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Information Systems Change as Process: The Case of Forskerfabrikken

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Abstract

Prior research has extensively investigated and confirmed the substantial and growing role that information systems (IS) have for the success of organizations. However, relatively little studies yet address the particular situation of small and medium enterprises (SMEs), as they are often too small and financially restricted to invest in large out-of-the-box enterprise systems. With this article we add to our understanding of how young SMEs (entrepreneurs) utilize the benefits of IS and deal with the challenges that come along. We use a process study and build on punctuated-equilibrium theory to understand the different interactions between the growth of an organization and the development of an enterprise IS. Our empirical setting is based on a rich single case study of the Norwegian SME Forskerfabrikken and its growth processes over 13 years. As a result of our analysis, we identify strategic drivers, external resources, organizational structure, process optimization, and stakeholder expectations as the main growth constituents of the organization. Our findings reveal the complex set of changes and interactions taking place within and across these categories of change, and demonstrate how IS are both influencing and influenced by the growth of the organization.

Keywords: Enterprise information systems, SME, process study, punctuated-equilibrium theory.

1 Introduction

In today's business environment, Information Systems (IS) substantially influence an organization's ability to achieve its goals and strategies. The demand for Information Technology (IT) has continued to grow, and particularly escalated around the last decade, as demonstrated by a large increase in IT spending (Lunden, 2013). This has led to an increase in commercial and scientific research regarding IS (Devos, 2011). The current research base is not, however, a reflection of modern society's mix of businesses (Bernaert et al., 2014). Small and Medium sized enterprises (SMEs), i.e. enterprises with less than 250 employees and an annual turnover under €50 million and/or total assets under €43 million (Bernaert et al., 2014), account for more than 99% of all enterprises in 28 EU countries (Muller et al., 2014). Researchers claim that much IS research is focusing on large enterprises, as SMEs are often considered too small and financially inflexible for large scale IT investments (Bernaert et al., 2014, Obwegeser et al., 2015, Devos, 2011).

This paper therefore aims to extend our understanding of how recently established SMEs (entrepreneurs) utilize IS in their growth process, and how the organizational development is influenced by the concurrent development of an enterprise IS landscape. Our research question is formulated as follows:

How does the development of enterprise information systems interact with the development of the organization as a whole?

Our research follows a processual perspective, which focuses on how change unfolds over time (Mason, 1996). The choice of theory and method are strongly influence by this perspective.

The remainder of this paper is structured as follows: first, we will discuss the theoretical background in the form of punctuated equilibrium theory (PET), followed by an introduction to our case study methodology and process theory. Subsequently, we introduce the case company and empirical setting, before presenting our analysis and discussion. Finally, we end with a conclusion and the limitations of our research.

2 Theoretical background

To understand how changes in Forskerfabrikken unfolded, we used the episodic approach of Gersick (1991)'s *punctuations*, also referred to as punctuated equilibrium theory.

Newman and Robey (1992) found that PET could be a useful perspective when modelling the development of IS within organizations. In addition, several studies have recognized punctuations concerning organizational and IS change (Tyre and Orlikowski, 1994, Lassila and Brancheau, 1999, Van de Ven et al., 1999, Garud and Karnøe, 2001, Plowman et al., 2007, Lyytinen and Newman, 2008). Sabherwal et al., (2001) also concluded that an organization's IS evolution and misalignment could be analyzed using a PET perspective in their case study of three large organizations. PET is therefore a useful tool for documenting changes within Forskerfabrikken's enterprise system (ES). We argue that employing a PET perspective based on a rich process model can be helpful to uncover patterns and relationships among the actors and entities in our case setting (Lyytinen and Newman, 2008). Consequently, this method and theory will enable us to acquire a more nuanced view of processes and their interactions (Lyytinen and Newman, 2008, Street and Meister, 2004). In this paper, we largely build on Lyytinen and Newman (2008) to explain information systems change, however adopt their proposed methodology to use categories created inductively from our case data instead of socio-technical components.

The roots of PET are to be found in evolutionary biology and particularly Darwin, but also philosophically in Hegel and Marx's theory of dialectics, which recognized that a system evolves through stages (Lyytinen and Newman, 2008). In social science and management, PET has been further elaborated, among others, by (Gersick, 1991) and (Fox-Wolfgramm and Boal, 1998). Within this paper we follow

predominantly the ideas and concepts of PET as formulated by Street and Meister (2004), as well as Lyytinen and Newman (2008).

Within system change theories, there exist two paradigms for describing the nature of change (Tushman and Romanelli, 2008, Gersick, 1991, Lyytinen and Newman, 2008). In the first paradigm, change is seen as continuous and incremental. This means that change slowly accumulates over time in incremental steps, leading to a stream of small mutations (Gersick, 1991). In stark contrast, the second paradigm holds a revolutionary view. At the core of this paradigm are periods of *revolutions*, also referred to as metamorphic change. Subsequently, these revolutions are followed by periods of *stability* (Lyytinen and Newman, 2008) and small mutations, also described as equilibrium by Gersick (1991). Lyytinen and Newman (2008) saw stability as a better description, as a system never truly rests in total equilibrium.

As a third core concept, any PET will typically include a discussion of *deep structure* (Street and Meister, 2004). Gersick (1991) defines deep structure as *"the set of fundamental choices a system has made of (1) the basic parts into which its units will be organized and (2) the basic activity patterns that will maintain its existence"* (Gersick, 1991)**.** As deep structure is based on the conditions that describe a system, it forms a framework for the system, encouraging the use of structure and behavior that form the organization (Plowman et al., 2007, Gersick, 1991). Intuitively, systems tend to remain stable as they originate from previous actions and are therefore constrained by path dependency (Garud and Karnøe, 2001).

Periods of continuous and incremental change can be classified as *first-order change*. This periods are considered as *episodes* where changes occur incrementally (Lyytinen and Newman, 2008). Such periods are more common if a system is highly flexible. If a system is more rigid, incremental adoptions are less common as the system is not always be malleable enough to gradually adjust to changes (Gersick, 1991, Lyytinen and Newman, 2008).

A *revolutionary period* is a compact period involving radical change, a *second-order change* (Lyytinen and Newman, 2008, Gersick, 1991). Often, significant change in systems occur in such a periods. However, the grade and process of change depends on the path-dependency and active management of the organization itself (Gersick, 1991, Lyytinen and Newman, 2008).

A period where an organization sees the need to abandon their current deep structure and reform a new one is known as a revolutionary period (Gersick, 1991), or a period of *system upheaval* (Lyytinen & Newman, 2008). In such a period there will occur an abrupt or incremental instability between categories, a *gap*. In Lyytinen and Newman (2008)'s paper, this gap was between socio-technical components, in our model it is a gap between categories. Any event that creates a gap is called a *critical incident*. If the gap happens from an incremental drift towards misalignment that eventually leads to a point of instability, there occurs a *tipping point*. If the situation occurs abruptly, the organization experiences an *encounter*. The use of an *intervention* aims to close the gap that occurred. An intervention will then normally be followed by a *punctuation*, the actual response to revolutions. A punctuation therefore includes a sudden and rapid change in the deep structure (Sabherwal et al., 2001, Street and Meister, 2004).

Any change in a category can eventually lead to a punctuated change. Consequently, systems constantly have to adopt both to their internal and external environment. If the system fails to adapt in time, it will result in system instability and ultimately lead to poorer performance (Lyytinen and Newman, 2008).

An intervention, the choice of fixing a gap, is not always successful, but can result in three potential outcomes. One can succeed by removing the gap, one can fail, or one may even weaken a system's stability. There are a number of reasons for the failure of an intervention: individual's thinking, under-

standing, learning and remembering; the system's complex interdependencies with other factors (Cohen et al., 1972, Van de Ven et al., 1999), lack of skills of a central actor, or simply bad luck (Lyytinen and Newman, 2008). The use of the concepts of interventions and gaps allows us to diagnose the change process. Consequently, it gives a researcher the ability to point out what can go wrong, when and how one should intervene, but also what interventions work and why they work (Lyytinen and Newman, 2008)

When an organization needs to respond to a revolutionary period, the response always depends on the system's deep structure. During a punctuation, the deep structure is disassembled and reconfigured, in addition to enforcing transformation (Gersick, 1991). Encounters are used to specify the necessary conditions for the new system as a drastic change will not take place without the introduction of an incident. In conclusion, the need to react to changes (in the form of gaps that occur among the systems elements) to maintain a system's performance and viability is at the core of PET (Lyytinen and Newman, 2008).

The punctuation, which describes the revolutionary change itself, can "*add novel technical elements, replace, remove or expand organizational structures and routines, and wipe out ideas, beliefs, skills, and values that underpin and are embodied in the organization*" (Lyytinen and Newman, 2008). During a punctuation, categories and their interactions will therefore have to be reconfigured, causing new and emergent properties. In addition, previous changes to the system will become antecedent conditions for new efforts of change (Lyytinen and Newman, 2008). An example of a response to a punctuation could be the change of IS strategy (Sabherwal et al., 2001, Street and Meister, 2004). The rest of the organization would need to change accordingly to be properly aligned (Street and Meister, 2004). However, as managers chose themselves whether they propagate change or not, certain managerial behaviors can cause a refusal to change during a revolutionary period, leading to the persistence or weakening of existing structures (Orlikowski, 2000, Orlikowski and Robey, 1991, Street and Meister, 2004).

PET describes organizations as systems that show "*a continuous oscillation between periods of incremental adoption and moments of system upheaval*" (Lyytinen and Newman, 2008). Evolutionary and revolutionary states have a dynamic relationship and organizations tend to move between them continuously. This can be caused by several factors both externally and internally, such as financial crisis, system malfunction or replacement of personnel. Consequently, changes are often abrupt (Lyytinen and Newman, 2008).

3 Methodology

Our research seeks to interpret the causes and effects of change in a retrospective perspective. Acknowledging the social construction of the historical data, an interpretive paradigm of research was chosen. The interpretive paradigm is appropriate because the research process of collecting and analyzing data was an outcome of the subjective interpretations of the researchers and the research objects, and there could be many interpretations of the same data, all of which may be potentially meaningful (Eriksson and Kovalainen, 2008).

Case studies are particularly well-suited to answer how and why research questions about events which the researchers have little control over (Leonard-Barton, 1990). To learn how a specific case works, a "thick description" of the case is needed (Geertz, 1973). For case studies, the emphasis lies in the production of detailed and holistic knowledge, based on multiple empirical sources of rich data in context (Tellis, 1997). Data was thus collected from three different sources in order to achieve a deep understanding of the case.

The relationship between theory and empirical research follows both inductive and deductive logic where the research process pivots from empirical research to theoretical results and back (Eriksson and Kovalainen, 2008). The research was based on a grounded theory approach because of its continuous interplay between analysis and data collection, and for its specific set of procedures of generating middle-range theory that are delimited to specific aspects of social phenomena (Eriksson and Kovalainen, 2008).

3.1 Process theory

In this paper, we discuss the development of organizational IS as a sequence of events over time by using a process theory approach. This will be done by developing a process model. As opposed to a variance model that tries to explain variation in outcomes, we will interpret our view of the outcomes based on previous sequences of action (Sabherwal and Robey, 1995). With the use of a process model, it will be possible to explain how and why a process was organized in a certain way, in addition to how and why this process created the outcomes it did (Lyytinen and Newman, 2008). It is however important to note that as a consequence of using this method, not all relevant knowledge will necessarily be discovered as it is a retrospective method. Consequently, missing information will leave certain gaps in our narrative. Our explanations can therefore only be tested against plausibility, but not correctness. This is a well-known limitation of process theory, as there could be multiple possible explanations for an incident, making it hard to verify (i.e. to ensure that one answer is right), but easier to falsify (i.e.to claim that one answer would be false) (Lyytinen and Newman, 2008).

3.2 Data collection

The main source of data for an understanding of how and why the enterprise system changed over time was semi-structured interviews. A feature of the case study is the possibility to combine qualitative and quantitative materials (Eriksson and Kovalainen, 2008). Internal documents from Forskerfabrikken provided quantitative financial data that could verify the qualitative data from the interviews. In addition, publicly available information was used to get a deeper understanding of the environment of the case company.

All interviews were audio recorded, and transcribed. Three different people with different responsibilities in the case company were interviewed in order to get a holistic understanding. These three people were Sverre who has the sole responsibility of the IT infrastructure, Hanne who is the founder of the company and Anne who is the CEO. The first round of data collection consisted of three semi-structured interviews where the respondents elaborated their personal narrative of events and emotions experienced in the course of the case company history (Riessman, 1993).

Data source	Description
Interviewees: • Anne (Founder) • Hanne (CEO) • Sverre (IT responsible, 2 interviews)	Semi- structured interviews that provided rich information on the history of the company and the development of its IT infrastructure. 3 stakeholders providing different insights.
Internal documents	"Wish list" of IT features from the employees to Sverre the IT developer, Business plan and an excel spread sheet with measures of output, revenue and profit.
Direct involvement	Deep understanding of how the case company works.

Table 1. Overview of data sources and description.

Access to internal documents was also granted from the case company. These documents consisted of the business plan and future strategy, an excel spread sheet of key figures for external reporting and a "wish list" of IS features the employees found important for their work.

One of the researchers worked for the case company for 7 years, being involved with daily operations and administrative issues. This direct involvement was also an important source of data that provided a deep understanding of the case company from the very beginning.

3.3 Data analysis

Interviews were transcribed in their original language Norwegian. Following the grounded theory approach the data material was subject to open coding where the data was first coded as a timeline of events and circumstances. From the coded data material, we employed axial coding in order to categorize events and concepts that were related to each other (Eriksson and Kovalainen, 2008). An iterative process of constant comparison of empirical indicators was used to produce categories (Eriksson and Kovalainen, 2008).

Explicit connections between the categories and events were then further analyzed using the punctuated equilibrium theory. The overall purpose of intensive case study research is to construct 'a good story worth hearing' (Dyer and Wilkins, 1991). A process model was thus developed which describes how different categories of changes occurred over time. As part of this process, we constantly wrote down memoirs on a whiteboard in order to explore the relationships between the concepts (Strauss and Corbin, 1990). On this basis, we found the most dominant relationships that would form the basis of our middle-range theory.

4 Case description

Forskerfabrikken AS is a Norwegian company located in Oslo, founded in 2002. As many small start-ups, Forskerfabrikken started in the founder's basement, where she managed Forskerfabrikken's freelancers and finances. Forskerfabrikken's mission and goal is to motivate the younger generation, specifically children in kindergarten and primary schools to become more interested in the natural sciences by offering courses (Forskerfabrikken, 2015).

The organization has grown substantially since its inception. In its current state, Forskerfabrikken has nine fulltime employees. Management consists of Hanne, Anne and Ian. Hanne is the founder, and responsible for the development of courses, Anne is the CEO, while Ian is responsible for sales. Many of Forskerfabrikken's product offerings are made possible by the use of freelancers who teach and manage courses in their areas.

Forskerfabrikken offers a wide selection of courses, where courses are primarily addressed to children in kindergarten or primary school. The courses offer great variety in subjects, but are mainly based on the natural sciences such as biology, chemistry, etc. Forskerfabrikken offers three categories of classes, two for children and one for teachers. Sign-up for courses is today organized through Forskerfabrikken's website. On their website, parents are able to choose between a wide range of day-courses as well as extended summer courses offered by Forskerfabrikken.

4.1 Information Systems in Forskerfabrikken

At Forskerfabrikken's inception, Excel was used as a way to track course attendees. Later, Forskerfabrikken created their own system called Samlebåndet (Norwegian for: the conveyor belt). The reason for Samlebåndet's creation was that no other system had the ability to properly follow customers through their full lifecycle with Forskerfabrikken. To keep up with the ongoing changes of the organization, the system has been continually updated and expanded.

Samlebåndet was developed voluntarily and without pay by Sverre, a programmer with years of experience and husband to Hanne. Because of the context, there has therefore not been set any milestones, deadlines etc., as he has developed the system in his own free time. During the development of Samlebåndet, Sverre has however continuously talked to employees of Forskerfabrikken and tried to incorporate their wishes into the system using an iterative approach.

Today, Samlebåndet is a web-application with numerous uses. The system gives an overview of the whole organization, easing the organization of courses, but also performing various administrative tasks:

- Web-based enrolment and payment
- Providing course leaders participant lists and parents' contact information
- Adding course leaders to courses
- Creating courses in Norway's counties as required
- Retrieving e-mail addresses
- Retrieving statistics
- Retrieving revenues for accounting purposes

Forskerfabrikken also uses several other, mostly cloud-based services to run its daily operations. Netledger is used for accounting purposes. A CRM system is used to handle relations with the private and public organizations they are cooperating with. Dropbox is used as a standardized folder system. Gmail is used as their e-mail service. A webshop has been launched that sells products related to their courses. Forskerfabrikken also has social media presence in the form of Facebook, Instagram, Youtube and their own blog. These systems, including Samlebåndet, and the interactions between them can be seen as Forskerfabrikken's enterprise system (ES).

5 Analysis and discussion

In the analysis of our case data, we focus on exploring the mechanisms that led to punctuations and upheaval of deep structure. Using a grounded theory approach, categories of change are inductively extracted, defined and related to each other. Building on this structure, we are able to present a process

model that graphically relates the categories found to changes that occurred over time. Based on an inductive research approach we identified five categories of change from our case data. Change is conceptualized as a significant new direction of effort and behavior. An internal or external event may act as trigger for changes in one or several of the categories identified. Figure 1 depicts the process model we created on the basis of our analysis, and gives a detailed view on the timeline of events.

5.1 Strategic drivers

Strategic drivers as a category are describing changes in underlying strategic goals that inform the decision making process in Forskerfabrikken. This includes the perspective of time for planning and the purpose of strategic decisions. Within this category, two major changes were identified.

When Forskerfabrikken was founded in 2002, no business plan was formally set up. Forskerfabrikken was registered as a so-called ideal association, which means that members hold voting rights. This underlined its identity as a social entrepreneur (Austin et al., 2006). The association was organized such that the members, which were the University of Oslo and three other associations, paid a yearly fee to be a member. This created a lot of uncertainty, as Forskerfabrikken could not be sure whether members were going to continue paying the fee for the next year(s) or dropping out. To adjust to that fact, the planning time horizon was limited to one year at the time, effectively constraining long term and strategic decision-making.

In 2009, Ferd (an investment fund) offered to support Forskerfabrikken for the next three years, both financially and with knowledge, but the support came with conditions. Forskerfabrikken was asked to formulate a business plan that outlined a path to become financially self-sufficient. As an extension of this, they agreed to be registered as a limited company in order to consolidate voting rights. The business plan and the increase planning security allowed for an expansion from Oslo to nationwide services. We identified this event as a change in the strategic drivers, as from that point on the decision-processes were directed at national growth in Norway, and guided by the goal of financial self-sufficiency as outlined in the business plan.

In 2015, Forskerfabrikken for the first time made profits without external financial support. A strategic decision was made by the board, which again changed the rationale of decision making in Forskerfabrikken. It was decided to expand internationally within the next two years, increasing the risks and scope of decisions due to eventualities that may arise from the growth process.

5.2 Stakeholder expectations

Over the course of Forskerfabrikken's lifetime, the expectations of stakeholders have influenced the choices the company has made. It is therefore interesting to categorize the changes in stakeholder expectations. Stakeholders include organizations and individuals, internal and external, who may directly be affected by, or have an interest in the actions of Forskerfabrikken.

As the use of e-business became more and more common, also Forskerfabrikkens customers started to expect to be able to enroll and pay online. According to Hanne, this trend was an important factor for the development of online functionality in Samlebåndet.

As a condition for Ferd's support, Forskerfabrikken had to fulfil certain requirements. They had to develop a business plan that would ensure that they became self-sufficient financially, become a limited company, and to expand nationally as soon as possible. Ferd as a stakeholder clearly affected Forskerfabrikken with its expectations and demands.

With the realized benefits of the implementation of Samlebåndet V.2, the full time employees began to see the possibility of more benefits. Together with Sverre they developed a "wish-list" of features and

improvements they wanted to be developed. Samlebåndet V.2 was based on the data model of V.1, which led to some fundamental limitations of the system. For example, course participants and course leaders could only be registered in one county in Norway because it was not expected in the early period that Forskerfabrikken would expand nationwide. Whenever a person was to be registered with a course in another county, the employees had to create a new object in the database. This created unnecessary work and redundant data, which over time created problems. Over time, the employees incrementally increased their expectations to the reliability and functionality of the IS and became more critically to system limitations and failures.

Ferd and other business partners also began to request descriptive statistics over the course participants with regards to gender and number of participants. Sverre added the necessary functionality to Samlebåndet V.2 in order to generate these statistics, which before did not seem relevant to the organization. The request of statistics is an example of how external stakeholders changed their expectations to Forskerfabrikken, eventually leading to a more professional, fact-based business conduct.

In 2013, the trend of social media presence became so significant for Forskerfabrikken that they created a Facebook representation. Up until this point, the dominant marketing channel was flyers being distributed to children at their local schools, which they brought home to their parents. Later, Forskerfabrikken also created a YouTube channel, an Instagram account and a blog. This shows how the customers' expectations changed Forskerfabrikken's marketing strategy.

As Sverre has always been an important resource for Forskerfabrikken with his IT competence, the whole organization has become dependent on his services. He has incrementally developed V.1 and V.2, and he has fixed the problems that arose from redundant data storage. In the interviews, Sverre clearly expresses that he expects Forskerfabrikken to become more self-reliant able to fix some of these problems themselves with the development of Samlebåndet V.3.

5.3 External resources

Events in this category relate to the interaction of Forskerfabrikken with resources external to the organization. These changes are based substantially on the ability to exploit resources in the external environment. In this category, five changes were identified.

Hanne's background as a scientist was an important factor for the development of shared IT systems, as she quickly saw the need for a common database to manage all courses and attendees. In 2002, Forskerfabrikken received 50 000 NOK from "Oslo kvinners handelstand forenings stiftelse" (OKHF) for the development of Samlebåndet version 1 (V.1). In 2007, Hanne attended a business development program hosted by "Næringslivets Hovedorganisasjon" (NHO) that drastically changed her ability to exploit external resources. She learned about board composition, which made her realize that the current board members did not add any value in terms of different views and competencies. They were all scientists with little knowledge about branding, marketing etc.

Perhaps the most significant change in Forskerfabrikken's exploitation of external resources was in 2009 when Ferd included them in their portfolio of social entrepreneurs. In addition to financial flexibility, Ferd also provided professional board members with profound business knowledge. In 2010, Hanne was elected to the Ashoka fellowship, which is the largest network of social entrepreneurs in the world (Ashoka, 2015). Being part of this large international network created a change in their ability to access and exploit external resources. In 2015, Forskerfabrikken received free advice from previous members of the top management of two large international consulting firms in relation to their new internationalization strategy. Forskerfabrikken's ability to exploit external resources has continuously developed, in particular with Hanne's activities, and supports the growth of the organization.

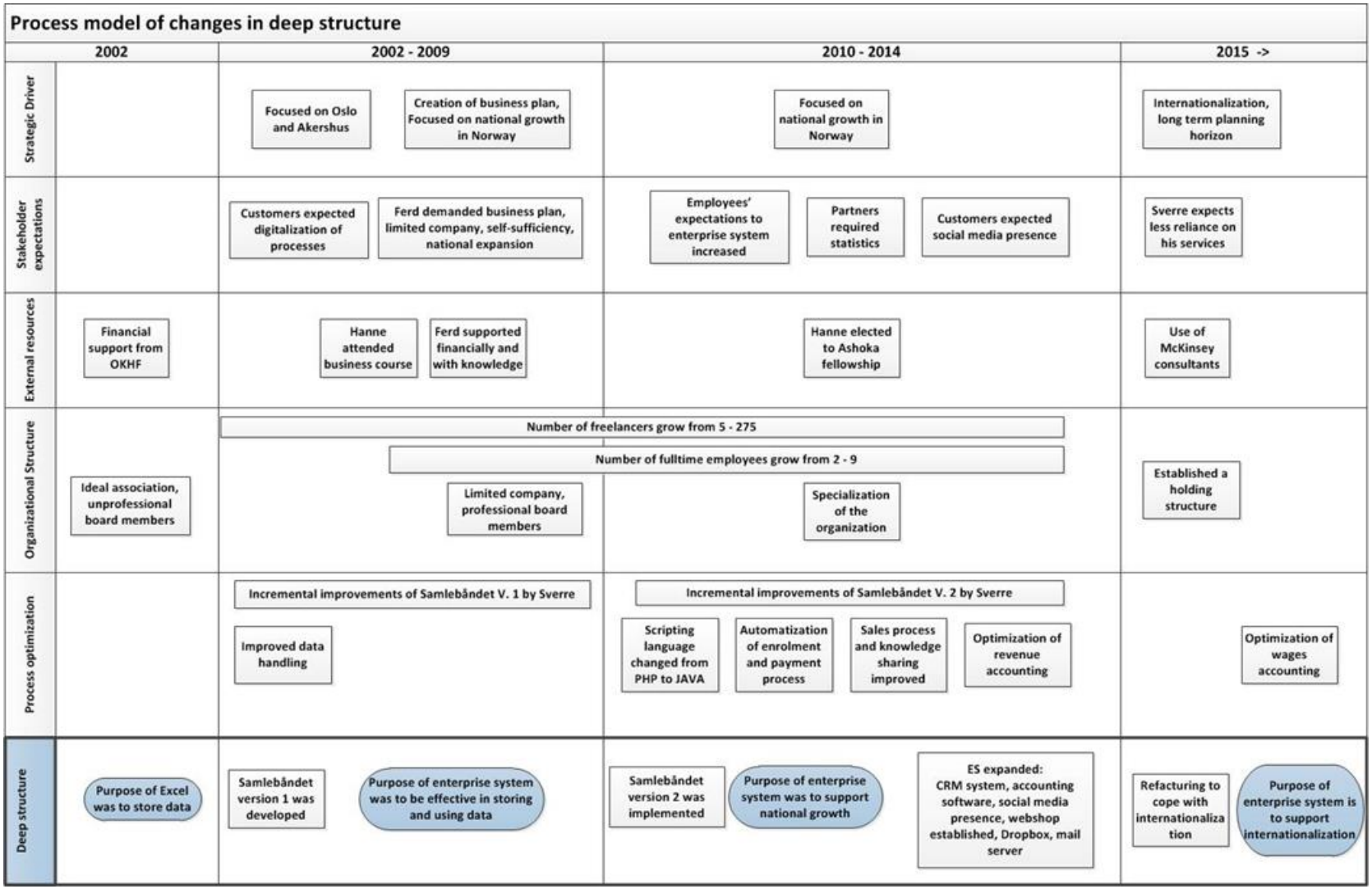

Figure 1. Process model of Forskerfabrikken 2002 – 2015.

5.4 Organizational structure

Being initially registered as an ideal association proved to have negative effects on the decision processes of the organization. As voting rights were held by the members, Hanne had to rely on the cooperation of board members for decision making. From 2002 to 2008, Forskerfabrikken had no full time employees, but around 30 freelancers who held the courses.

In 2008, the first two full time employees were hired, and the company changed its legal status to a limited company, with Hanne holding the majority of stocks. By the time Ferd got involved in 2009, the board members were replaced with people having extensive business knowledge and professional networks. From 2009, the number of full time employees gradually expanded to 9 and the number of freelancers rapidly increased from 30 to 275. As the organization expanded in this period, the full time employees became more and more specialized in their work. As of 2015, Forskerfabrikken has designated employees for customer service, logistics, procurement, inventory, sales, marketing, social media and the academic development of new courses.

Because of the internationalization strategy and advice from several consultants, Forskerfabrikken reorganized their company structure again in 2015. An international holding company was established, where Forskerfabrikken Norway remained as a daughter company (Proff.no, 2015).

5.5 Process optimization

Administrative and operational processes have gone through some changes as Forskerfabrikken has developed during its lifetime. This category consists of changes in optimization and improvements of important processes in the company. Six changes were identified.

Before Samlebåndet V.1 was developed late in 2002, Hanne used Microsoft Excel to handle course enrolment. Excel was useful for the registration, but constrained her ability to keep track of the individual course participant's history. When Samlebåndet V.1 was developed and implemented, all the course attendees had to enroll through e-mail or via telephone, which was then manually entered into the database.

The inefficiency of this process created a bottleneck effect on the growth of the company as the number of unique course attendees per year passed 850 first in 2009. This manual procedure lasted until 2010 when Samlebåndet V.2 was implemented. This version made it possible for the course attendees to sign up and pay online through Forskerfabrikken's website, thereby making the manual procedure redundant. The same year, the number of unique course attendees tripled to 2500. The optimization of the enrollment process was the first major change in Forskerfabrikken's processes.

Samlebåndet V.1 was coded in the PHP scripting language due to memory constraints on the server where it was hosted on. According to Sverre, the PHP code has grown without overall architecture and maintenance has become difficult. As V.1 grew and more data points were generated, it was no longer appropriate to maintain it. When V.2 was developed, he chose to create an object-oriented design of the system and changed the programming language to JAVA. Thus, the process of maintenance was changed alongside the change of the programming language.

Soon after the implementation of Samlebåndet V.2, the administrative process of reporting sales data to the accounting firm was automated. The system was developed to export sales data from the courses in the format the accounting firm requested. Automating this process freed CEO Anne from many of her previous tasks, and provided her with more capacity to focus on strategic issues. The revenue data was in late 2012 exported directly into the accounting software called Netledger. It provided Anne with a better overview over revenue and company performance. Optimization of the accounting process was a major change in Forskerfabrikken's processes.

As the organization became more and more specialized, and the number of locations and collaborators for courses increased, the need for a more structured approach to the sales process became apparent. Up until 2014, they used Dropbox to share files with each other, but they did not have a standardized folder system that everyone subscribed to. In the same year, they acquired a CRM system to connect to external parties and hired a specialist to organize their Dropbox folders, which facilitated knowledge sharing between employees.

It is currently planned to further develop Samlebåndet V.2 so it can also handle the accounting of wages of freelancers. Increased integration of Samlebåndet with the accounting software Netledger will optimize the administrative processes and make it more efficient.

6 Conclusion and limitations

This paper's purpose was to determine the role and interplay of enterprise system development with the growth process of an organization. We found the most important factors to be the organization's strategic drivers, stakeholder expectations, external resources, organizational structure and process optimization. Based on these five categories, we became able to interpret events and changes over time by the use of punctuated equilibrium theory. We see similarities with the identified categories of change and the socio-technical elements identified by (Leavitt, 1964) which, among others, has been used by (Lyytinen and Newman, 2008) to explain how a change outcome emerged. Our findings are therefore consistent with previous research.

The use of PET proved useful in explaining how and why changes in the enterprise system occured over time. However, other theories could have been used in order to explain the changes. Forskerfabrikken has to a large degree been dependent on external resources to achieve their goals, and has consequently directed its effort towards becoming self-sufficient from these external resources. As organizations seek to reduce their dependency on environmental factors and maximize the dependence of other organizations on themselves (Hillman et al., 2009), the resource dependency theory could have provided an interesting perspective on this phenomenon.

From the perspective of IS development, Fitzgerald et al. (2002) explain how incremental change is not enough to achieve real change, because change is about abandoning the present way of doing things, requiring breaking with the present. The incremental changes in Forskerfabrikken's ES has only furthered the current purpose of its ES deep structure. Only when punctuations occurred in the surrounding system, real change to the ES was triggered.

From a human resource perspective, Sverre was an incredibly important contributor to Forskerfabrikken's growth through his free work and many years of experience. People factors have more than six times greater effect on development productivity than the use of any software tools (Boehm, 1981). The fact that Forskerfabrikken had free access to a developer with many years of experience and with extensive knowledge of the organization, made the IS development process substantially easier and greatly reduced the costs involved.

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