize their business. The block system was the foundation that was built upon with additional systematization, rationalization and digitalization efforts which resulted in what the respondents now calls “the small-block-system.” The small-block-system was during many years of systematization saved and printed into an access database. The access database was (and still is) based on excel and google drive documents, built on the previous manual work of systematization of calculation methods, price lists and material lists of the small-block-system. The access database was later developed and programmed with new designed interface and functions as an intranet (The CC Portal). However, before the CC Portal was developed the access database containing all the small-block-system data was an enabler for developing the code for the current automation systems. The Vice-CEO explained that they initially searched for developers that could transform their systematization to code with the goal of automating and improving the firm’s internal work processes. The Vice-CEO clarified that CC’s knowledge and capabilities in systematization and abilities of describing how they wanted to automate their internal processes made the process of working with software developers relatively straightforward. The precondition of systematized manually written data in documents together with the internal knowledge about the data was explained for a developer that created code that connected each document with each other to generate automated functions. Instead of picking out and read the data in each separate document to manage work, the documents “merged” through coding, which generated automated functions that are used today to create major different effects of value creation. According to several respondents, CC’s digitalization journey would not have happened in the way that it did without the precondition of systematization:

“Many companies must have... they have harder to make the same digitization journey as we have done. Before you can digitize something, there must be some
systemization, you have to break it down, for otherwise it cannot be translated into code.” (Respondent 8)

Specifically, the precondition of systematization and later digitalization efforts at CC was realized in a digital service – the Web-based 3D Configurator¹ (W3DC) that both enabled internal and external IT-based value creation.

4.2 External IT-based value creation dynamics

Discussing the motivations behind launching the W3DC with the respondents, it was clear that the purpose was always to simplify for private individuals to sketch and purchase a building. Customers should not have to seek several offers from different suppliers to understand what is reasonable and suitable for them. They should be offered a service that indicates an approximate price and available services and products:

“Say you went to a clothing store, there are no colors no sizes, so you have to call stores and ask them. Just that little extra step, maybe turning some people looking for simpler shops, people expect... the more technology evolves, people expect things to be simple. Things should be simple, it’s not supposed to be [that you]... have to talk to a salesman about what shoe size I have and maybe have a hand to sell on me the extra shoelaces... it’s so nice that it’s clear... clear about what’s going on! This simplicity is very valuable for the customer!” (Respondent 4)

The purpose of digitalizing the manual work involved in calculating buildings and managing customer orders was not only to create a more efficient work processes for CC. The information from the access database was initially programmed by a developer as a new external digital service for the customers, a Web-based 3D Configurator. The W3DC builds on the small-block-system and based on the same data as the internal calculation methods, price lists and material lists. This development realized a visible representation of their internal calculation system for the customers with the high information transparency and novel service capabilities.

The purpose of the W3DC is to serve the customer with information built on 3D visualization models of products and services that CC offers. The W3DC is web-based, customers can via the CC's website without any demands of in log or special programs, design and configure their own building kit with a set of features that meet customer need, budget and what they think are a pleasant design. The customer starts with easy navigation to select which type of building (garage, cottage, stable, carport or machine hall) to configure. The customer uses the computer mouse or finger (on tablet/smartphone) to navigate inside the W3DC, to spin around the building, zoom in and out, and select between designated options for designing their building. The selecting starts with deciding size of the building, e.g. panel type, width and roof pitch, length, height, wall height, rule thickness, carport on gable side, roof fall side or none. Next step, the customer selects from the designated list what doors, ports or windows they want by dragging and placing them on the building they find appropriate. However, the placement of doors, ports or windows need to follow the W3DC logic of 1.2 meters blocks (the small-block-system), customers cannot place a door where they want. After the doors, ports and windows are chosen, customers are choosing “add-ons” and services: Foundation

¹ Respondents used the term 3D calculator and 3D configurator when describing the service. In this thesis I will use Web-based 3D configurator – W3DC
packages, underlay and outside roof, ground painting, air gap, roof drainage system, insulation package, installation layer and mounting kits. Customers can during the whole design process see price shifting (as a price-calculator) depending on how they are designing and what products and services they have chosen. Customers can deliberate on what they think are suitable and fitting their budget, need, and go back and change. When the design process is done, customers can send their created 3D-building as a link in an order to CC, through an easy klick via an integrated mail function with personal and contact information. (See Appendix 3 for how customer was involved with the use of W3DC).

The easy navigation and usability in W3DC and its capabilities has been acclaimed by the customers through surveys and phone calls with the sales department. Customers have underlined how easy it is to use it and commended the feeling of seeing prices shift. The visualization feedback creates concrete understanding of the costs and how the building will look in the future, which creates a self-confident for the customers:

“Well, that's a lot of people who call in and say, well ... “hello, that's great a thing, it's easy, fun and great, I'm sitting on the weekend and playing with it””
(Respondent 2)

The use of the W3DC is a practice of digital communication that relies on the transparency of the service. The fact that CC offers a digital service for free with all the information a customer need for purchasing a building, together with the ability in a user-friendly way to design their future building is the central key for enabling the external value creation. Essentially, CC gives power to customers to be involved in the construction process with a service in a digital and innovative nature. Customers can create their building in the way they want with a set of features and few limitations which generates high level of user satisfaction and a strengthened self-confidence.

A majority of the respondents argue that customer values rely on transparency of the price-calculator. The easy navigation to grasp what building size, height, windows, doors or additional add-ons one can afford, and the possibility of comparing offers from other competing firms generates a massive customer value. The 3D visualization also gives an easy and fast way for customers to visualize their thoughts and create a relative intention of how the building will look like. Respondent 3 is discussing the value creation for the customer in the use of the W3DC:

“Especially simplicity and accessibility, the customers can bring their phone, they can bring the computer or tablet wherever they can and sit and click and plan the building and feel confident that this is right. It's not just that customers can get the building kit together, they can even get in all their windows, all the insulation, and they gain an understanding of how it's going to be... “Oh this is what it will look like and cost”. That's the major value for the customer”. (Respondent 3)

Respondent 6 agrees and conveys a similar description of the customer's value creation process:

“Many customers choose us because they get a price indication... Maybe a customer is sitting.... a customer who has no 3D Calculator and... “Can I have a
window here, should I have a window here, or should I have a window here”, but they have not seen what it will look like in 3D... But then in the 3D calculator, the customer will get a little taste [...] So, I think it leads to greater self-confidence so the customer may feel that this is what they want. And at the same time, they have been sitting at home and feeling and thinking a little bit before sending an offer”. (Respondent 6)

3D visualization has taken marketing to another level at CC: Instead of having the traditional pictures on a website where customers can swipe between pictures of buildings in different views, the customer can now design their own building from scratch and see what it looks like in 3D, generating a self-customization effect. This customer-customization ability in relation to customer needs and budget, together with the 3D visualization generates a huge self-insurance and empowerment within the customer. Furthermore, it means that it is not a sales rep that is pushing customers to do purchase anything, it is the customer themselves that have the power what to choose, design and what they want their building to look like:

“I think it’s exactly that customer have sat and clicked in and... “I want this”. They can see what things are costing... and no sales rep has sad, “chose this”, sort of forcing them to purchase something... the customer can in peace and quiet, at home think and let it sink in... and possibly look up other offers to check if there are cheaper alternatives” (Respondent 5)

Several respondents stress that the logic of W3DC and its capabilities has contributed to increased customer satisfaction. The 3D visualizations create a clear understanding and indication of what a building will look like. The customer can actually “walk into” (zoom into) the building to see how their choices of products are manifested. This manifestation creates a visual feedback towards customers, a self-assurance. When customers experience a sense of self-assurance in their customization process the interest in the building is strengthened, customers feel that they configure “their building” and no one else’s. Furthermore, the simple HTML-based navigation strengthens the usability and availability of the service whereby customers can easily understand how it works. Customers can for example share their 3d-link in social media channels:

“So you just paste it in on Facebook or whatever you want: “Look at my building”. Then friends get exactly the same 3D view... and they can actually modify it and send back again and say ... “I think you should have these windows”. (Respondent 7)

4.3 Internal IT-based value creation dynamics

CC has the privilege that all its internal IT systems are developed in-house. The IT systems are grounded in their precondition of systematization and customized for CC’s needs and work processes. This fact along with having in-house programming staff gives CC a major competitive advantage. The employed IT-developers can constantly communicate with other employees in different departments working with the IT systems and improve them to generate internal and external IT-based value creation.
Several respondents refer to the core foundation of CC’s internal IT as the **CC Portal** for the realization of internal IT-based value creation. The portal is essentially the firm’s intranet, what the respondents pointed out to be a mixture of traditional CRM and ERP system. The key internal IT system contained by the portal is an automated **ordering system** which have the ability to print production drawings and picklists for the production department and create orders for the customers via the sales department. The ordering system with the W3DC, obtaining customer generated data to for basis for an offer. The W3DC is built on the same undelaying data as their access database of price lists, calculation methods and material lists. Therefore, the W3DC has a fundamental role in several department at CC. Since the W3DC is where customer starts the process of purchase a building kit, CC rigorously monitors website traffic:

> “19 out of 20 customer requests comes in through the 3D Configurator. Our entire website is in some way built to steer the customers towards using it, we have 3D-links connected to real pictures of buildings in our website that other customers have done in the 3D Configurator, actually many customers goes thought that and start configure” (Respondent 3)

The heavily internal utilization of W3DC verifies that CC are outlining their business strategy to be dependent of W3DC’s capabilities. This mean that value creations are dynamic, CC are dependent on the realization of external value creation towards customers. The retrieved external values by customers later generates the internal value creation though collaboration with their internal IT, generating automatization processes. When customers have created a building in the W3DC and requests an order\(^2\), the sales department retrieves an e-mail with a 3D-link representing customer’s configured 3D building. The sales rep goes through the customer designed building, if it looks fine they paste the link into a field in the ordering system. The embedded data in the link is then automatically transformed from figure into words as an offer. (See appendix 3 for how W3DC was used internally).

The automatization in the ordering system and the usability and collaboration with the customer via the W3DC has created major values for the sales department. Sales rep highlight that it is easier to come to an agreement with the customer and that it makes order documentation much faster:

> “It eases up our work now so terribly much! And clarifies to customers that they may have a picture of their future building. It speeds up everything, simplifies, and improves our internal work.” (Respondent 1)

Several of the respondents argue that the W3DC in and of itself does not generate substantial internal value creation. However, when using the ordering system together with the W3DC all the automatization functions were realized. This automatization has changed the way CC work, generating more productivity, effectivity, and managing more customer orders:

> “Well, the routines have changed a lot if we only focus on 3D calculator... but I’m thinking a little bit more about the internal IT-system: The employees do not have

\(^2\) Described earlier in previous chapter as the final step for the customer in using the W3DC.
to do things as they did before. The documents will be printed out automatically, which frees up more time so that they become more effective. (Respondent 7)

The sales department noticed that utilizing W3DC created a better understanding in customers about their small-block-system. This awareness in customers generated a positive shift from talking about price, products, services or what the customer wants to design, to provide customers service. Furthermore, the effects of W3DC gave sales rep a smoother sales process, the traditional sales process of selling on customer’s additional products or services is almost gone. The fact that W3DC is digital and a free service caused a tendency for the customer to choose between the alternatives of add-ons, which are referred as the previous sell on. This has not only generated financial profits for CC as a whole, but also a better relationship with the customer, instead of selling on focusing on providing service. Even more notable, customers have a tendency of not bargain about the price just because CC’s products and services are online on the web and easy to find and understand. This effect have made the sales process much more sufficient and faster to agree with the customer:

“Compared to after the calculator where we have a combined interface where we can get all the data through a few keystrokes, you do not have to settle down with a calculator and work manually...its big difference there ... you can put as a sales rep you can spend your time just servicing the customer, serve them with the ones they want answer quite fast”. (Respondent 3)

The W3DC together with the ordering system is not only generating internal value creation for the sales department. The production preparation department that work with creating building plot drawings, building foundation drawings and productions documentation lists, gets also automatically generated with the use of W3DC and ordering system. However, the production preparation can encounter problems with the use of W3DC and the ordering system. Customers have sometimes a building-dream that can be complicated and requiring extra design in what several respondents calls “special”. This special effect refers to what the W3DC cannot visualize. This results in that the ordering system cannot generate the special information from the customer automatically. This situation requires extra work for the production preparation department to draw new plot drawings in the drawing system CAD (computing-aided design) to create new production lists. This slows down the process, because the production lists are fundamental needed information for the production department to create building kits for the customers:

“Our blocks are 1.2 meters sections. So, a building can be 3.6 meters, it can be 4.8 meters, 6 meters. But if a customer says he wants a width of 5 meters, then we will not say it’s not possible, then it must be that we have 4 regular blocks, and one tiny block. But then then it becomes one special block that is shortened, less than 1.2m. And that it’s also not possible to make the 3D view on the fly [...] And it may be that, sometimes there is a problem of it, it may be possible to work around it, but it’s suddenly not as simple as the 3d link indicated anymore, at least not for us, maybe it’s not for the customer not playing an equal role, but it can be messy at our end. And sometimes it may be a situation that almost does not work, though it seemed to work 3d if you did. But anyway ... there are exceptional cases,
it’s not often anyway, but it’s a little disturbing when those cases arrive.”
(Respondent 4)

Furthermore, the ordering system and the W3DC have also a purpose for the constructor. The constructor has the task to calculate solidity of the buildings and to support the sales department with special buildings. Respondent 6 describes that the W3DC is a visual tool for creating a better internal communication with the sales rep that have treated the order. Respondent 6 is using the W3DC and the ordering system to get data-dimensions, (high, length, with, roof pitch and more) needed for calculating solidity. Respondent 6 puts the data in a similar fashion as the sales rep in the ordering system, but in a calculation system that automatically will calculate the solidity. This automatization spares the constructor enormous amounts of time which results in working with other more creative tasks. For example, develop new calculation methods for new features in the W3DC that can improve the constructors work even more.

In summary, CC is clearly a digitalized work place that relies on their effective internal IT and the automatization effects together with the available W3DC towards the customer to generate internal value creation. The easy and productive relation between the use of W3DC and the ordering system have created positive effects of the company culture. For example, CC only have one constructor working part time, one production preparation worker and six sales rep employed. The employees are young (22-40 years) and constantly working to find new solutions, they are not afraid of testing new internal IT systems and improve new features internally in the W3DC. The Vice-CEO noticed that their recruitment of new personnel have change because of the effective internal IT. CC can now recruit personnel that are fitting for the culture and representing the same values and visions as the company, rather than having the right competencies:

"But in this business, we might have needed five or six constructors. We have one constructor working part time up to now. Our carpenters or technical sales rep are not that in the paper... basically, they have come from everywhere. Because they do not need it, our systems are so good and it creates enormous power in the ability to build the culture as we want.” (Respondent 8)

The use of W3DC and the ordering system together with the CC Portal have resulted in more power of building the company culture as they want. Today they are more adaptive to change, working digital and agile which improves to accomplish their ultimate goal; to help each other internally to provide as good service and values towards their customers.

5. Discussion

This thesis reports on a case study of a construction company that builds its business strategy around effective internal IT systems and a Web-based 3D Configurator through which customers can create and order building online directly in their web browser. The thesis set out to explore IT-based value creation dynamics in digital service innovation, focusing on the relationship between internal and external value creation. My findings reveal the W3DC as a fundamental means for CC to achieve both external and internal value creation. This should be contrasted to the fact that CC, a family business with a long legacy in the industry was
historically highly focused on manual work. The findings showed how the W3DC first improved customer satisfaction, and later led to improvements of internal work processes. In this way, at CC, external value creation was an enabler for internal value creation. Thus, the overall value creation processes at CC occurred through interactions between customers’ use of the W3DC to order building kits, and the employees’ use of W3DC to create and deliver these building kits (cf. Lush & Nambisan, 2015)(see appendix 5). This finding stands in contrast to previous digital innovation research, which has mainly portrayed the opposite: Firms first innovate with the purpose of improving internal work processes and strategies for productivity to generate internal value creation, and later on engage in IT-based external value creation (e.g. Swanson, 1994; Yoo et al. 2010a; Bharadawaj et al. 2013; Fichman et al. 2014).

5.1 Changing service encounters

External value-creation – values which are created by firm (a provider) or co-created with customers and retrieved by a third party (e.g. customer, partners) (Lush & Nambisan, 2015) are presented in a new way with the use of the W3DC in contrast from before launching and utilizing it. The findings revealed three key external values facilitated by the W3DC. First in terms of transparency: the customers could easily access all the information needed, when they needed it, and prices would immediately update during the process as they made changes to the design. Second, the W3DC gave customers the power in their hands to design their own building according to their specific needs and budgets, without and having phone conversations with sales reps explain their needs and negotiate prices. Third, the 3D visualization generated self-assurance in the sense that customers are designing something very tangible that is theirs and no one else’s. Seen from Bygstad’s (2017) perspective, the W3DC is a prime example of Lightweight IT. The W3DC is of an innovative nature and it is free. It is also and user driven in the sense that customers are creating their own building and making their own design decisions. As a digital service, W3DC is in many ways an example of a new knowledge regime that is based on 3D representations and while being portable in the sense that it can be used on smartphones.

The findings explained CC’s role as the provider of the service, and the customers’ role as the creators of value-in-use. Accordingly, CC provide the value-in-exchange phase which mean no explicit realization of what Lush & Nambisan, (2015) describes as value creation. The value-in-use are created by the customers themselves which is when external value creation occurs (Lush & Nambisan, 2015). This co-creation of value means that customers (the user of the digital service) have the power of external value creation (Vargo & Lush, 2004).

Applying the concept of survuction theory, how services encounters unfold (Langerad et al. 1981; Hoffman & Turley, 2002) to the case, it can be argued that both service operation and service delivery system are now controlled by the customer. The realization of internal value creation is highly dependent on the external value creation process that is initiated by the customer. The W3DC is indeed a system that is visible to the customers as they create individual and tailor-made buildings, generating external values. Furthermore, the W3DC has changed the inanimate environment and how customers retrieve value. The traditional physical environment in which contact personnel is operating to deliver values has changed. Sales reps are not doing the traditional selling though phone and selling add-ons to customers,
which has created an improved relationship and communication with the customer, in the sense that customers are not feeling that sales reps are selling on something they not want. Now, customers first communicate with a free digital service in a digital environment, and later the sales reps. The massive amount of information, unique capabilities and usability of the W3DC has had a self-serving effect in that customers are in charge of the service operation system, which results in a new self-delivery system driven by the customers retrieving external values. (See Appendix 5)

5.2 The W3DC: Heavyweight IT or Lightweight IT?
In the literature, internal value creation is understood as values created and retrieved inside a firm to produce value-in-use (Vargo & Lush, 2004). The firm needs to retrieve benefits (values) and apply or utilize those to realize internal value creation (Lush & Nambisan, 2015). The findings showed that at CC; systematization as a precondition enabled a digitalization journey, which later realized as a digital service for customers that created a set of uncertain outcomes of value-in-use that was unthinkable for CC. From Bygstad’s (2017) perspective, the W3DC can be, on the one hand, be defined as Lightweight IT: It is user-driven, and customers are in charge of producing value-in-use. However, the findings revealed that the W3DC was so innovative and valuable for CC that it also triggered internal use, as a pedagogical tool for calculating buildings, creating a better internal communication between departments, and help customers with less digital competence to use it, presenting a visual representation of their created paper sketch. Therefore, on the other hand, it is such internal IT capabilities that Bygstad (2017) attaches to Heavyweight IT. Therefore, the W3DC somewhat challenges the logic of Heavyweight IT and Lightweight IT.

The findings revealed that in the case of CC, using the W3DC in tandem with various heavyweight IT systems traditionally used in the construction domain (such as the ordering system) realized a whole new arena of internal value creation across multiple organizational departments. First, the automation effect for sales reps, removing previously manual work – making their work much more efficient – resulting in managing more customer orders – gaining financial profits for CC. These combinations of Lightweight IT and Heavyweight IT are not fully visible for the customer but they serve as the foundation for internal value creation at CC.

The findings showed how internal IT-based value creation (value-in-use for CC) was dependent on the realization of external IT-based value creation: As customers have retrieved values from the W3DC, it next generates further internal value for CC. First, customers learned CC’s small-block-system and became “a better customer”, resulting in a smoother sales process and quicker agreements. Second, customers were provided with clear visual information of products and services in 3D representations and a high level of transparency concerning prices, which created a tendency of not bargain about price and improved communication for the sales rep to focus on delivering service and customer satisfaction.

Aside from the W3DC, the findings highlighted the CC Portal as a focal IT system at CC. In relation to Bygstad’s (2017) classification the CC Portal can easily be classified as Heavyweight IT: it is developed and maintained by professional programmers and relies on longer systematic work and more complex digital technologies that provides internal values.
However, applying Nambisan & Lush’s (2015) take on services, the value-in-use of the internal ordering system is generating internal values in and of itself. Customers need to generate a 3D-link as the last step of using the W3DC (retrieving external values), and deliver it to the sales department. If the customers do not complete this delivery, no values-in-use are retrieved internally through the use of the ordering system.

Applying servuction theory (Hoffman & Turley, 2002) to conceptualize the service encounters at CC, the CC Portal is an invisible core system, containing multiple IT-systems. These invisible IT-systems (e.g. automated price lists, calculation methods and production material lists) are completely unknown by customers. However, the findings showed that the W3DC was built on the same data as CC’s internal calculation methods, which in the sense revealed the previous invisible logic of small-block-system towards the customers of how to calculate buildings internally. This revealing of calculation method questioners if parts of the internal IT systems are interpreted as the survuction’s classification of invisible and visible systems.

5.3 Value creation dynamics

The findings highlighted the dynamic nature of internal and external value creation enabled by the W3DC. External value creation retrieved by customers using the W3DC must be realized before CC retrieving the most substantial internal values. However, CC is the provider of W3DC, which can be interpreted as the delivery of these external values. On the other hand, if customers do not use the W3DC and retrieves the value-in-use no explicit value is created either internally or externally (cf. Lush & Nambisan, 2015). This means that customers are first in charge of their own value creation which later generates internal value creation for CC. Empowerment was highlighted as one of the key customer values associated with the W3DC. However, this value generating a dynamic response meaning that CC are relying on customers retrieving external IT-based values, which can affect CC internal work processes and its economic situation. Relying on customers can be demanding, and the findings revealed that CC’s also allowed for customized buildings that the W3DC could not visualize. Furthermore, this value creation dynamics of empowerment in the customer is heavily context driven, some customers do not have the digital competence to use the W3DC, and others have additionally demands what the W3DC cannot visualize (cf. Lush & Nambisan, 2015). In the perspective of Bygstad’s (2017) classification of IT, the digital and innovative nature of W3DC raises questions concerning possible limitations of classifying a broad range of technologies into just one of two categories. The findings showed that the W3DC functions both as an internal and external digital system that creates both internal and external values in a dynamic fashion. Perhaps is a new category of IT needed for describing W3DC’s place and capabilities. In the case of W3DC, a fitting category would be Medium weight IT, responding its uncertain classification of either Heavyweight or Lightweight IT and its value creation. The W3DC is cheap, free, user driven and of innovative nature interpreted as Lightweight IT. It is built upon CC’s databases and realized through systematic programming, and used as an internal system for generating internal values, characterized as heavyweight IT. Therefore, labeling W3DC as medium weight IT can be fitting solution for its uncertain characteristics.
Appling Hoffman & Turley’s (2002) incarnation of the servuction model, the findings reveal that the invisible and visible nature in W3DC is shifting, generating value creation dynamics. The findings show that the W3DC is a “simplified” version of what CC can provide to its customers. In reality, CC can provide more products and services that are not available in the W3DC. This can be interpreted that CC is “hiding”, making certain products and services invisible for the customers, or that the programming time at CC is too low for managing to code in all their services and products into W3DC. However, findings exposed that customers tend to choose standard according to the W3DC capabilities, because of the easy access and value of transparency. This tendency of choosing standard have resulted in easier process for delivering the end value to customers, a complete building, through utilizing all the automated functions in different heavyweight IT. However, this was not the whole truth, some customers have noticed the “invisible nature” in W3DC, resulting in special buildings. These new demands from certain customers disrupted the whole internal automated work processes. This is a key limitation of CC’s current IT-based external value creation processes.

6. Conclusion

The purpose of this thesis was to understand the role of a web-based 3D configurator in a construction context and generate new knowledge about value creation dynamics by asking: *What is the role of digital service innovation in a construction context and what are the associated dynamics between internal and external IT-based value creation?* In order to answer the research question, I conducted a qualitative exploratory case study in a small construction firm. The study shows how the W3DC plays a fundamental role at CC when it comes to delivering information, services, and value to customers. It also identifies and explains the dynamics involved in external and internal IT-based value creation: As customers traverse the process of purchasing a building in W3DC they experience three key external values; transparency, empowerment, and self-assurance. The study shows how, in turn, the retrieved external values next trigger the realization of internal value creation. Internally, the W3DC itself provided improved internal communications between departments, and towards customers. Further, internal value creation was enabled through combinations of internal IT-systems (Heavyweight IT) and the W3DC (Lightweight IT) that provided automated functions, generating; higher productivity, faster customer order management, managing more orders per employee and financial profits. However, the substantial internal value creation enabled by W3DC was highly dependent of the realization of external values retrieved by customers.

6.1 Contributions

This thesis contributes to deeper knowledge in digital service innovation, and its role in enabling both internal and external values that can be an important engine of growth for contemporary firms. Furthermore, engaging strategically in digital service innovation can unleash major values for traditional firms in established industries. However, the uncertain and dynamic nature of digital service innovation will raise new managerial challenges. The case study of CC is unique which makes it hard to generalize the results to other firms. However, on an analytical level, the thesis contributes to theory by highlighting the importance of
systematization as a precondition for digitalization. Firms that seek to use a W3DC need to carefully consider what should be visible to customers, and what should not. Firms need to first understand customer needs and their potential purpose of use and be mindful of how such use may impact the firm’s overall value creation dynamics. This thesis provides a starting point for future research that seeks to create frameworks for managing digital service innovation. I specifically encourage future research to further investigate the nature of value creation dynamics in digital innovation, and explore how such dynamics can be managed in both startups and incumbent firms.


Reference list


Introduction questions

- Can you tell me how a regular workday is for you?
- When did you start working at CC?
- Can you tell me how it is to work at CC? (Something that sticks out?)
- In addition to your website, what kind of digital tools / IT systems do you have?
  - Who do you use in your work?
- Can you describe some examples where IT systems affect your work?

W3DC:

- Can you describe for me what the 3D Configuration system is for you?
- What do you think was the purpose of launching such a service?
- How did the process look like from a customer starting to configure a building until you build it?
- Do you know if the buildings look different from the 3D configurator compared to reality?
- Is there any difference between the 3D configurator options and the ones that are available in reality?
- Do you use the 3D configurator for anything other than just that the customer can design his building?
- If you had to change or add / change something on the configurator, what would it be?
- What do you think of the 3D Configuration Tool?
- Which role has the 3D Configuration tool in your/ yours work processes?
- In what ways does the 3D configuration tool affect work?
- Can you develop, or describe an example, how do you think it creates value for you and your colleagues?
- Imagine a scenario without the 3D configurator, how would it be?
- If you did not have the 3D configurator what do you think you had missed?

If the respondent worked at the company before launching W3DC:

- Do you see a difference in the way you work before and after you launched the 3D Configurator?
  - Did any change happen? If yes, what changes?

Values:

- What do you think the 3D configuration tool means to your customers?
- Can you explain an example of a customer who has estimated the configurator?
- Can you explain any example of a customer who has misunderstood the configurator?
- Can you describe if there have been any changes in the relationship with your customers when you launched your configurator?
Appendix 1: Interview guide

- Why do you think the 3D configuration tool became so popular (attentive)?
- Have you noticed someone other than me who has been interested in your 3D configurator?

Future
- How do you look at the future of the 3D configurator?
- What potential future development do you see?

- Thanks for your participation! Do you have anything to add?
Appendix 2: The thematic maps

The initial thematic map

The final thematic map
Appendix 3: The role of W3DC
Appendix 4: Value creation dynamics
Appendix 5: Changing service encounters