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DEZIDE

Informing the Realization of Benefits through the Development of New Management Information Systems

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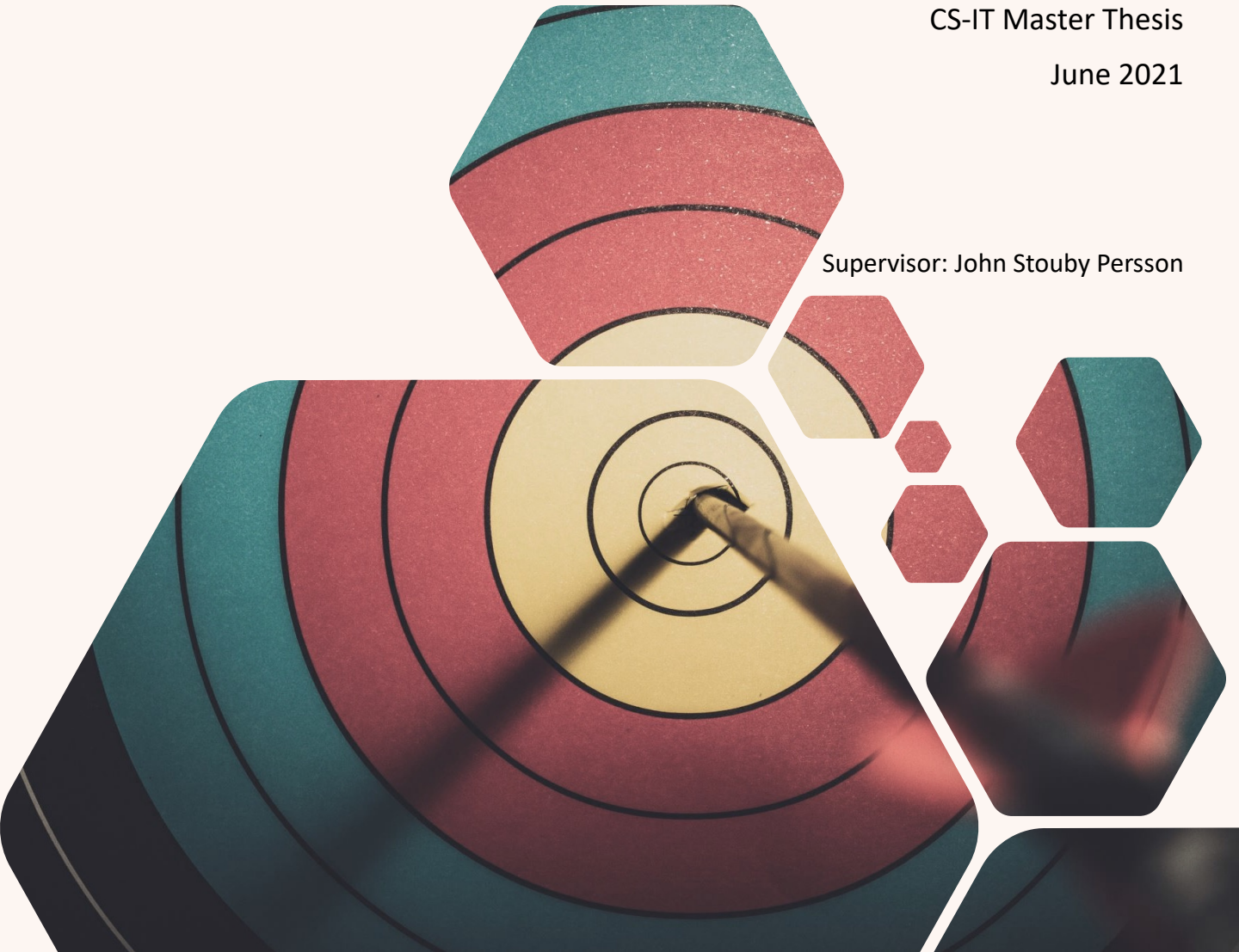

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Abstract

Successful integration of IT systems has been measured in terms of the artifact being delivered on time, on budget and to specification. For organizations, successfully implementing a software artifact entails realizing (long term) benefits from the use of the artifact, and managing the organizational change happening in the background needs to happen openly and explicitly. For the case company, Dezide, a company that offers AI-based guided troubleshooting software, supporting their clients' organizational change activities such that at the end of the onboarding process, the clients have a deep understanding of the benefits arising from the use of the Dezide software and how to achieve them is fundamental in their business model, and this effort is captured into the onboarding framework. This thesis uncovers how can designing a new management system that supports all management-related activities throughout the onboarding process in an informating manner can be used as a boundary object to overcome each increasingly complex type of knowledge boundary and as such inform the realization of benefits throughout the onboarding process. The theory-ingrained artifact designed for use within the case organization is meant to serve as a model based on which other organizations (within other industries) can develop their own systems in order for them to be successful and realize benefits.

Keywords: `change`, benefits, benefits realization, information systems, informating versus automating, knowledge management, knowledge boundary, boundary object

Summary

During the *Introduction*, I start discussing the problem area from a broad perspective, namely how change is a complicated but necessary endeavour that organizations across industries need to undertake and manage in order to realize benefits. Developing or integrating IT tools is an activity that initiates a process of change, and the adequate use of these tools helps ensure organizations a competitive advantage within their respective markets. Focusing in from change, research shows that adopting a benefits oriented approach to managing change and the integration of new tools, as well as the acknowledgement that realizing benefits is the only reason for investing in change, helps ensure the success of new IT projects. Moreover, this requires a process of training and supporting the client staff in adequately using the tool, especially in cases where the tools can be customized to the clients' specific domains.

Such a service is offered by Dezide, an Aalborg based company that offers AI-based solutions for guided troubleshooting. Their onboarding framework captures the integration, training and support

process that takes place when clients are trialing Dezide's solution, and it serves multiple roles within the organization. Currently, the decentralized format of the assets used throughout the onboarding forces Dezide's Project Manager to manually manage the activities involving the assets, and such the company is looking for ways to improve their onboarding process with the design and development of a new management system such that the onboarding becomes more streamlined and transparent and helps them realize benefits.

As such, this thesis aims to uncover how can a new management system be designed such that it supports all the activities within the onboarding framework in an informating manner, such that the underlying knowledge management process is facilitated by the new boundary object in overcoming each increasingly complex knowledge boundary type and realize benefits.

During the *1 Concepts and theories* section, I present the theories used throughout this thesis; the concept of change is used to understand the onboarding framework and its activities, and realizing benefits acts as the ultimate goal of the endeavours undertaken within this thesis. The informating and automating capabilities concepts are used in the informing of the IT artifact (i.e. the new management system), and the concepts of knowledge and knowledge management demonstrate how the new management system informs the realization of benefits throughout the onboarding.

Within the *2 Methodology* section, I showcase that this thesis draws on the engaged problem formulation, action research design and case studies methodologies to reach the above mentioned goal. Moreover, I present the case of Dezide and their onboarding framework, as well as the data gathering process employed. During this section I reference the abductive analysis process employed, which is then exemplified within the following section.

Section *3 Data analysis and findings* presents the abductive process of analysis and describes the findings of this thesis, as well as describing each informating feature of the new management system (the Planning module). The section closes with a detailed, stage-based description of building the theory-ingrained artifact, with explanations on how each boundary is overcome and benefit realized.

Finally, section *4 Discussion* summarizes the contribution to the field and practice, as well as discusses the limitations of this thesis and what the future work entails. The paper concludes in the section *Conclusion* with a short summary of what has happened throughout the thesis.

Introduction

In today's world, IT has become such an integral part of people's lives that IT systems are used all around the world, assisting people in all industries and facilitating communication and information sharing at a global scale. With the rise of social media in the last decades, and following the overall growth of the IT sector, companies and organizations must respond to the changes and challenges

they face, either to maintain an edge and continue to be competitive, or just to maintain relevance in their own fields. Moreover, the ongoing global COVID-19 pandemic has put even more strain on companies, with them having to navigate between the physical restrictions governing the workspace and the overall need for scaling up the digitalization efforts to accommodate new ways of working in record times.

Dealing with change is complicated, and requires knowledge and willingness to adapt. IT tools support emerging ways of working, and they are crucial to the competitiveness of an organization within its industry [Cameron and Green (2012)]. Developing or integrating new IT tools within organizations sparks the process of change.

Despite an increase during latest years in specific project management activities that help facilitate change, a still large percentage of companies fail to successfully implement new tools in their organizations, putting them at a disadvantage when facing the competition and leaving them in a critical position. The 2021 *Pulse of the Profession* study shows that 13% of projects within "traditional enterprises" are deemed failures, and that overall, companies that fail to embrace change are less likely to succeed in a range of project outcomes [PMI (2021)]. In this regard, understanding what constitutes a failed IT project is key - research has shown that judging the success of IT projects strictly on delivering it on time, on budget and to specification has become insufficient, and understanding that a project will only be perceived as successful only if it ultimately delivers benefits that exceed the cost of achieving them is imperative for the organization and its efforts surrounding the delivery or integration of a new tool [Doherty et al. (2012), Bradley (2010)].

An increasingly competitive global economy and a shift in the driving factors behind the use of IT led to the emergence of Benefits Realization Management (BRM) and its importance today [Bradley (2010)]. Benefits Realization Management (BRM) in the context of IT is the process of organising and managing, such that the potential benefits arising from the use of IT are actually realized [Ward and Elvin (1999) as cited in Doherty et al. (2012)]. Benefits are of value to many different types of stakeholders, and without generation of benefits for at least one stakeholder group, there is no reason to invest in change. As such, benefits are the key driver for change and should lie at the core of any change endeavour [Bradley (2010)].

Dezide is a Danish company that offers AI-based guided troubleshooting. Guided troubleshooting has its roots in diagnosis, which is an application area for AI methodologies due to its high complexity and requirements for data [Skaanning et al. (2003)]. Dezide's software suite is comprised of a set of questions, actions and causes that are linked together based on probabilities and cost using Bayesian networks as the foundation to form troubleshooting guides. The guided troubleshooter is accompanied by an authoring tool, a knowledge capturing software system aimed to gather tacit knowledge from experts' minds and make it explicit [Nonaka (1994)] - display it in a structured way (i.e. the trou-

bleshooting guides) such that anybody dealing with a specific type of issue can use expert knowledge captured within the guides regardless of their own expertise.

Due to the usability of Dezide's software suite in a wide range of industries, it requires integration, training and support in order for the clients to adequately use the tools. Dezide offers such a service, captured in what is called the onboarding framework - it is a collection of the company's 20 years of experience in what constitutes a successful integration process of their product into client companies, and it is an integral part of Dezide's business model.

The framework has a dedicated focus on realizing benefits for the clients, and an implicit focus on realizing benefits for Dezide. Throughout the onboarding, various assets are used to capture and transfer knowledge between Dezide and their clients, and specific roles contribute to diverse degrees to this process. In its current format, the onboarding framework does not offer a centralized solution for managing the onboarding process, and Dezide's explicit objectives for improving the process to make it more streamlined and transparent towards the clients suggest the design and development of a new management information system that can inform the onboarding process and help Dezide realize benefits.

Drawing on the engaged problem formulation and action design research methodologies, this thesis showcases the abductive process of developing a theory-ingrained artifact that informs the realization of benefits through the onboarding process, both for the clients and Dezide [Sein et al. (2011), Nielsen and Persson (2016), Dul and Hak (2008), Yin (2003)]. In doing so, the onboarding process will be analyzed through Carlile's theory of knowledge management across knowledge boundaries, and the new management system will be designed as a boundary object that facilitates overcoming all types of knowledge boundaries, based on the informating and automating capabilities concepts of information systems; this allows to determine how overcoming each boundary informs the realization of benefits.

Moreover, Dezide's context and current shape of the onboarding framework form the case studied throughout this thesis, from which the phenomenon described in later sections is observed [Flyvbjerg (2006)].

As such, the aim of this thesis is to uncover

> **How can new management information systems inform/informate the realization of benefits?**

Using the terms *inform* or *informate* (which in this thesis are used interchangeably) captures the notion of managing knowledge across boundaries through the use of a single, process wide boundary object (i.e. the new management system), as this thesis aims to demonstrate.

In the remainders of this paper, section 1 describes the relevant theoretical concepts employed throughout, section 2 showcases the methodology on which this thesis is based on, as well as the case

organization and the data gathering process, section 3 captures the abductive analysis process, the findings and development of the new management system informed by theory, and section 4 discusses the contribution to the field and practice, and the thesis' limitations and future work avenues.

1. Concepts and theories

This section presents the main concepts and theories employed throughout this thesis. The change and change management concepts are used during section 2 to present and discuss the case company Dezide and its onboarding framework. The concepts of informating and automating information systems are used during section 3 to design a new management information system for the onboarding framework. Lastly, the concepts of knowledge, knowledge boundary and managing knowledge at different types of boundaries are also used in section 3 to understand the way in which a new information system can inform the realization of benefits throughout the onboarding process.

1.1. Change & Benefits realization Management

According to the Oxford Dictionary, one definition of *change* is "to pass or make someone or something pass from one state to another" [Oxford (2021)]. In today's dynamic world, change can be seen everywhere. For companies and organizations, external and internal change are both factors that contribute to gaining or maintaining a competitive advantage, and using IT tools becomes a catalyst for change [Bradley (2010)]. As such, avoiding change is not a viable option [Bradley (2010)], which is why the challenge becomes to "develop an effective and timely method of determining the optimum set of proactive changes, and to manage them, so that stakeholder resistance is overcome and defined performance goals are achieved" [Bradley (2010), p.4].

Change management (CM) is one of these methods and it encourages identifying the goals and objectives the organization aims to achieve following the change process, in other words identifying the benefits to be generated from a project. Benefits realization management (BRM) in information systems development is "the process of organising and managing, such that the potential benefits arising from the use of IT are actually realized" [Ward and Elvin (1999) as cited in Doherty et al. (2012), p.4].

Because the only meaningful reason for change is the realization of benefits [Bradley (2010)], BRM can be used at any level within an organization, and the prerequisites for it to thrive include (but are not limited to) customisation of the BRM process and its integration with existing processes, an (at least) supportive organizational culture and a governance structure focused on benefits realization [Bradley (2010)].

A *benefit* is more than something that can be directly related to a cost reduction or increase in revenue - it is an outcome of change which is perceived as positive by a stakeholder [Bradley (2010)].

Benefits cannot be directly made to happen, they are something to be tracked or monitored throughout the change activities that are managed to lead to realising the benefits [Bradley (2010)]. Moreover, it is critical that benefits are owned by someone (i.e. a beneficiary, looking to realize that benefit), and that relevant measures are identified to ensure the degree to which the benefit has been realized [Ward and Elvin (1999)]. Since there is a relationship between a benefit and its measures (as a benefit can be measured with multiple measures), some measures can be more complex. The owner's responsibility is to empower actors to carry out the actions that realize the benefit [Ward and Elvin (1999)].

It is important to mention that while some benefits can be identified upfront, some emerge later on, as users innovate and improvise with their local working environment [Doherty et al. (2012)]. As such, another role of BRM is to ensure opportunities are exploited in a productive manner [Doherty et al. (2012)].

For information systems, the benefits realization approach seeks to "facilitate a programme of organisational change, that will complement a new information system's functionality, and in doing so facilitate the realization of important benefits" [Doherty et al. (2012), p.8]. Being unable to formulate such a process, develop an appropriate set of benefits to drive the change by and failing to educate and train the relevant stakeholders results in organizational or project failure, which is still an issue with systems development and integration [Doherty et al. (2012)].

Despite an increase in both agile and change-oriented organizations, as well as in the success rate of information systems development and integration, in 2021, 13% of projects within "traditional enterprises" and 11% of agile enterprises are deemed failures [PMI (2021)], and 37% and 36% respectively, had a failed project with budget loss.

Information systems success has mostly been focused on the software development project being completed on time, on budget and to specification [Doherty et al. (2012)]. In practice, this does not automatically mean the delivery of real benefits, due to the nature of some benefits being emergent over the lifecycle of a system [Doherty et al. (2012)]. Doherty et. al. suggests a set of principles upon which to formulate adequate success factors depending on each organisation and project, which include:

- Benefits orientation - the ultimate goal of an information systems development project should be the delivery of clear business benefits; users and senior managers must play proactive roles [Doherty et al. (2012)]
- Organisational change - benefits arise from the organizational change that accompanies an IT implementation, rather than directly from the technology; success factors must explicitly address organisational change [Doherty et al. (2012)]
- Tailor to context

- Investments have a lifecycle - success factors are relevant throughout the operational life of the system, not only at, for example, hand in to the users [Doherty et al. (2012)]

Similarly, Terry Cooke-Davies identifies that a success factor critical to the success of a project is the existence of an effective benefits delivery and management process that involves the mutual co-operation of project management and line management functions [Cooke-Davies (2002)].

1.2. Informating versus Automating information systems

The concepts of automating and informating information systems were developed by Shoshana Zuboff in 1989. She argued that information systems technology is characterized by a fundamental duality, on the one hand that technology can be applied to *automate* operations, with the aim to replace human effort and skill with a technology that enables the same processes to be performed at less cost, higher efficiency and higher accuracy, and on the other hand that technology can be used to create information (to *informate*), with the aim of bringing to the surface and making explicit the underlying processes that accomplish work, and to empower the users to understand the business process to create innovative solutions to the organizational problems [Zuboff (1989), Surendra and Nazir (2019)].

The work of Surendra and Nazir (2019) identifies the characteristics of an informating functionality, and uncovers how an informating functionality differs from an automating one:

- A functionality moves from an automating role to an informing role along a continuum; a re-designed functionality to become more integrated with the users' work processes empowers the users to accomplish their work more seamlessly through the information obtained from previously disparate systems

- Informating functionalities tend to be "ready-to-hand", rather than "present-at-hand", as the latter represents the automating functionalities which pose hindrances to achieving the task seamlessly

- Informating functionalities provide greater user control over the system, which enables the users to perform their work without IT support and with greater ownership

- A functionality does not become an informating one simply by someone having said so, but rather through the users' adoption of the informating perspective when using that functionality (e.g. asking how can one use the system to better accomplish their work objectives)

- Informating functionalities uncover work practices that are taken for granted, as well as assumptions that threaten the status quo

In the words of Zuboff (1989), "even when an application is designed to automate, it simultaneously generates information about the underlying processes through which an organization accomplishes its work. [...] [Informating] is meant to capture the aspect of technology that may include but also go beyond automation" [p.8].

1.3. Knowledge

Nonaka (1994) states that "any organization that dynamically deals with a changing environment ought not only to process information efficiently but also create information and knowledge" [p.14]. In his paper, he differentiates between information as being *a flow of messages*, while "knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder" [Nonaka (1994), p. 15]. He explains the syntactic and semantic aspects of information, the former being measured without regard to its meaning or value, whereas the latter focuses on conveyed meaning [Nonaka (1994)], and he also explains the *explicit* and *tacit* knowledge concepts - explicit knowledge refers to knowledge that is transmittable in formal, systematic language, whereas tacit knowledge has a personal quality, which makes it hard to formalize and communicate, and is rooted in action, commitment and involvement in a specific context.

Nonaka (1994) work in developing a dynamic theory of organizational knowledge creation allows him to postulate four modes of knowledge creation through conversion between tacit and explicit knowledge, namely socialization, combination, externalization and internalization. His spiral model of organizational knowledge creation draws on the notion that tacit knowledge is mobilized through a dynamic "entangling" of the four modes of knowledge conversion through externalization. Knowledge creation centers on building tacit and explicit knowledge through internalization and externalization interchangeably.

1.4. Managing knowledge at different types of knowledge boundaries

Paul Carlile's paper on boundary objects in new product development suggests that knowledge is "a critical but challenging source of competitive advantage for an organization" and "both a source of and a barrier to innovation" [Carlile (2002)]. He claims that "the characteristics of knowledge that drive innovative problem solving within a function actually hinder problem solving and knowledge creation across functions" [Carlile (2002)], where a function refers to different departmental activities/practices existing in organizations (e.g. sales/marketing, engineering, production etc.). *Knowledge boundaries* exist at the intersection between these functions, and Carlile classified them as follows:

- Syntactic - establishing a shared and stable syntax across a boundary ensures communication and helps solve information processing problems; as novelty increases, the question becomes if the existing syntax is sufficient to process the information at the boundary;

- Semantic - despite a shared syntax across a boundary, individuals' interpretations often differ, so the semantic boundary extends the syntactic one by paying attention to the individual, context-specific aspects of creating and transferring knowledge (taking individual tacit knowledge and converting it into explicit knowledge); as novelty once again increases from the different kinds of knowledge, the dependence across these differences generates consequences, so the question becomes how to understand and deal with these consequences

- Pragmatic - highlights the importance of understanding the consequences between things that are different and dependent on each other; it recognizes the need for an overall process for transforming existing knowledge to deal with the negative consequences that arise;

Using boundary objects helps transform the knowledge in order to resolve negative consequences arising from differences and dependencies emerging from the actors. A boundary object represents objects that are shared and shareable across different problem solving contexts [Star (1989) as cited in Carlile (2002)]. These across-practice objects work to establish a shared context that *sits in the middle*[Star (1989) as cited in Carlile (2002)], and facilitate the problem solving and innovation processes taking place within organizations.

Carlile offers three elements that qualify a boundary object as efficient, at each level of boundary discussed above:

- Syntactic level - a boundary object establishes a shared syntax or language for individuals to represent their knowledge; having a shared syntax to deal with any type of knowledge boundary is fundamental;

- Semantic level - a boundary object provides a concrete means for individuals to specify and learn about their differences and dependencies across a boundary;

- Pragmatic level - a boundary object facilitates a process where individuals can jointly transform their knowledge; when dealing with negative consequences arising from a semantic boundary, individuals must alter, negotiate or change the object to transform the knowledge used;

In a following paper, Carlile looked at the boundaries found within organizations from a managing knowledge across boundaries perspective. His work describes the different processes required at each type of boundary to effectively manage knowledge through a framework that maps the progressively complex boundaries (syntactic, semantic and pragmatic) with three progressively complex processes - transfer, translation and transformation [Carlile (2004)].

He details the difference, dependence and novelty properties of knowledge at a boundary that were also mentioned above:

- Difference - a difference in the amount of knowledge accumulated; as difference in the amount and/or type of domain-specific knowledge increases between actors, the amount of effort required to adequately share and assess each other's knowledge also increases
- Dependence - a condition where two entities must take each other into account if they are to meet their goals; without dependence, difference is of no consequence; as the number of dependencies increase between actors, the complexity and amount of effort required to adequately share and assess knowledge at a boundary also increases
- Novelty - how novel the circumstances are; when novelty is present, both the capacity of the common knowledge to represent the differences and dependencies now of consequence and the ability of the actors involved to use it become important issues; as novelty increases, the amount of effort required to adequately share and assess knowledge also increases

His framework for managing knowledge across boundaries illustrates that as novelty increases, each type of knowledge boundary has an associated knowledge management process. At the syntactic boundary, the level of novelty is minimal, so when a common syntax is established, the knowledge is simply being *transferred* across the boundary. As mentioned, as novelty arises, because the current syntax is no longer sufficient to describe the differences and dependencies, the next type of boundary needs to be crossed, namely the semantic one. At this level, individuals' interpretations require the knowledge to be *translated* (through, for example, externalization [Nonaka (1994)]) as to develop common meaning and overcome this boundary. Consequences are now being identified, and individual interests arising create barriers in developing shared meaning. Again, as novelty increases from these newly found interests, the pragmatic (or political) boundary needs to be overcome by negotiating and changing the individual knowledge between the involved actors (*transforming*). When interests are in conflict, the knowledge developed in one domain generates negative consequences in another, impacting the willingness of an actor to make changes in their knowledge, which is at stake.

2. Methodology

The case study research methodology has been controversial and misunderstood in many instances throughout history. It has been mistaken for a methodology that cannot generalize its findings or contribute to scientific development, that it can only be used for hypothesis development in incipient phases of research endeavours or that it is biased due to the researcher's preconceived notions [Flyvbjerg (2006)].

Despite all that, researchers began understanding the value and importance of case studies as a research methodology, and as such contributed to the now large body of literature around this subject.

One definition of case studies is provided by Yin (2003), that states: "A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between object of study and context are not clearly evident." (p. 13-14). Dul and Hak (2008) extended Yin's definition, as it did not encompass the fact that a case study is an inquiry of only one single instance of the object of study (or a small number of instances in the case of comparative case studies), as well as the fact that the real-life context is not manipulated during such a research endeavour.

Regardless of what researchers have defined a case study to be, an argument for why this project was conducted as a case study can directly be drawn from the definitions presented above, that is that it allows both the researcher (myself) and the reader to go into detail about a single instance of a phenomenon happening in its real life context. As such, the case to be discussed throughout this project consists of the organization Dezide and their service for onboarding new clients, the onboarding framework.

In addition to the case study approach, this project draws from action design research, with a particular focus on (engaged) problem formulation. Action design research (ADR) is a method for generating prescriptive design knowledge through building and evaluating ensemble IT artifacts in an organizational setting [Sein et al. (2011)]. Its staged model presents problem formulation as the first stage, and offers two principles fundamental for this thesis:

1. **Practice-Inspired Research** This principle emphasizes viewing field problems (abstracted into a class of problems) as knowledge-creation opportunities for the researcher at the intersection of technological and organizational domains [Sein et al. (2011)].

   Within the thesis, the case illustrates the intersection of technological and organizational domains through the onboarding framework, with the knowledge-creation opportunity being the improvement of the onboarding framework through the development of a new management system.

2. **Theory-Ingrained Artifact** This principle emphasizes that the ensemble artifacts created and evaluated via ADR are informed by theories, resulting in the initial design of the theory-ingrained artifact which is then developed throughout the next stages of the ADR process [Sein et al. (2011)].

   Within the thesis, the new management system's design is informed by the theories presented in section 1, leaving the implementation for later stages extending beyond this thesis' time frame.

The term *engaged* adjacent to *problem formulation* within parentheses refers to the engaged problem formulation methodology proposed by Nielsen and Persson (2016). Their work offers a detailed, prescriptive methodology for formulating problems, that interleaves multiple research methods in order

to overcome shortcomings of the individual methods used. Within this thesis, the engaged problem formulation methodology frames the nature of the outcome and, in combination with the problem formulation principles of the ADR methodology, presents a model of how a new management system informates the knowledge management process across the onboarding framework and realization of benefits for the case organization.

Within the case-based, engaged problem formulation methodology, the chosen method of analysis breaks out from the broadly used inductive or deductive approaches, and employs an abductive process. Commonly known, the inductive approach is data-driven, and uses data to formulate new theories, whereas the deductive approach is theory-driven, and data is used to test hypotheses that are formulated based on theory [Brinkmann (2014)]. Brinkmann (2014) elaborates on a third form of analysis, namely the abductive approach, which is neither data- nor theory-driven, but rather breakdown-driven. This form of reasoning is concerned with the relationship between a situation and inquiry and it can be used in situations of uncertainty, bewilderment or wonder in which situations and instances are broken down in order to be understood [Brinkmann (2014)].

While that engaged problem formulation highlights the importance of a well-established inductive data analysis process that allows for the formulation of the problem to be strongly grounded in data, the abductive approach employed within this thesis allowed me to gain insight through breaking down real-life situations emerging throughout the collaboration with the case company, identify a class of problems the case exemplifies and focus away from solving a specific issue into developing an understanding of the phenomenon taking place. This is consistent with the first principle of problem formulation presented above, and the stumble data [Brinkmann (2014)] that emerged through the abductive analysis (presented in section 3) during meetings, discussions and semi-structured interviews was assembled such that the design and development of the new management system becomes highly informed with theory (making it consistent with the second principle described above).

The concept of abductive analysis is firstly discussed here in order to support the process of data gathering as well as data analysis. In continuation of this section, I present the case (the company and the onboarding framework) and the data gathering process that draws on the *stumble data* concept proposed by Brinkmann (2014), leaving the data analysis as a separate, full section.

2.1. The case - Dezide

Dezide is an Aalborg-based company founded back in 2001 by a group of Aalborg University newly graduates. The company was created based on a decision to commercialize the results of a research collaboration between AAU and Hewlett Packard's (HP) R&D Department, research that was meant to create an intelligent guided troubleshooter for HP's printers, in an effort to minimize customer support costs and time spent solving printer issues. Guided troubleshooting has its roots in diagnosis,

and intelligent troubleshooting "guides the customer through a fast sequence of troubleshooting steps (*actions or questions*) attempting to resolve the problem" [Skaanning (2000), p.549].

Their collaboration - the SACSO project (System for Automated Customer Support Operations) - resulted into two tools: a decision-theoretic system for troubleshooting, and a knowledge acquisition tool called the BATS Author (Bayesian Automated Troubleshooting System). Dezide's system works on the same idea, with their software suite comprising of an (online) knowledge acquisition tool (the Web Author), and the Bayesian Belief Network (BBN) troubleshooter (Troubleshooter). The Web Author is a platform used by subject matter experts (SMEs) to convert the tacit knowledge they possess into explicit knowledge by building troubleshooting guides, without having to have prior knowledge about Bayesian networks. The guides consist of knowledge expressed in questions, causes, actions, probabilities and costs, which are then used by the Troubleshooter to automatically identify the next best available step to solve any problem at hand.

While the SACSO project was designed with limited applicability, namely for troubleshooting printers issues, Dezide expanded the solution to many industries, from renewable energy, to large construction machinery manufacturing or telecommunications. Over the past 20 years, the customizable, domain agnostic software allowed customers to realize benefits such as reduced troubleshooting time, reduced amount of subsequent visits and dispatches on-site or instant transfer of skills to new employees [Dezide (2020)], making Dezide a relevant competitor in the field of diagnostics and troubleshooting.

Fundamental for the success of an IT tool is not only its integration into the client company and adequate training of the users, but also the management of the change process onset by the new tool. As discussed in section 1, a benefits realization approach to developing or integrating new information systems (IT tools) seeks to facilitate a programme of organisational change that complements a new information system's functionality and so facilitates the realization of important benefits [Doherty et al. (2012)]. Dezide offers a set of IT tools that require integration and training to be adequately used, which indicates the beginning of a change process required on the client's side to accommodate for the new system. Given that the only meaningful reason to invest in change is to realize benefits [Bradley (2010)], the realization of benefits becomes the driving factor within the change process. In Dezide's case, this process is formalized within the **onboarding framework**.

Onboarding, or the onboarding process, in the context of Dezide, refers to when a *new* client decides to *test Dezide's services* in a *pilot* project. An almost identical process takes place after the onboarding, namely the *roll-out*, which is when a client decides to move forward with Dezide and use it at a larger scale. Within this paper, only the onboarding process is of relevance, as both onboarding and roll-out are very much alike and any changes within the onboarding framework will automatically be applied in the roll-out as well.

The framework summarizes a three-month long, phase-by-phase collaboration between Dezide and

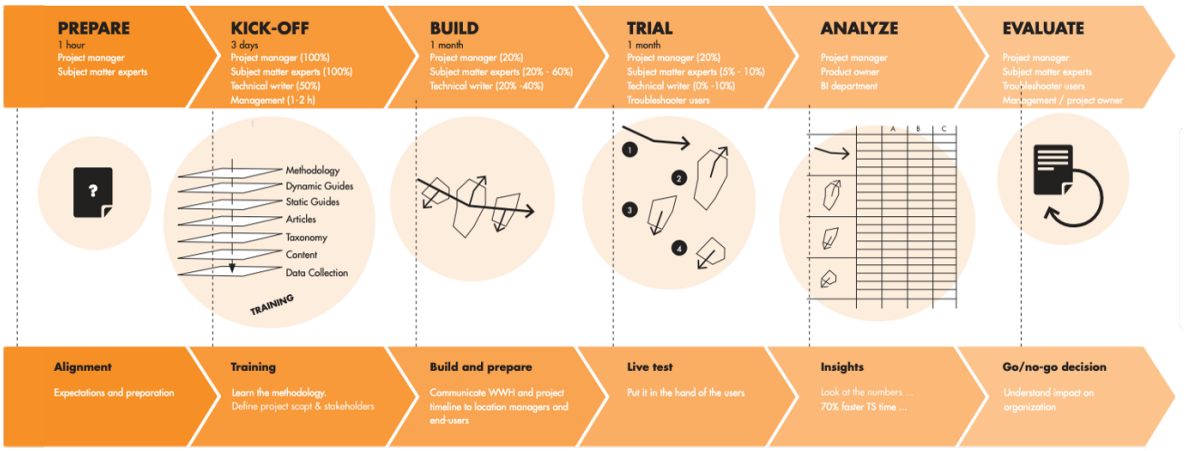

Figure 1: Onboarding framework

the client company, during which Dezide supports the client through change in integrating the software, training and evaluating the whole process both to provide feedback, as well as to improve their client's own processes. Following Doherty et al. (2012)'s and [Cooke-Davies (2002)]'s principles for ensuring the success of integrating information systems, Dezide's onboarding framework was designed to provide support in the organizational change process, orient towards benefits to be realized by the clients' resulting from the use of the software suite and to provide a customizable tool that can be tailored to the clients' own domains and contexts.

The framework was developed and maintained by three key stakeholders of the company (CEO, Project Manager - PM - and a Sales representative) into the current shape, illustrated in figure 1. The framework is flexible, and it does not serve as a stencil based on which the endeavour should be undertaken, but rather it offers a guideline for which are the most relevant steps to be taken to ensure the onboarding is a success, i.e. the software suite is successfully integrated within the client company, the client staff is trained in building and using troubleshooting guides, and the company is using the software in production to realize their own set of benefits.

Furthermore, the framework is a means for communicating the plan to the client in the incipient phases of the collaboration between Dezide and their clients, and to provide a high-degree of transparency into the process. It can be understood as a boundary object that aims to facilitate the discussion between Dezide and the client at a pragmatic level - an object that allows for discussion and constant transformation of the knowledge involved between both parties. Each phase has an underlying set of meetings, assets and desired outcomes or goals, which help ensure a lean learning curve for the stakeholders involved, objects that allow Dezide to better understand how to support their clients during the onboarding process and improve their approach.

To better illustrate the onboarding process, I will use a fictional company (Company X) that focuses on maintaining operating wind turbines. The company is actively hiring new staff in order to be able to maintain the growing number of wind turbines. The senior employees possess a high degree of knowledge for maintaining turbines (domain-specific knowledge, tacitly possessed by the subject matter experts, SMEs), and they are required to perform training for new staff on top of their daily duties, which impacts the company's performance. Moreover, maintaining wind turbines is a complex endeavour, and, for instance, a single on-site visit might not be enough to reliably solve an issue. Facing these challenges, Company X decided to look into alternative ways to improve their troubleshooting processes, allowing them to limit maintaining costs and returns on-site to solve the same issues, as well as providing the new employees the opportunity to use SMEs' knowledge in the field to successfully solve issues on the first try without much prior experience needed.

After Company X requests Dezide's services, the company begins the onboarding process starting with a preparation meeting (Prepare phase), in which Company X's project manager and SMEs get an introduction from Dezide's Project Manager (PM) about what is going to happen throughout the onboarding. The next phase, the Kick-Off, consists of a three-day on-site workshop (i.e. on the client's grounds) in which the purpose is to identify the client's goals and expectations from Dezide's solution and train them how to capture their knowledge and form a knowledge base within Dezide's software. Following is the guide building phase, in which Company X have the required knowledge to create new guides using Dezide's Web Author; during this phase, Dezide's PM provides support and helps the client build high quality guides. Once the troubleshooting guides are built, they are sent out to the field to be tested by the technicians (end-users), and based on their feedback, the guides' contents get adjusted to reliably be used in troubleshooting situations (Analyze phase). Finally, Dezide and company X evaluate the whole experience with feedback from each user-group, and assess whether the goals were achieved (Evaluate phase). Once the evaluation is complete, Company X has to decide whether Dezide's solution is beneficial for the company, specifically if Dezide's solution can help them realize benefits in the long run, and if so, the process of rolling out Dezide's solution to a larger scale within Company X begins.

As mentioned, throughout the onboarding, various assets (email templates and documents) are used to transfer and capture knowledge between all the stakeholders. It is Dezide's PM's responsibility to make these assets available to the client, and to ensure they adequately fill them in in due time.

These documents are currently decentralized, and come in many formats, from PDFs to MS Word documents and Excel sheets. For example, a PDF document for gathering essential information about the clients' context, a shared Excel sheet to illustrate the roadmap of the onboarding plan, and a Word document to hold all the email templates are used at various points within the onboarding. All of these are shared with the clients through emails, and the PM needs to manually gather the filled-in documents and upload them on an internal file-sharing application. These assets can all be understood as boundary objects.

Moreover, the role of the Project Manager within Dezide is currently only represented by a single employee, who is in charge of managing all the onboarding and roll-out processes happening at once (i.e. with various clients), as well as supporting regular day-to-day client activities with established clients. As the company grows, this decentralized knowledge transferring process becomes burdening for a single individual, and with new project managers being hired within Dezide, it becomes essential to develop a new informating managing system that can be used throughout the onboarding such that the onboarding becomes more streamlined and more transparent towards the client, and the new system informs the users to complete their tasks more efficiently.

The need for this transformation forms the basis of my thesis. Throughout the collaboration, my role is to work closely with Dezide to determine a solution for their practical problem, namely to:

- Understand the current context and format in which the onboarding framework exists
- Identify ways of improving this process through the design and development of a new managing software system

Given the complexity of Dezide's solution and their distinctive approach to onboarding customers, my academic interests aim to uncover

- Why and how does creating a centralized system for managing the planning activities (i.e. a new boundary object) within the onboarding framework facilitate knowledge transfer
- How does a new management system informate the realization of benefits for Dezide
- What does such a system entail from a design perspective such that other companies can apply in their own contexts to ensure the realization of benefits

These two different interests are characteristic of methodologies such as collaborative practice research or action research, but since this thesis aims to engage in problem formulation with the case company and draws upon the first stage of the action design research methodology presented at the beginning of this section, the two different interests map with ADR's focus on the two seemingly disparate challenges [Sein et al. (2011)].

2.2. Data gathering

The data used throughout this project was gathered on a constant basis as per the abductive approach, through shared documents, discussions, meetings and semi-structured interviews between Dezide and I. In the first stages of our collaboration, an initial thesis proposal was formulated by the three key stakeholders from Dezide, in which they sketched the outline of the project; through this document, the object of study (Dezide and their onboarding framework), practical outcome (new management information system) and academic interest (summarized in the problem statement) were defined. Although not final, these served as a solid foundation for building the project, and the form illustrated throughout this paper is a result of many iterations and direction shifts.

Following the initial proposal, meetings and discussions with the above mentioned key people allowed for gaining deeper insight into the onboarding framework, the roles of the employees within the onboarding and background information into the company. Some preliminary findings that emerged as stumble data throughout the collaboration include:

- The three key stakeholders developed and formalized the onboarding framework together, as a result of their years of experience in onboarding customers within Dezide
- The level of responsibility of Dezide's PM - being in charge of all the client-related activities, both throughout the onboarding and day-to-day activities within the company
- The decentralized aspect of the assets used throughout the onboarding impacts the PM's ability to perform his duties
- The need for a new system that centralizes the assets and allows the PM to quickly assess and act within specific situations
- The need for the new system to increase the degree of transparency of the onboarding process towards the clients and streamline the process to account for future company growth

As the collaboration was within its incipient stages, and I had limited insight into Dezide's onboarding process and how assets are being used throughout it, the need for individual, semi-structured interviews with the key stakeholders emerged. The interviews contained questions that inquired about each interviewee's department's goals, elements considered by them to be candidates for new software features, and reasons for undergoing this updating of the onboarding framework endeavour. These interviews formed the base on which the findings (presented together with the analysis in the next chapter) were formulated; moreover, they allowed to identify certain elements that were not explicitly represented in the framework as assets, but were of utmost importance in the early phases of the onboarding, in which the training and knowledge externalization through guide building take place.

In the latter part of our collaboration, I scheduled additional meetings with all three stakeholders, with the purpose of discussing the findings and prioritizing them for the future implementation. Once the four of us had a shared understanding of what a new managing information system would entail in terms of possible features, I expanded my focus to other roles that are not directly involved in the onboarding process, but have a direct influence over the new system's shape and logic, namely the head systems' architect of the company. During the meeting with the now expanded set of stakeholders, we formalized the new management system tool to be implemented - the Planning Module. It includes features based on the identified elements from previous meetings and my analysis process, and it will be shaped into a web-based tool, created as a separate software within Dezide's software suite.

3. Data analysis & Findings

As previously mentioned, throughout this section, I will present the abductive analysis employed within the thesis, in order to provide transparency and clarity in terms of how the theoretical concepts presented in section 1 map with the empirical findings of this engaged problem formulation research. To do so, I will illustrate key breakdown situations in which I used abductive reasoning to deal with uncertainty, and what findings emerged from each of these situations. Moreover, during the meetings and interviews, I purposefully asked questions that forced the company to be reflective and critiquing of their practices, as per the abductive process discussed by Brinkmann (2014).

Specifically, the first subsection depicts the process of identifying the findings based on which the Planning Module was designed, as well as introducing central theoretical concepts used throughout the thesis. The second subsection details the informating capabilities of the new management system (the Planning Module) and its features, and the last subsection analyses the relationship between the Planning Module and onboarding framework using Carlile's framework for managing knowledge.

3.1. Findings

The first situation of uncertainty arose in the incipient stages of the collaboration, during which time both parties were in a process of gaining insight into each other's contexts and backgrounds, and I was trying to envision an outcome beneficial for both parties, taking into consideration both practical and academic interests. The initial thesis proposal document was used during the first meeting as a basis for discussion and for clarifying any aspects of the onboarding framework that were not captured properly.

An early finding of the proposal document was the *change management activities* keyword. When inquired about its meaning within the organization, how does the company support their clients through change throughout the onboarding process and why is it relevant for the onboarding , Dezide explained the onboarding framework was the result of many years of onboarding customers, and based

on their experience, retaining the customers undergoing the onboarding was most successful when the organization offered as much support as was needed to successfully use the software in the real-world to the realization of the client's own benefits.

Even in the early phases of our collaboration, the limited data I stumbled upon through discussions and the initial thesis proposal helped me uncover the first central concept of the thesis, namely benefits realization. Starting from change and looking into the literature, I realized the concept of benefits realization encompasses change, and through this I came to the first main finding, namely that Dezide's goal with improving the framework expands the high level of transparency and streamlining objectives into them wanting to improve the framework to help them realize benefits through onboarding customers. As such, a more streamlined and transparent process draws more new clients in, keeps Dezide on a competitive level and generates more revenue. Furthermore, when taking the current global context into consideration, namely the Covid-19 pandemic, another identified benefit is client retention, as the pandemic substantially impacts the acquisition of new clients.

The framework serves many purposes. With respect to the clients, the onboarding has an explicit role of realizing the benefits the clients identify at the beginning of the process (similar to the example Company X who was pursuing the reduction of second on-site visits to fix the same issues). With respect to Dezide, the onboarding framework has a tacit role within the marketing and sales activities of the organization, which expands Dezide's own benefits realization process that takes place once the onboarding is successful and the client proceeds with the rollout.

Within the same meeting, it was discussed that throughout the onboarding there is constant collaboration and communication between Dezide and the clients, that Dezide's Project Manager (PM) is the person always in contact with the clients, with him being responsible to manage the assets used, notify about upcoming meetings and training sessions, train and support the clients in building troubleshooting guides and other similar management-related activities. Not having a centralized system to facilitate this process is time consuming and prone to mistakes, and as such, we were discussing how creating a new management information system that the relevant stakeholders (i.e. Dezide's PM and the relevant counterparts from the client's side) can use can be a solution for improving the onboarding framework. Moreover, during the analysis I focused on how can this new management system be used to generate the benefits Dezide is tacitly looking to realize.

As such, the first findings of the analysis show that:

1. The process of improving the onboarding framework, which includes developing a more streamlined process with a higher level of transparency towards clients, has as goal realizing benefits for Dezide, where some benefits are
    - Drawing more clients in;
    - Retaining the clients that are already going through onboarding;

- Generate more revenue through onboarding and retaining new clients;
- Remain competitive on the market by offering a unique, qualitative onboarding process;

2. Improving the onboarding framework can be accomplished through the design and development of a new management information system

The following semi-structured interviews were used as an opportunity to dive deeper into each Dezide stakeholder's experience with the onboarding framework and to inquiry about each stakeholder's struggles with the framework, onboarding improvement considerations and possible new system features. The data gathered through these interviews allowed me to formulate the following preliminary list of assets, both explicitly (documents, templates, roadmap) and implicitly (preliminary list of guides) used throughout the onboarding. This list consolidated the baseline for designing the features of the new management information system.

- Documents - includes all the current documents Dezide uses throughout the onboarding
- Email templates - includes all the current email templates Dezide uses to communicate with the clients
- Preliminary list of guides - not currently explicit within the framework, but highly valuable; this simple list of troubleshooting guide titles is intended to be constructed by the clients' project manager/lead, who then assigns a subject matter expert to build a specific guide from the list
- Interactive Roadmap - a roadmap of the onboarding is currently living in both a Jira format (internally, for Dezide) and an Excel format (externally, shared with the client), and is being manually maintained by Dezide's project manager in both places; having an interactive, shared roadmap within the new management system ensures a higher level of transparency of the framework and, when paired with a notification system, can be used to notify both sides about upcoming events, documents to be filled or other relevant information in the same vein.

This finding was a crucial moment in our collaboration, because, as mentioned, the list was used to discuss about and design the new system's features. Moreover, through one of the interviews, I gained an important insight - the onboarding framework was also used as a marketing tool for sales purposes, leading me to identifying a new benefit:

- Improving the framework with a new management system increases the quality of service offered by Dezide.

This was also a crucial moment in the research process because it led to the emergence of the other two central theoretical concepts of this thesis. The first concept relates to the design process of the

new information system, and it draws upon the work of Surendra and Nazir (2019) and Zuboff (1989) that have examined the informating and automating capabilities of information systems features.

#	Findings
1	Improving the onboarding framework has multiple goals
	1.1 Provide a higher degree of transparency of the process towards the clients
	1.2 Streamline the onboarding process
	1.3 Realize benefits
2	Improving the onboarding framework can be accomplished through the design and development of a new management information system
3	Benefits to be realized particularly include
	3.1 Drawing more clients in
	3.2 Retaining clients already within the onboarding
	3.3 Generating more revenue
	3.4 Remaining competitive on the market
	3.5 Improving the onboarding framework with a new management system increases the quality of service offered
	3.6 The new management system facilitates knowledge transfer throughout the onboarding
4	Assets relevant for the new management system
	4.1 Documents
	4.2 Email templates
	4.3 Preliminary list of guides
	4.4 Interactive Roadmap

Table 1: Summary of findings

Similar to how the benefits realization concept emerged from finding a keyword within one of the interactions with Dezide, the second theory also emerged from the interviews. During these, the stakeholders, when explaining the onboarding process in detail, used a common, specific keyword, *knowledge transfer*, to refer to activities such as capturing knowledge from the clients through documents, training the users into building troubleshooting guides or offering feedback on the onboarding process. Looking into knowledge and Nonaka (1994)'s research about organizational knowledge creation, I came across Carlile's work with managing knowledge at different boundaries. Finding Carlile's theory allowed me to uncover another benefit to be realized through upgrading the framework:

- The new management system facilitates the knowledge transfer throughout the onboarding.

As discussed in section 1, benefits need to be owner by an owner, and be represented by a measure or set of measures that assesses the degree to which the benefit has been realized [Ward and Elvin (1999)]. For the benefits identified, summarized alongside the other findings in table 1, their owners, potential actors and associated measures are presented in table 2. Given that Dezide is a small company, in most cases, the owners are also the actors, despite the roles not usually being assigned to the same individuals [Doherty et al. (2012)]. Moreover, the Sales and Marketing activities are undertaken within the same department in Dezide, namely Sales; as such, the Sales representative also fills in the role of a Marketing representative.

3.2. The Planning Module

The next step was to present the preliminary list of assets to Dezide to firstly, determine that it realistically depicts relevant functionality that improves the onboarding process and secondly, to reach a consensus in terms of the overall form of the new system. We formalized the system into what is called the Planning Module, a web-based system with the following features:

- Centralized assets (documents and email templates) into one virtual, online space, accessible by both Dezide and the client;
- Possibility to create a Preliminary List of Troubleshooting Guides, which is simply a list of guide titles that the client's project manager/lead constructs, and then assigns a subject matter expert to build that specific guide using his own tacit knowledge, as well as the training and support provided by Dezide through the onboarding;
- Interactive roadmap accessible by both Dezide and the clients' leaders and managers, that displays the progress of the onboarding framework phase by phase, including relevant assets, upcoming (or past) meetings and phase goals. The roadmap itself can be used to send notifications or reminders in a centralized, easy way;
- User Access System - a secondary feature within the Planning Module, it allows for establishing security access levels, which ensures specific users have access only to the information they need;
- Notification System - another secondary feature, this allows for sending reminders to the clients in instances when they need, for example, to fill in specific documents, or prepare for upcoming meetings; it also notifies Dezide when they need to be aware of changes happening on the client's side
- Automated Reporting - while this was not discussed above, the interviews and meetings also uncovered the activity of manually creating the reports used within the later stages of the on-

#	Benefit	Owner	Potential Actor(s)	Measure(s)
3.1	Drawing more clients in	CEO Sales representative	CEO Sales representative	Potential clients acquisition rate (leads)
3.2	Retaining clients already within the onboarding	CEO Sales representative	Project Manager	Customer retention rate
3.3	Generating more revenue	CEO Sales representative	CEO Sales representative Project Manager	Potential clients acquisition rate Customer retention rate Financial growth rate
3.4	Remaining competitive on the market	CEO Sales representative	CEO Sales representative	Product benchmarking (against competitors) Client feedback (software, process)
3.5	Improving the onboarding framework with a new management system increases the quality of service offered	CEO Sales representative Project Manager	System Architect Developer(s) Project Manager	Client feedback (software, process) Owners'/Actors' feedback and assessment
3.6	The new management system facilitates knowledge transfer throughout the onboarding	CEO Project Manager	System Architect Developer(s) Project Manager	Client feedback (software, process) Owners'/Actors' feedback and assessment On-time completion of onboarding tasks rate

Table 2: Benefits owners, actors and measures

boarding; this feature aims to automatically build the reports using data already available within the system, while Dezide can focus on preparing for meetings.

A starting point for understanding why creating a new management system to support the onboarding process informs/informates the realization of benefits is, of course, the new management system's informating and automating capabilities. When developing a new information system, it is naturally an automating system, as it allows to automate operations and replace human effort [Zuboff (1989)]. For the Planning Module, this is most clear when looking at the Automated Reporting feature, which aims to automatically build a report that was previously constructed manually. Another example can be seen within the centralization of the assets, as now Dezide's project manager's job's complexity is reduced significantly by not having to go around various systems looking for the correct assets.

Arguably more valuable are the informating capabilities of information systems. The onboarding is in and of itself a process in which knowledge needs to be managed across boundaries (detailed within the next subsection) and, in order to successfully do so, the new management system needs to be designed with informating capabilities in mind, such that the new tool becomes the supporting mechanism for the onboarding process, and it contributes to the realization of benefits. In this way, the new system becomes a boundary object used to facilitate the overcoming of the knowledge boundaries throughout the onboarding. As such, the following list/table details the informating capabilities of each feature of the Planning Module, drawing upon the work of Zuboff (1989) and Surendra and Nazir (2019),

- The Online Centralized Assets, Interactive Roadmap and Notifications System features, but also the Planning Module as a whole, are ready-to-hand, meaning they simply represent tools for users to complete the tasks at hand, rather than something they need to be aware of and purposefully consider in order to try to do their tasks [Surendra and Nazir (2019)]. For example, receiving a notification when it is time to fill in a document for an upcoming new phase of the onboarding, and being able to complete the task within the same system, allows the adequate user on the clients' side (such as a project manager or a team leader) to quickly take action and perform the task, without having to go through multiple systems.

- The Preliminary list of guides and the User Access System features inform the Planning Module as they provide greater user control of the task at hand, without additional need for support from Dezide's side [Surendra and Nazir (2019)]. In this case, the user access system allows for the adequate assignation of a subject matter expert to building a specific troubleshooting guide, which helps facilitate knowledge transfer through ensuring qualitative guides are built by the relevant domain experts.

- The Automated Reporting feature eliminates the manual labor on Dezide's side and makes the reporting immediately available to the client - the reports generated display valuable information about both the quality of the troubleshooting guides and their contents, as well as information about the users' and stakeholders' experience when using Dezide. Having this information available at all times helps users to better understand their own business process and make appropriate changes to improve it, which then helps them accomplish their work more seamlessly [Surendra and Nazir (2019)]

- The Planning Module as a whole can easily be integrated within the work processes practiced throughout the onboarding, and it can help uncover underlying work practices that are being taken for granted [Surendra and Nazir (2019)] on either side.

However, another characteristic of an informating functionality is that it does not become informating because it was designed to be so, but rather when the users adopt an informating perspective when using that functionality [Surendra and Nazir (2019)]. This is yet to be established for the Planning Module, as that requires building the software and testing it within an onboarding process, which is not possible within the current bounds of the thesis, and which will be discussed in the section about limitations.

3.3. Developing the theory-ingrained artifact

In order to fully understand how a new management system informs/informates the realization of benefits, a link needs to be established between the system (Planning Module) and the process (onboarding framework). As stated in section 1, Carlile's paper on knowledge boundaries states there are three types of boundaries - syntactic, semantic and pragmatic [Carlile (2002)]. His follow-up paper extends this understanding by uncovering each type of boundary has an associated activity that helps actors overcome the boundary and reach the desired goals - knowledge transferring at the syntactic level, knowledge translating at the semantic level, and knowledge transformation at the pragmatic level [Carlile (2004)].

Using Carlile's inverted triangle model, the left-hand side of figure 2 represents the onboarding framework and its phases (in orange), and the right-hand side represents the Planning Module as a whole (in blue). The Planning Module acts like a boundary object that supports activities throughout the onboarding process (i.e. across all types of boundaries), and as such its relationship with the onboarding framework adjusts as the onboarding process advances. The increase in novelty captured within the sides of the triangle (from bottom up) reflects, in Dezide's case, the progression through the onboarding process - so, the level of novelty (right-hand arrow) increases as Dezide and the client progress through the onboarding (left-hand arrow). The full model is illustrated in figure 2.

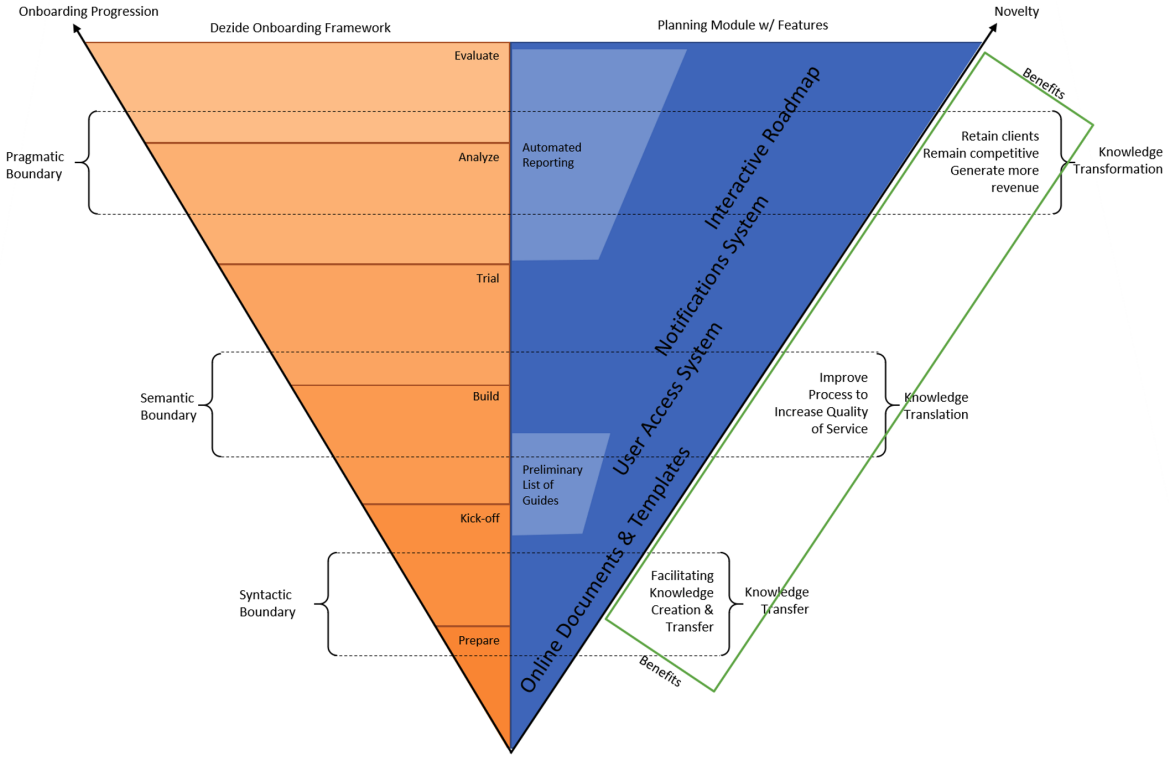

Figure 2: Informating the realization of benefits at each knowledge boundary throughout the onboarding process

The syntactic boundary arises early on in the onboarding, somewhere between the Prepare and Kick-off phases, as illustrated in figure 3. During the Prepare phase, the client is introduced to the onboarding and what is to come, and expectations are being laid out. The Kick-off starts up the onboarding with a more detailed meeting that briefly describes Dezide's software, and the assets, which are boundary objects [Carlile (2002)], are being used to capture the first bits of knowledge. During these phases, both Dezide and the client transfer knowledge between each other through a shared lexicon, making it possible to efficiently manage the domain-specific knowledge on either side across the boundary [Carlile (2004)].

The role of the Planning Module at this boundary is to facilitate the knowledge creation and transfer taking place, through features like Online Centralized Assets (which are used as boundary objects to formulate the common lexicon), Interactive Roadmap (which is also used as a boundary object to illustrate the plan for the onboarding and helps develop a common understanding of the process), or Notifications System (which automatically reminds Dezide and the clients about upcoming tasks and meetings). In this way, the Planning Module informates the realization of the *facilitating the knowledge transfer* benefit identified earlier, which is illustrated on the right-hand side of the figure, within the curly brackets depicting the boundary. This is a first argument for how an informating

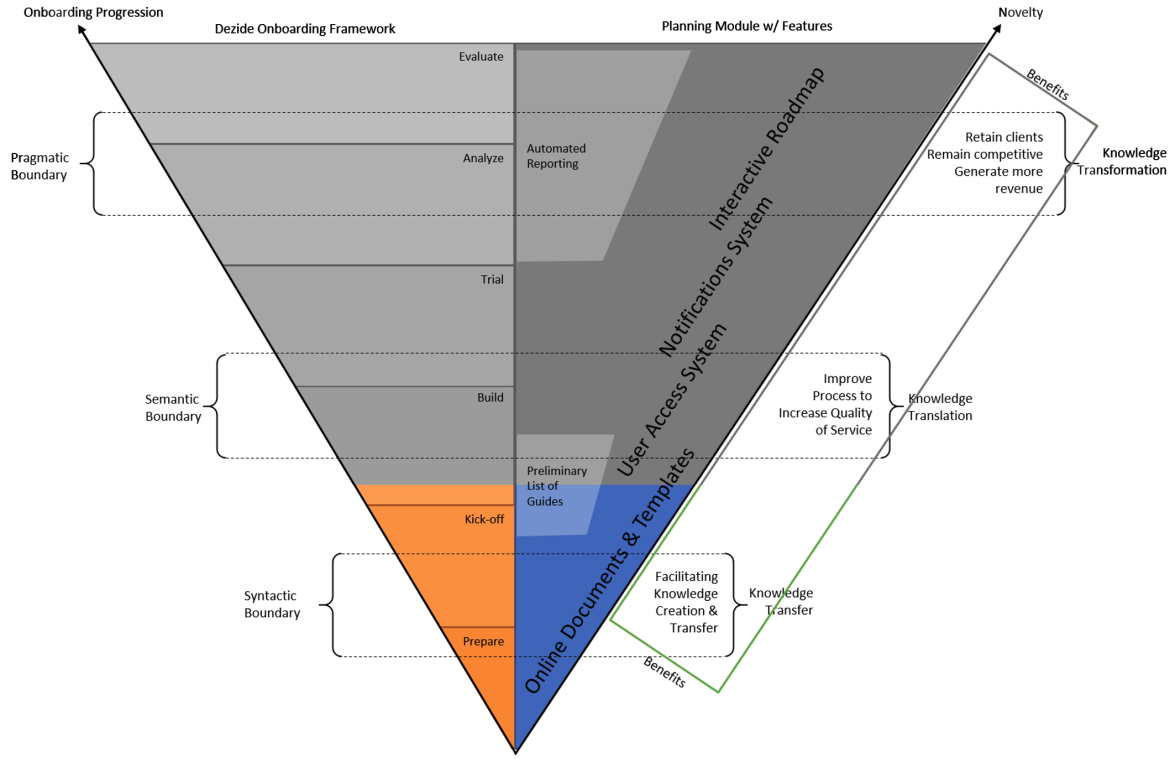

Figure 3: Informating the realization of benefits at the syntactic boundary through knowledge transfer

system contributes to the realization of benefits for Dezide.

As we progress through the onboarding, the level of novelty increases and the shared lexicon and established common ground become insufficient to understand the consequences arising from differences and dependencies between the actors as personal interpretations and meanings emerge, and such a semantic boundary is faced [Carlile (2004)]. For the onboarding process, this boundary is visible somewhere around the Build and Trial phases, captured in figure 4; during the Build phase, Dezide trains the clients in how to build troubleshooting guides within their systems (i.e. how can subject matter experts externalize their tacit knowledge into explicit knowledge using the structure provided by the system [Nonaka (1994)]), and then supports them in the guide building activity. During the Trial phase, the newly created guides get shipped to the end-users (technicians), and they use them in real-life situations to solve their day-to-day issues, so that they can provide feedback on the quality of the guides' contents. While the process in which the subject matter experts use their tacit knowledge to build troubleshooting guides for technicians to use can also be analyzed using Carlile's integrated framework, I am focusing on the boundary between Dezide and the client in which the former is in charge of training and supporting the latter in building guides. If the two parties fail to translate their domain-specific knowledge through the development of shared meanings and mechanisms, then

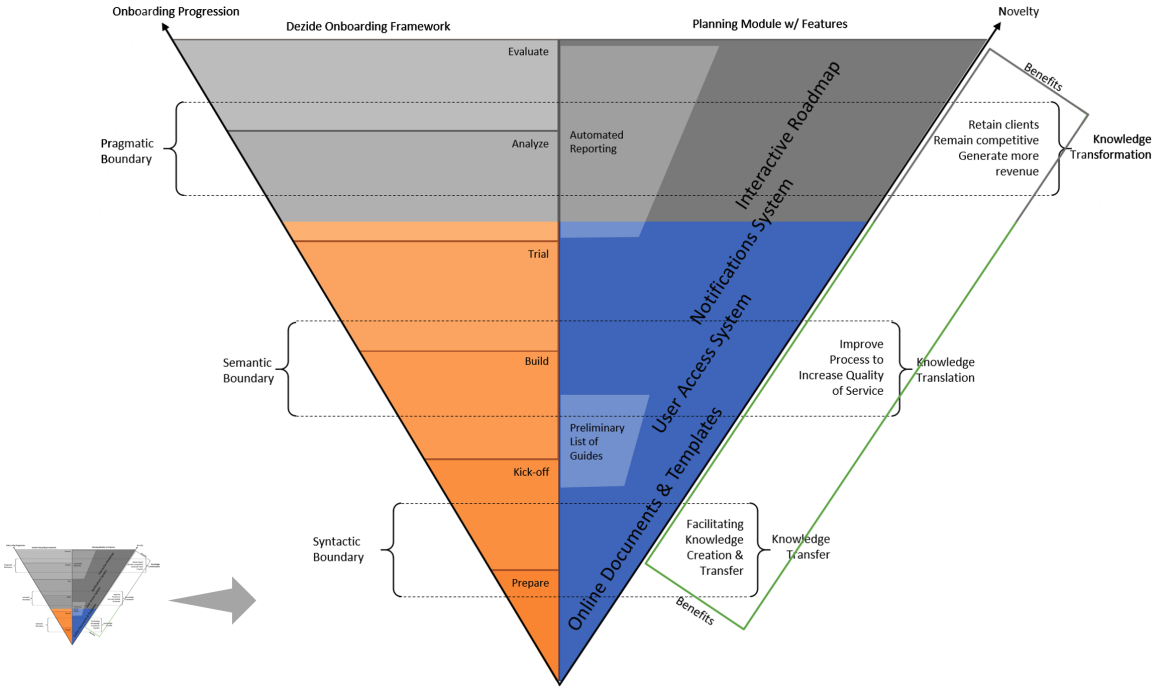

Figure 4: Informating the realization of benefits at the semantic boundary through knowledge translation

a pragmatic boundary is faced [Carlile (2004)].

At this boundary, the role of the Planning Module is to improve the quality of the onboarding process by offering ready-to-hand features that can be used to ensure the clients and Dezide can overcome their differences in interpretations and meanings. For example, the preliminary list of guides in combination with the user access system can be used to assign subject matter experts to build specific guides, which ensures adequate resource allocation and a qualitative guide knowledge base (since the right person with the right knowledge is building the right guides). The Trial phase is used to determine the accuracy of the guides' contents, and so the centralized online assets feature provides transparency and insight into this aspect. In this way, the Planning Module improves the onboarding process and informates the realization of the *increase the quality of service offered* benefit. This serves as a second argument for the role of informating capabilities of systems into benefits realization.

Finally, as we progress towards the final stages of the onboarding and novelty increases once again, we approach the pragmatic boundary, which in the onboarding's case lies somewhere between the Analyze and Evaluate phases (figure 5). During the Analyze phase, Dezide uses data automatically gathered through the use of the troubleshooting guides to build a report that assesses the quality of the guides that were built in previous phases of the onboarding. During the Evaluate phase, using that report in combination with user feedback, Dezide manually builds a new report that evaluates the clients' experience with using the software. These activities present the opportunity to develop

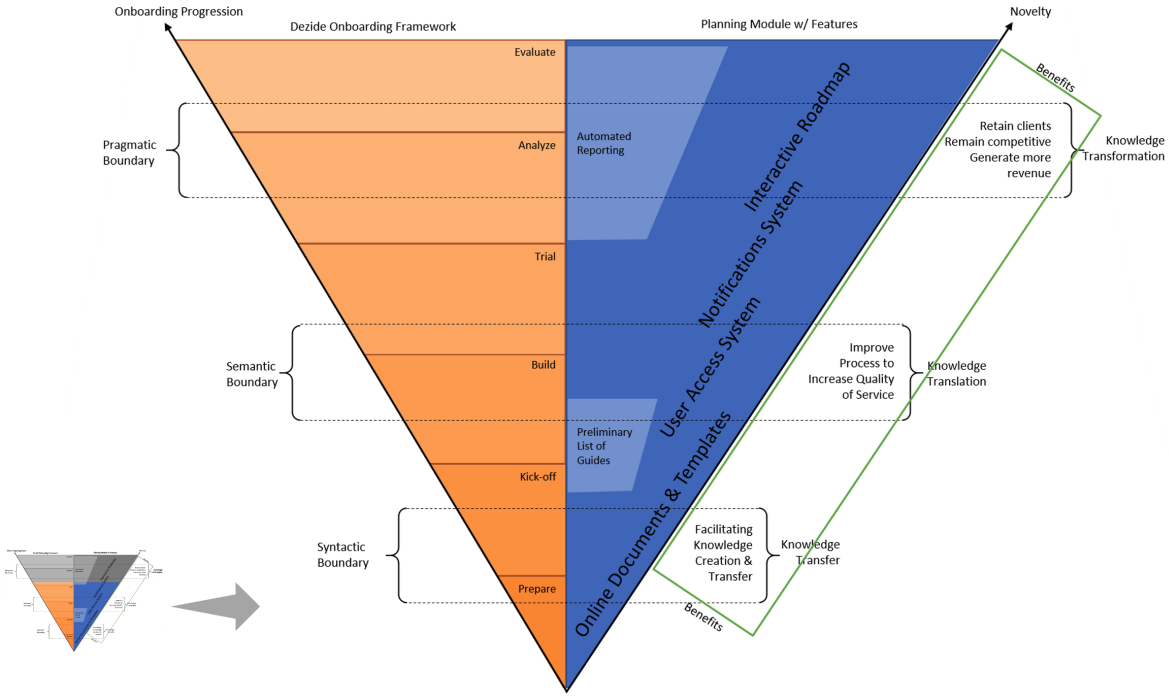

Figure 5: Informating the realization of benefits at the pragmatic boundary through knowledge transformation

common, pragmatic interests between the actors (i.e. Dezide and the client), that allow them to address the consequences, differences and dependencies of each other's domain-specific knowledge and overcome the pragmatic boundary through transforming the knowledge used in the past [Carlile (2004)]. At the end of the onboarding, the question becomes if Dezide's troubleshooting system is indeed a solution worth investing in from the clients' side, and if so, the two endeavour in a whole new, identical process, namely the roll-out.

The role of the Planning Module at this final boundary is to help retain the clients that underwent the onboarding, and by doing so, generate more revenue and remain competitive on the market. Features like the Automated Reporting, and all other features discussed so far are meant to inform the decision of whether or not the client moves forward with Dezide's software into the roll-out (to become established clients), as well as be the foundation (boundary object) on which the translation of knowledge and hence, the overcoming of the pragmatic boundary, take place. As such, the Planning Module informates the realization of the final, pragmatic benefits - *retaining clients, remaining competitive, generating more revenue, drawing in more clients with the improved onboarding service.* This is the third and final argument for how can a new management system inform the realization of benefits within organizations.

4. Discussion

4.1. Contribution to the field

Throughout the thesis, I have used the concepts described in section 1 to inform the design of a new management system in order to improve the onboarding process and realize benefits.

The concepts of change and change management were used within the paper to understand the fundamentals about the case at hand, namely Dezide and their distinctive approach to onboarding customers through the onboarding framework. The change management theories allowed me to illustrate that the onboarding framework is a process built to support the clients' change management activities outset by the integration and use of Dezide's troubleshooting software, and to academically support that the onboarding framework represents an effective and timely method of managing a set of proactive changes to achieve defined performance goals [Bradley (2010)].

Focusing in from the change management concept, which proved to be very broad during the early stages of the research process, the concepts of benefits and benefits realization management emerged as something encompassing change, with the argument that without the realization of benefits, there is no reason to invest in change [Bradley (2010)]. This helped me uncover the objectives of the problem situation encountered within the case company, Dezide, namely that the company's goals with improving their (change-oriented) onboarding process were to firstly, facilitate the realization of benefits for the clients undergoing the onboarding and secondly, to streamline (inform) the onboarding process in order for Dezide to realize benefits from successful onboarding processes.

Moreover, designing and developing a new management information system (the Planning Module) to support the onboarding process relates to the extant literature that views benefits realization management in information systems development to be the process of organising and managing such that the potential benefits arising from the use of IT are realized [Doherty et al. (2012)], as well as upon Doherty's considerations that a benefits realization approach facilitates a programme of organizational change that complements a new information system's functionality and facilitates the realization of important benefits [Doherty et al. (2012)]. Having developed the Planning Module as a boundary object that supports the change and knowledge-related activities within the onboarding process, and having based the design of the Planning Module's features on the informating capabilities described by Zuboff (1989) and Brinkmann (2014), this thesis extends the extant literature on successfully realizing benefits and managing change by making an argument for designing new information systems with informating capabilities at the foundation in order to facilitate the realization of benefits, managing of the change activity and success of the supporting system integration process (in Dezide's case, the success of the onboarding process translates into retaining customers and generating more revenue). Moreover, this is consistent with the second principle of the problem formulation stage in action design

research discussed in section 2, namely the construction of a theory-ingrained artifact that manifests the theory in a socially recognizable form [Sein et al. (2011)].

The central theory used throughout this thesis is Carlile's theory of managing knowledge at boundaries within an organization [Carlile (2004)]. As demonstrated in section 3, this thesis extends Carlile's theory from its inter-departmental application to an inter-organization application, as well as focuses it into the information systems field. This is an important contribution to the field, as it uses Carlile's theory to showcase how a process of developing and sharing knowledge involving two different organizations takes place, what types of boundaries the two actors face and when and how designing a process-supporting information system facilitates, or rather, informates overcoming the boundaries and the realization of benefits for both sides.

Finally, I believe the biggest contribution my thesis brings to the field of information systems is through the combination of the theories presented above, because it provides researchers with a novel way to analyze how knowledge is being created and shared within processes involving different organizations, where do the different types of boundaries that need to be overcome arise, and how a new information system can be designed such that it informs the process to realize benefits for all involved organizations. This is consistent with the first principle of problem formulation in action design research, namely that the research is inspired from practice, and the solution can be used to solve a particular class of problems (developing a theory-ingrained IT solution that informs similar processes to the onboarding framework and the realization of benefits for those organizations involved) [Sein et al. (2011)].

4.2. Contribution to practice

Given this thesis was done in collaboration with a real life organization and that it proposes a unified way to analyzing processes and designing new supporting information systems that act as boundary objects that facilitate the knowledge management processes across boundaries, the main takeaways for practitioners consist of the following:

1. *Having a change/benefits oriented process is primordial to the realization of benefits from the use of the IT tool both for the software creator and the client*; this is supported by the large body of literature on change and benefits realization management, which shows that a benefits orientation approach to software development and integration is crucial in the success of a new IT tool and in the competitive edge of the organizations possessing and using these tools [Doherty et al. (2012), Bradley (2010)].
2. *The informating capabilities of information systems supporting a process directly contribute to the realization of benefits*; as demonstrated throughout section 3 of this thesis, informating capabilities empower users to understand the business process to create innovative solutions to their

organizational problems [Zuboff (1989), Surendra and Nazir (2019)], and when combining with a benefits oriented approach, has the potential to realize benefits that would have otherwise not been realized.

3. *Paying attention to the knowledge management process taking place during the collaboration between two organization is of utmost importance, and finding ways to use the IT tools to overcome all the types of boundaries is another facilitator for realizing benefits*; this application of Carlile's theory across organizations involved within the same knowledge-oriented process informs the design of new information systems, and these new boundary objects positively inform the knowledge management process and realization of benefits.

4.3. Limitations

This study is limited in a number of ways. Firstly, it is limited by its time frame - the thesis project was allocated approximately five months, time used to focus on the first stage of the action design research methodology, namely the problem formulation (identifying the theories and their relationship with the empirical findings and designing the theory-ingrained artifact in the form of the Planning Module). The time frame did not allow for going into the remaining stages of action design research, which means that the assessment of the Planning Module in its improvement of the onboarding and its informating capabilities to the realization of benefits was impacted by the impossibility to implement the Planning Module within the case organization Dezide. Moreover, this impeded an assessment of how the new system can uncover work practices taken for granted, and how the system actually empowers its users to undertake an informating mindset when having to complete a task through it.

Secondly, the ongoing Covid-19 pandemic hindered the engaged problem formulation process between myself and the case company Dezide, as it limited our possibility to physically get together and have extended discussions of the subject at hand. While the meetings, discussions and interviews were held online, without any difficulties from either mine or Dezide's side, the lack of physical presence eliminated all the opportunities for watercooler banter (ad hoc, informal conversations) which could have enriched the abductive data gathering process.

Thirdly, a theoretical limitation of this study lies in the application and use of Carlile's concept of boundary objects. While this was indeed presented within the paper, with particular moments in which various assets were referred to as boundary objects, a more detailed look into the different extant boundary objects within the onboarding framework or similar processes could enhance the understanding of the knowledge management process, and provide a deeper understanding into how new management system features can be designed such that they become informating.

Finally, this study is limited in its objects of study. This thesis looks at a single case, and while it does indeed allow for understanding a specific phenomenon within its real-life context, it needs to be

extended to other companies that employ a similar onboarding process, in order to determine the true validity of the findings presented here and the true applicability of the theory-ingrained IT artifact.

4.4. Future work

In the future, a fully fledged action design research founded on the problem formulation presented throughout this thesis must be undertaken within Dezide, in order for the formalization of knowledge to take place and generalize the outcomes [Sein et al. (2011)]. Implementing, releasing and testing the Planning Module within actual onboarding processes with clients is fundamental in developing a general understanding of how similar theory-ingrained artifacts can inform the realization of benefits within similar processes. Whilst this thesis' time frame could not offer a quantitative argument of the Planning Module's contribution to the onboarding process, the company relies on the thesis' qualitative arguments for why building and releasing the new system will inform the realization of benefits for all the stakeholders involved in the onboarding and rollout processes.

A very important element subject to future work is the measurement of the degree to which the benefits identified within section 3 and summarized in tables 1 and 2 were realized. This specifically entails the implementation and testing of the new Planning Module in an actual onboarding process, as well as long-term measurement of the benefits using the measures noted in table 2 and active involvement of the owners and actors into the realization of said benefits.

From a theoretical perspective, this study can be extended to multiple case organizations that employ a similar process to Dezide's onboarding framework in order to build quantitative arguments to support the findings of this study. The true form of the engaged problem formulation methodology can be employed here, where a highly inductive approach applied in collaboration with multiple organizations can uncover industry wide issues that can be formulated into problems to be addressed by further, larger-scale action design research processes.

Moreover, deepening the understanding of the nature of the boundary objects at each boundary can also contribute to the generalization of this study, and its applicability to other fields than information systems. Focusing future research on the specific change management activities taking place will help gain further insight into the specifics of how knowledge is managed at each boundary, extending the findings of this study. Furthermore, assessing just specific phases within onboarding-like processes (such as the Build phase, during which the clients undergo a parallel knowledge management process) can help uncover valuable details for practitioners looking to improve their organizations' processes.

Another research avenue to be explored lies within Nonaka's theory of dynamic knowledge creation within an organization. This can also be extended to understanding the process of knowledge creation within onboarding-like processes, which can help researchers formulate or expand on principles of designing such processes to facilitate the knowledge creation taking place between organizations.

Conclusion

In this thesis, I present an abductive engaged problem formulation process in collaboration with Dezide, from which the outcome is in the form of a theory-ingrained IT artifact meant to inform the knowledge management process within the onboarding framework and the realization of benefits both throughout and from the onboarding. The problem-inspired research activity [Sein et al. (2011)] uses principles from action design research, engaged problem formulation, case study research and abductive reasoning to formulate the theory-ingrained design of the new management system (the Planning Module) such that the boundary object facilitates the overcoming of all types of boundaries faced throughout the (onboarding) process, and with its informating features, informs the realization of benefits emerging from within the process. Section 1 presents the relevant theories used to both understand the context presented in the case, as well as the theories that inform the design of the new management system. Section 2 details the methodology employed, the case organization and data gathering process, followed by the presentation of the findings and abductive analysis process in section 3. Section 4 discusses this project's contribution to the field and practice, as well as limitations and possible future work avenues, that can help extend this study into a generalizable format to be used within multiple organizations or other fields.

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