Fuelling innovation by organizing for idea generation by employees

Master Thesis

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Abstract

The relationship between organizational structure and product innovation has long been of interest to academics and practitioners. Given the necessity to generate product innovations in the competitive software market, STAP HR has expressed its concerns whether they have enough innovation capacity to be futureproof. By means of a practice-oriented case study, this research contributes to the question of STAP HR in two ways. First, based on semi-structured interviews, insight into how the organizational structure influenced idea generation by employees was provided. The diagnosis showed that, in particular, the production structure hindered idea generation, by narrowing employees' view, reducing the range of stimuli and hindering interaction between specialists. Second, conditions that encourage idea generation were incorporated into an organizational structure redesign. On the basis of a focus group and the results of the diagnosis, multifunctional teams have been designed that are responsible for the realization of a complete order. This enables insight into customer needs, products and processes, problem-solving possibilities, contextual depth and cross-functional contact, which stimulates idea generation. The insights provide theoretical implications and act as a show case for small to medium-sized software firms on how to strengthen innovation by organizing for idea generation by employees.

Content

Integrity

The participating company and its products bear pseudonyms for reasons of anonymity. The real names are known to the researcher and supervisor. The company's pseudonym, STAP HR, refers to the products and services that the company provides.

Dutch	English
Salarisverwerking	Payroll
Tijdregistratie	Time registration
Administratie	Administration
Personeelszaken	Human Resources
HR service	HR service

STAP HR offers two HR systems: SmallStep and BigStep. These names refer to the differences between the two HR systems. SmallStep is a standardized HR system for small to medium-sized organizations. SmallStep takes little effort to buy, implement and use. BigStep, on the other hand, is a customizable HR system for large organizations. The process from sale to use requires a great deal of effort from both the buyer and STAR HR. BigStep is more expensive than SmallStep.

1. Introduction

Organizations must pursue the ability to improve existing products and to introduce new solutions to customers to obtain and keep a competitive advantage (Lewis et al., 2002; Bernstein & Singh, 2008; Damanpour & Wischnevsky, 2006). Software firms fail relatively often compared to other knowledge-intensive firms (Shanling et al., 2010). The software market is a characterized by low entry and exit barriers and a high rate of product innovation and is therefore highly competitive (Giarratana & Fosfuri, 2007; Schmalensee, 2000). As a consequence, product innovation is not only to stay competitive, but is a necessary condition to stay in the game (Capaldo et al., 2003; Rose et al., 2016). Product innovation of software includes, for example, adding new functionalities, application concepts and design patterns (Carlo et al., 2012). In the software industry, having the capacity to generate innovations yourself is crucial, as opposed to adopting innovations from others. Software innovation is difficult to adopt from other organizations (Grimaldi & Torrisi, 2001), because the intangible character of software requires a high degree of tacit knowledge (Rose et al., 2016). On top of that, when an organization generates innovation it can profit from first-mover advantages such as image and reputation, brand loyalty and switching costs, technological leadership, setting of product standards, experience effects and patents (Cottrell & Sick, 2002).

An innovation has been defined as the creation and the successful exploitation of new ideas (Adams et al., 2006; Damanpour & Wischnevsky, 2006). The product innovation process starts with an idea and ends with the launch of new products or services. This process is named the innovation generation process (Gopalakrishnan & Damanpour, 1997). Researchers have divided the innovation generation process into stages in various ways, but what they have in common is that the process starts with the generation of ideas. The first stage, idea generation, is frequently considered as the most critical phase in the innovation generation process (Frishammar et al., 2013; Troy et al., 2001), because it directly influences the success of the subsequent stages and the final outcome (Dwyer & Mellor, 1991; Frishammar et al., 2013; J. Kim & Wilemon, 2002). The focus of this research is on the idea generation of the innovation generation process.

The idea generation stage in the innovation generation process reflects the activities related to identifying a problem or need (Rogers, 2010), collecting knowledge and information about previously identified related problems (Bernstein & Singh, 2008), notice appropriate means to solve the problem or fulfil a need (Utterback, 1971), and pose ideas or proposals that might solve the problem or can fulfil the need (Gopalakrishnan & Damanpour, 1997). Employees are the most important asset in the idea generation process. The use of the ideas of managerial as well non-managerial employees positively influences innovation performance (Andries & Czarnitzki, 2014), because the generation of ideas is based on individual knowledge and creativity (Bledow et al., 2009). Organizations should put effort in utilizing the talents and creativity of their employee base, as it is found to be the most important intra-

organizational factor that affects the idea generation process (Murphy & Kumar, 1997). Management certainly cannot command employees to generate good ideas and ensuring a continuous flow of high quality ideas is a widely recognized problem of organizations (Girotra et al., 2010; McGuiness, 1990).

Prior research points to a variety of different factors that seem to determine to what extent an organization is able to successfully generate ideas. The link between organizational structure and innovation has been of longstanding theoretical interest (Hansen & Birkinshaw, 2007; Lekkerkerk, 2012; Thompson, 1965). Recently, researchers focused on how structural dimensions affect specific stages of the innovation generation process, including idea generation. Formalization, for example, is found to be negatively related to the generation of ideas, because it impedes creativity and freedom (Lee & Choi, 2003; Lopez et al., 2006). Most studies only examined the effect of some structural dimensions on idea generation in isolation, which limits our understanding. For gaining a thorough understanding of how organizational structures affect innovation, an integral approach to organizational structures is needed by which the structure as a whole is taken into account. It is important to also take into account the interaction between structural dimensions (de Sitter, 1998; Mintzberg, 1980). Ideas are often the result of the integration of knowledge and perspectives. An organizational structure can lay the foundation for a network in which different thoughts can come together (de Sitter, 1998). An integrated approach to organizational structures fits best with this research.

Socio-Technical Systems Design (STSD) theory will provide the theoretical view on organizations. This theory fits best with the aims of this study for the following reasons. First, it offers a comprehensive view on organizational structures, by taking into account multiple parameters describing the structure (de Sitter, 1998) and considering both social and technical outcome variables (Baxter & Sommerville, 2011). Second, the STSD theory includes, next to general theory, practical tools to diagnose, redesign and evaluate organizational structures. Organizations often experience difficulty in translating theoretical concepts to practical changes. To increase practical relevance, academic research should support organizations in making this translation. To lessen this gap, we will go through the intervention cycle, which is practice-oriented (Verschuren & Doorewaard, 1995) and make use of the practical tools that STSD offers. In both the diagnosis and redesign phase we will support the organization in making the translation from theory to practice. This is especially helpful in the redesign phase, as this offers direct practical solutions which can be implemented.

The object of this practice-oriented research is STAP HR, an organization that operates in the Dutch human capital management (HCM) software market. STAP HR is a small firm that creates a competitive advantage by offering all-encompassing customized HR solutions to its customers, combined with high quality service. The environment that STAP HR operates in is highly dynamic and customer demands change rapidly. The organization wants to keep up with the market, for which innovation capabilities are needed. STAP HR aims to fully utilize the talents and creativity of employees and has tried to stimulate innovation for a few years know, but without success. The CEO sensed problems with the generation of innovations and wants to take action.

Research goals

The practical problem of STAP HR related to getting innovations of the ground was the starting point of this research. To lower the scope of this research, this research focused on only the first step towards innovation generation: idea generation.

Verschuren & Doorewaard (1995) distinguish five phases in the intervention cycle: problem identification/sensing, diagnosis, design, change and evaluation. As we stated before, the diagnosis and design phase will be the focus of this research. Due to time constraints the phases change and evaluation are not included. Figure 1 presents the conceptual model of this study.

Goal diagnosis phase

The goal of the diagnosis is to gain insight into how problems with the generation of ideas for product innovation within STAP HR can be related to structural conditions.

Goal design phase

The goal of the design is to develop a redesign of the organizational structure of STAP HR and provide advice on how product innovation can be stimulated by developing a structural redesign focused on increasing the generation of ideas.

Research question

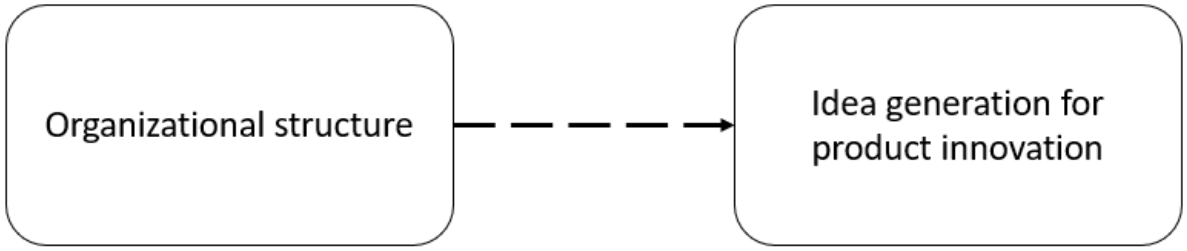
What are structural causes for problems related to product idea generation within STAP HR and how can the organizational structure be redesigned to increase the generation of product ideas?

Sub questions:

- What does the organizational structure of STAP HR look like?
- How are product ideas generated in STAP HR?
- How does the organizational structure of STAP HR influence the generation of product ideas?
- How can the organizational structure of STAP HR be designed to increase the generation of product ideas?

Figure 1

Conceptual model



Practical relevance

The practical contribution of this research is both by directly intervening within STAP HR and acting as a show-case for other organizations facing problems with product innovation. This research aims to provide practical recommendations to the management of STAP HR. Both the outcomes of the diagnosis and redesign have a high degree of applicability. In the diagnosis, theory is already translated to the context of STAP HR and that makes it easier for practitioners to apply this knowledge. The redesign offers STAP HR a concrete intervention to deal with current problems.

Additionally, this research addresses software SMEs who have similar characteristics as STAP HR. Successful product innovation starts with creating conditions that facilitate idea generation. Organizing for product innovation is both crucial and challenging for companies. By conducting a practical study this research aims to make it more accessible and understandable for organizations to deal with idea generation problems. Hopefully, managers who experience the same problems as STAP HR are triggered to take action in their organization. Due to the highly context-specific nature of this research, the outcomes can be generalized to software SMEs with similar characteristics only. Management of SMEs can, based on the extensive case description and results, determine whether the results also apply to their context. The lessons learned in this research apply to other settings as well, even though they need translation to the other context.

Academic relevance

This research aims to contribute to both L-STSD and product innovation literature. This research aims to analytically refine the Lowlands Socio-Technical Systems Design (L-STSD) method as formulated by de Sitter (1998) in two ways. First, we extend L-STSD theory by offering fresh empirical evidence of an application to a knowledge-intensive context. L-STSD has been applied to practice many time, from industrial to service contexts (e.g. den Hertog, 1976; Van Hooft, 1996), and from contemporary to temporary organizations (Moorkamp, 2018). Because knowledge-intensive organizations comprise an increasingly prominent part of industries, it is useful to see how L-STSD can be applied to this context. Second, we broaden our understanding of innovation within L-STSD. STSD takes into account product

innovation as an outcome variable of organizational processes (de Sitter, 1998), but does not distinguish between different stages in the innovation process. However, the different stages in the innovation generation process thrive best under different organizational conditions (Bernstein & Singh, 2006; Magdalena, 2015). De Sitter (1998) sees problems as the starting point for idea generation. Even though problems often bring about idea generation, idea generation is broader than just the result of problem solving. Idea generation literature therefore can extend L-STSD. This study specifies de Sitter's (1998) outcome variable by focusing on one innovation stage to enhance our understanding of how organizational structures influence product innovation.

This research also aims to contribute to product innovation and innovation generation literature. Studies typically focus on latter stages of the innovation generation process or idea evaluation rather than generation (Kach et al., 2012). By providing empirical insights into idea generation we aim to enhance our understanding of the innovation generation process. Moreover, by examining the relationship between organizational structure and idea generation we add to recent literature focused on factors influencing specific stages of the innovation generation process.

2. Theoretical framework

2.1 Introduction

The theoretical background is split into four subsections. The first revisits the literature on product innovation, which will be described along three often used dimensions: types of innovation, innovation process types, and stages of innovation generation process. In the second subsection we continue our path focusing on the first stage of the innovation generation process – idea generation. The third subsection elaborates on drivers and organizational factors of product idea generation. Then in the fifth subsection we continue along the organizational design path and lay out a structural approach to product idea generation. Lastly, in the sixth subsection we narrow our focus to the organizational design theory used in this research: Lowlands Socio-Technical Systems theory.

2.2 Product innovation

2.2.1 Innovation types

An innovation has been defined as the creation and the successful exploitation of new ideas (Adams et al., 2006; Damanpour & Wischnevsky, 2006). There are two types of innovation: product and process innovation (Boer & Willem, 2001; Polder et al., 2010). The former consists of the creation of new products, services and product-service combinations (Bonanno & Haworth, 1998), while the latter focuses on reducing delivery lead time, lower operational costs and increase flexibility (Boer & Willem, 2001). Recently, some authors state that the distinction between product and process innovation is only of analytical importance. They recognize the importance of product and process innovation integration in manufacturing companies (J. S. Kim et al., 1992; Pisano, 1997). Both product and process innovation capabilities are boosted by adopting an integrating strategy (Pisano, 1997). However, from an academic standpoint the distinction between product and process innovation in the early stages of innovation is useful. Motives and objectives for innovation differ for the two types and the two types ask for different organizational conditions (Boer & Willem, 2001; O'Brien, 2020). Moreover, Utterback and Abernathy'' s model (1975) of innovation and stage development showed the different path that product and process innovations take. They describe how in the early stages of an innovation process product ideas and designs are generated rather without practical constraints and that integration with organizational processes becomes stronger as the innovation process progresses (Utterback & Abernathy, 1975). Product innovation has implications for organizational processes, but this is not yet of importance in the idea generation stage. On top of that, so far, research on idea generation was mainly focused on product innovation (Frishammar et al., 2011; O'Brien, 2020). Due to the deductive nature of this research, this line will be followed so that these insights can be used to develop theoretical expectations for the context of this research. Therefore, the focus of this research is on product innovations, bearing in mind that an

integrative strategy is needed in later innovation stages. We define product innovation as the creation and the successful exploitation of new ideas related to new products, services, or product-service combinations.

2.2.2 Innovation process types

Innovations can come in two ways: generated or adopted (Damanpour & Gopalakrishnan, 1998; Damanpour & Wischnevsky, 2006). Innovations that are generated are created within and by the organization. The organization starts from scratch, and goes through the innovation generation process to come to a desired outcome – a new product or service (Magdalena, 2015). Now that the innovation is out there, other organizations can acquire the innovation and go through the process of innovation adoption. Adoption thus implies that the innovation is developed elsewhere. Organizations that are classified as innovative can engage in either, or both, innovation adoption or generation. However, the two innovation process types, innovation created internally or externally, differ in characteristics and the innovation process. On the one hand, generation is a creative, explorative process and is characterized by experimentation, discovery, exploring new possibilities, variation and search (Bernstein & Singh, 2008; Robbins & O'Gorman, 2015). Adoption, on the other hand, is more a problem-solving process in which exploitation is central (Robbins & O'Gorman, 2015). The process is more orderly and planned (Wolfe, 1994). Because of the distinct nature of the two innovation processes and the high important of generated innovation in the software industry this research will focus on innovation generation only.

2.2.3 Innovation generation process

Despite the chaotic course of the innovation generation process, scholars have tried to identify several stages in the innovation generation process. Some scholars described the process of generating innovation as linear and sequential - the unitary sequence model - (Gopalakrishnan & Damanpour, 1997b), where others framed the process in a more integrated and complex way – the multiple sequence model - (Bernstein & Singh, 2008; Eisenhardt & Tabrizi, 1995). In this research the first approach will be used as this approach allows the researcher to study a stage of the process in isolation. The unitary sequence model offers normative guidelines on how an innovation generation process should evolve, where the multiple sequence model can be used to describe and explain irregularities in the process (Gopalakrishnan & Damanpour, 1994). For those reasons, in combination with the simplicity the unitary sequence model offers, the linear approach is most useful for examining the innovation generation process for this research.

Within the unitary sequence model, researchers divide the generation process in different ways. Researchers differ in the amount of stages, the definition of the stages and the stages itself (see table 1). What all these models have in common is that the process starts with the generation of ideas and ends with market introduction. Each stage has its own characteristics and is facilitated by other organizational

conditions (Hansen & Birkinshaw, 2007; Pichlak, 2015). For example, network building capabilities are crucial for idea generation, but in the idea evaluation stage the screening and funding of ideas ask for different organizational capabilities (Hansen & Birkinshaw, 2007). Moreover, in his study Pichlak (2015) found that financial resources are essential in the development and commercialization stages, but less of importance in the invention (idea generation) stage.

The first stage, idea generation, is frequently considered as the most critical phase in the innovation generation process (Frishammar et al., 2013; Troy et al., 2001), because it directly influences the success of the subsequent stages and the final outcome (Dwyer & Mellor, 1991; Frishammar et al., 2013; J. Kim & Wilemon, 2002). And as it is the first stage in the innovation generation process it is a logical starting point for practical research which aims to improve product innovation capabilities.

Innovation generation process stages	Authors	Year
(1) Idea generation, (2) project definition, (3) problem solving, (4) design and development, (5) production, and (6) marketing	Rothwell & Robertson	1973
(1) Idea generation, (2) coalition building, (3) idea realization, and (4) transfer	Kanter	1996
(1) Idea generation, (2) project definition, (3) problem solving, (4) design and development, and (5) marketing or commercialization	Gopalakrishnan & Damanpour	1997
(1) Idea generation, (2) idea conversion, and (3) idea diffusion	Hansen & Birkinshaw	2007
(1) Invention, (2) development, and (3) commercialization	Magdalena	2015
(1) Idea generation, (2) research, design and development, (3) prototype production, (4) manufacturing, and (5) marketing and sales	Rothwell	1994
(1) Search for the source of the problem, (2) alternative generation, (3) an alternative evaluation, (4) selection and initiation of an alternative, and (5) acceptance and routinization	Cummings & O'Connell	1978

Table 1. Diverse classification of the innovation generation process

2.3 Idea generation

In this section, first, activities related to idea generation are examined. Then two dimensions of idea generation, novelty and volume, are described. Research on the generation of ideas for innovation is done in different research areas, including new product development (NPD) and creativity literature. In both literature streams extensive attention has been given to idea generation. Therefore, this research combines these insights with idea generation literature for the development of a theoretical background.

In general, the idea generation stage reflects the activities related to identifying a problem or need (Rogers, 2010), collecting knowledge and information about previously identified related problems (Bernstein & Singh, 2008), notice appropriate means to solve the problem or fulfil a need (Utterback, 1971), and pose ideas or proposals that might solve the problem or can fulfil the need (Gopalakrishnan & Damanpour, 1997b). Innovation therefore starts with the recognition of an opportunity by an

employee or a set of employees (Kanter, 1996). These employees are called 'idea champions' (Howell & Sheab, 2001), 'intrapreneurs,' ' idea generators' (Galbraith, 1982), or 'gatekeepers' (Reid & Brentani, 2004). They combine knowledge, perspectives and ideas from internal as well as external sources and thereby sense an opportunity which they then translate into an idea. Ideas are usually not independently generated, but rather build on each other (Toubia, 2006). Ideas are changed, sharpened and removed by confronting them with new ideas and information. Therefore the generation of ideas is not an individual act, but rather the result of the gathering of people.

The outcome of the idea generation process are ideas: the prospect of applying new knowledge, or applying knowledge in a novel manner, to business products, services or product-service combinations, such that a new source of economic gain may be realized (adapted from Birkinshaw & Hill, 2008, p. 16).

2.3.1 Degree of novelty

Two extremes, incremental and radical, are often used to describe the degree of novelty of innovations. Incremental product innovation is about improving existing products and services, while substantially new products and services are needed for radical product innovation (Büschgens et al., 2013; Chandy & Tellis, 1998). Most scholars evaluate the degree of novelty of innovations based on the outcome, an idea that is brought successfully to the market. However, as the focus of this research is on idea generation the dimension novelty will be explained on the idea level. Radical and incremental product ideas are defined as:

Radical product idea*: the prospect of applying new knowledge, or applying knowledge in a novel manner to products, services or product-service combinations that differ significantly from the current portfolio, such that a new source of economic gain may be realized* (adapted from Birkinshaw & Hill, 2008, p. 16).

Incremental product idea*: the prospect of applying new knowledge, or applying knowledge in a novel manner to make marginal improvements to existing products, services or product-service combinations, such that a new source of economic gain may be realized* (adapted from Birkinshaw & Hill, 2008, p. 16).

In these definitions we take an internal perspective to novelty, by which we assess novelty by the difference with existing products and services in the organization. In contrast to an external perspective, whereby novelty is assessed based on criteria related to the market and users/customers. An internal perspective will be followed, because it is important to first determine the degree of novelty of a product for the company itself before taking into account external perspectives (Herrmann et al., 2018).

Based on Herrmann et al. (2018) three distinctive characteristics of incremental and radical product ideas are formulated. Radical product ideas are significantly new to the business and have a high degree of uniqueness and originality. Radical ideas are defined also by a high degree of risk, and

are likely to face internal resistance (Herrmann et al., 2018; P. Robbins & O'Gorman, 2015). On the contrary, incremental product ideas are characterized by a low degree of uniqueness and originality because these ideas are focused on small improvements, repositioning or cost reductions of existing products (Eling et al., 2016). Incremental product ideas bear a relatively low degree of risk, because their impact on the whole organization is usually limited (Schoenmakers & Duysters, 2010).

In practice, a distinction between radical and incremental ideas is not commonly made (Nicholas et al., 2015). Especially in the idea generation phase companies face problems when trying to distinguish radical from incremental (Broennum & Clausen, 2015). This is because the distinction is not always clear, particularly in the early phase of an innovation process (Herrmann et al., 2018). Scholars focused on explaining the idea generation process often do not distinguish between incremental and radical ideas and innovation (Frishammar et al., 2012; Hansen & Birkinshaw, 2007; Kanter, 1996). However, in this research it is important to make the distinction, because radical and incremental innovations ask for different organizational conditions. We assume that the idea generation process is similar for radical and incremental ideas. The outcome of the idea generation process are ideas, which can be either radical or incremental. Organizational conditions, in turn, affect the outcome of the idea generation process, by facilitating the generation of radical, incremental or both kind of ideas. To be able to gain insight into how organizational conditions influence the generation of ideas, it is thus important to take into account the outcome of the idea generation process.

2.3.2 Volume

Most studies focus on the number of ideas generated, because quantity is preferred above quality (Paulus & Yang, 2000; Perttula et al., 2006; Troy et al., 2001): ''never look for the best way; but always look for 100 ways'' (Gagliano, 1985). The volume of ideas generated by employees is often taken as a measurement of the productivity of the idea generation stage (Girotra et al., 2010; Toubia, 2006). The volume of ideas will be taken into account in this research, because it provides general insights into the current state of the idea generation process.

2.4 Organizational determinants of idea generation

Scholars looked into determinants of idea generation and examined several organizational factors that affect the idea generation process. In this section the relationship between idea generation and the factors leadership, information communication, internal reward systems, culture and structure are described.

Leadership can potentially be a positive influence on the idea generation process (Mumford, 2000; Sosik, 1997). Leaders can directly stimulate employees to generate ideas and can create an environment in which idea generation is likely to occur (Mumford et al., 2002). Leaders should provide employees with sufficient freedom to engage in creative thinking rather than following management's ideas and protocols (Bernstein & Singh, 2006). Leaders must ensure group diversity, open communication, and freedom to experiment. One of the styles that is often presented as stimulating

creativity is transformational leadership whereby a leader actively engages with his employees and create motivation and morality (Andriopoulos & Lowe, 2000).

The influence of informal communication on idea generation is also well documented in the literature. Ideas often arise as a result of informal interactions within the organization (Allen, 1977). The early stages of the innovation generation process are in many respects informal, as it is an unstructured and ill-defined process (Jörgensen et al., 2011; Montoya-Weiss & O'Driscoll, 2000). It is therefore not surprising that informal contacts are highly important for the generation of ideas. An organization consists of a formal and informal structure and during the idea generation process, an appeal is made to the informal network. New information, knowledge, ideas and perspectives can be obtained through these networks which positively affects the idea generation process (Brentani & Reid, 2012; Burt, 2004; Granovetter, 1973; Howell & Sheab, 2001). When, however, one's network consists of similar people it may limit the diversity of perspectives and ideas (Burt, 2004).

Third, internal reward systems play an important role in the innovation process (Bernstein & Singh, 2006). In literature a debate is going on about the effects of monetary incentives on idea generation. Some researchers found a negative relationship between reward and idea generation (Donnelly, 2013; Hennessey & Amabile, 1998), but most recent studies show that incentives can positively influence the quantity and quality of ideas generated (Eisenberger & Rhoades, 2001; Eisenberger & Shanock, 2003; Toubia, 2006). For example, Eisenberger and Rhoades (2001) showed that by repeatedly rewarding students for creativity, students' creative performance increased for other tasks.

The fourth factor we want to highlight is organizational culture. Much research is conducted on organizational cultures that support creativity and innovation. Within a creativity stimulating culture effort is put in utilizing the talents and creativity of the employee base (Murphy & Kumar, 1997). Employees are stimulated to be creative and look beyond current patterns. Furthermore, experimentation is seen as crucial in the idea generation phase of innovation (Christiansen & Gasparin, 2017) and is therefore an important element of a creative organizational culture (Frishammar et al., 2012). Employee are encouraged to, in a trail-and-error way, gather information from the environment and combine sources from external and internal actors. Organizations with strong cultural values that support creativity embody a risk-taking, results-oriented, stimulating and challenging work environment (Amabile et al., 1996; Baer & Frese, 2003). In such a culture cooperation and interdependent behaviour is promoted (Tesluk et al., 1997).

Lastly, an organization's structure is found to be an important determinant for idea generation in product innovation. Literature on the relationship between innovation and structure has a long history. At first, scholars were focused on the relationship between structure and innovation outcomes (Garud et al., 2013). Once scholars gained a greater understanding of the complex innovation process, research started to focus on the stages separately. Recently research on the impact of organizational structure on the idea generation phase emerged (e.g. Csaszar, 2013; Knudsen & Levinthal, 2007). The idea

generation process is informal and uncertain, but crucial for an organizations innovation capability. To secure future competitive success organizations try to manage the generation of ideas and research tries to gain a better understanding of this elusive process. Managing the idea generation process is a dilemma. On the one hand management tries to steer direction and set focus and on the other hand a supporting and stimulating environment in which employees experience freedom should be created (Birkinshaw & Gibson, 2004). On top of that, for successful idea generation and innovation in general one needs to bring together multiple functions, resources and disciplines (Van de Ven, 1986). Because a structure determines how tasks are defined, allocated and related within an organization (Achterbergh & Vriens, 2009), taking an organizational design perspective is useful in studying the idea generation process.

2.5 Structure as determinant of idea generation

In this section we gain a better understanding of the relationship between organizational structure and product idea generation. Before delving into this, we shortly want to explain what we mean by organizational structure.

While there are several definitions of an organizational structure, researchers agree that structure is concerned with the arrangement of people, departments and other subsystems in the organization (Hunt, 1970; L. R. James & Jones, 1976). When looking at an organizations structure one classifies the organization by form or pattern, thereby revealing the anatomy of an organization (Hunt, 1970). For the definition of an organizational structure we rely on Achterbergh and Vriens: ‘‘the grouping and coupling of transformations into tasks and the resulting relations between these tasks relative to orders’’ (2009, p. 240).

Researchers have found structural conditions under which idea generation in organizations is stimulated. We want to describe the research to these structural conditions from two views. First, drivers of idea generation are described. Second, insights from the uni-dimensional structural approach to organizational structures are described. Then we will argue that an integral approach is needed in this research, after which we pose an organizational design theory that fits with the goals of this research.

2.5.1 Drivers of idea generation

the idea generation phase so-called drivers of innovation are activated. These drivers are structural conditions that contribute to the ability of individuals to see new opportunities, by facilitating a connection to a wide variety of sources (Kanter, 1996). These structural conditions are focused on either facilitating contact with the environment or across the organization. Thereby a network is created in which people can share ideas, knowledge and learnings and give feedback (Christiansen & Gasparin, 2017). This makes the network becomes a nest for the development of ideas. When an idea is posed in the network it ‘‘becomes a vehicle for creating new options’’ (Christiansen & Gasparin, 2017, p. 39).

Environmental scanning. Murphy and Kumar (1997, p.8) defined environmental scanning as all activities aimed at identifying opportunities through contact with the organization's environment. It is widely recognized that for innovation it is important to have linkages with external actors, where it is found to be of higher importance for radical than for incremental innovation (Carlo et al., 2012; Cohen & Levinthal, 1990; Damanpour, 1991). Steiner (2009) even argues that for the generation of radical ideas the use of external sources is a prerequisite. The amount of knowledge linkages with external actors influences an organizations capacity to scan and search the environment and interpret and integrate this knowledge into the organization (Carlo et al., 2012). Therefore, an organization should have contact with a diverse set of external actors (Tang & Ye, 2015).

Environmental scanning involves four main activities for idea generation for new products: direct contact with customers, contact with lead users, identification of new market opportunities, gathering market information and communication with innovators. First, Murphy and Kumar (1997) argue that direct contact with customers is the most important activity in the idea generation process. This outcome is in line with other research which highlighted the importance of a close relationship with customers (Akman & Yilmaz, 2008; Shocker & Srinivasan, 1979). Customers provide insight into the general needs in the industry as well as specific needs, thus are essential in the idea generation process (Murphy & Kumar, 1997). The second activity in the idea generation process for new products is the utilization of lead users. Lead users are uses whose present strong needs will become general in a marketplace in the future. Lead users can provide valuable insights into future needs and potential new products, services and product-service combinations (von Hippel, 1986). Therefore they are an important source of ideas for organizations (Cohen et al., 2002; Poetz & Schreier, 2012). The third and fourth activities are gathering market information and the identification of new market opportunities. Keeping up with market trends and dynamics is important for the generation of product ideas as this knowledge can give input for improvements to existing products of for new product, service or product-service combination ideas. Lastly, an organization can get inspired by other innovators for product ideas (Bailetti & Guild, 1991).

Organizations should create structural conditions that allow for crossing organizational boundaries and ensure close contact with customers. Potential idea champions should be close to the needs in the field, so that they can identify potentially successful new product ideas.

Utilization of creativity. In the idea generation process employees are the most important assets. The use of ideas of managerial as well non-managerial employees positively influences innovation performance (Andries & Czarnitzki, 2014), because the generation of ideas is based on individual knowledge and creativity (Bledow et al., 2009). Creativity and idea generation are two sides of the same coin as both terms are about the generation of new ideas (McAdam & McClelland, 2002; Shah & Ali, 2012). Heap (1989), for example, explains creativity as the synthesis of new ideas and concepts by the radical restructuring and re-association of existing ones. Titus (2000) similarly defines creativity as ''the

birth of imaginative ideas.'' Individuals should be stimulated to shake reality into a new pattern and utilize their talents as it is found to be the most important intra-organizational factor that affects the idea generation process (Murphy & Kumar, 1997).

To be able to look beyond patterns and engage in a creative process one needs to see the big picture. As de Sitter (1998) argues, product innovation requires a thorough understanding of the whole process of developing, making and selling products.

Cross fertilization. Innovation is about looking beyond past patterns. An important prerequisite is getting in contact with people who see the world differently (Rogers & Shoemaker, 1971). A 'cosmopolitan' rather than a 'local' orientation allows employees to get in contact with new information, knowledge, ideas and values (Zhou & George, 2001) and is linked to high rates of innovation (Rogers & Shoemaker, 1971). For example, Allen (1984) found that high-performing research and development (R&D) teams have far greater intra-organizational contact than low-performing R&D groups.

Employees' creativity is stimulated when they come into contact with alternative perspectives. However, people tend to associate with people who are like them, which is called homophily (McPherson et al., 2001). As a consequence, people get more often in contact with similar than with dissimilar people (McPherson et al., 2001). Interaction patterns are strongly influenced by the organizational structure. Employee interaction is facilitated within formalized units, but is less likely to occur between these units (Kleinbaum et al., 2013). However, as these between-unit interactions are sources for creativity it is important to create structural conditions that allow for cross-unit contact.

Job characteristics. Job design is also found to be a predictor for idea generation. Task autonomy (K. James et al., 1999), task variety (Coelho & Augusto, 2010), and multifunctionality (Dorenbosch et al., 2005) are positively related to idea generation. Multifunctionality can be seen as the counterpart of job specialization and refers to the number and scope of different tasks in a job (Dorenbosch et al., 2005). Multifunctional jobs are more challenging in comparison to simple jobs and could promote innovative work behaviour (Farr & Ford, 1990). In addition, broader jobs would enrich employees' knowledge, make them see more relationships in what they know and make them more creative (Herzberg, 1966). Similarly, redundancy, which concerns the degree of homogeneity of skills and knowledge among jobs of direct colleagues in the daily work process (Dorenbosch et al., 2005), promotes the idea generation process. Redundant skills and knowledge can facilitate communication between people and make it easier to share new knowledge (Hoopes & Postrel, 1999).

2.5.2 Uni-dimensional structural approach

A popular approach among researchers is the uni-dimensional structural approach. With this approach the relationship between a structural variable and innovation is studied (Damanpour & Gopalakrishnan, 1998). Most studies focused on the structural dimensions centralization, formalization and

specialization. In this subsection we will elaborate on multiple structural dimensions and their relation with idea generation.

Centralization. The impact of centralization on product innovation and idea generation is widely investigated. On the one hand, centralization can support the searching for information and generation of ideas by increasing coordination across individuals and expand information processing capacity (Marschak & Radner, 1972). On the other hand, centralization constrains the direction and breadth of ideas generated (Cardinal, 2001; Jansen et al., 2006). Additionally, because employees feel as having less control over the final decision in centralized organizations they are less motivated to seek for new opportunities and voice suggestions (Atuahene-Gima, 2003; Jansen et al., 2006; Reitzig & Maciejovsky, 2015). Centralization may also inhibit the generation of new ideas because employees might create more feasible and less original ideas to please their supervisor (Keum & See, 2017).

Formalization. Formalization refers to the extent to which procedures, rules and instructions govern organizational processes (S. P. Robbins & Decenzo, 2001). Researchers examined how a bureaucratic organizational form can support the implementation process of innovation, while impeding the generation of innovations (Pierce & Delbecq, 1977; Zaltman, 1979). As previously mentioned, creativity, (informal) communication and flexibility is important for the generation of ideas. However, when employee behaviour is formalized employees can act in a more routine way, which limits the need for communication with other organizational members (Lopez et al., 2006; Van den Bosch et al., 1999). Formalization also tends to reduce the spontaneity of its employees and reduce creative input and the creation of new ideas (Lee & Choi, 2003; Vega-Jurado et al., 2008). Another reason for formalization to not be supportive for the generation of ideas is that it limits attention to differentiate from existing knowledge and going out there to find opportunities (Jansen et al., 2006; Weick, 1979), while differentiation of existing patterns is a prerequisite for radical innovation (Herrmann et al., 2018).

However, there is also another side to the concept. Diversity of people and knowledge is important for the generation of ideas, but organizations find it hard to realize this. Rules and regulations can play an important role in bringing together employees from different organizational units. When well designed, these formalized procedures can encourage cooperation and unity among people (Adler & Borys, 1996; Hoonsopon & Ruenrom, 2012).

Cross-functional contact. Researchers mention cross-functional integration, cross-functional teams, and job rotation as ways to ensure employees to get in contact with colleagues with other expertise. Cross-functional contact is important because it allows employees to get in contact with new information, knowledge, ideas and values (Zhou & George, 2001). Multi-functional teams foster creativity and increase the quantity, quality and diversity of ideas generated (Alves et al., 2007). Cross-functional teams are particularly important for the generation of radical ideas, because radical ideas ask for the

combination of different expertise (Koc, 2007). Scott and Tiessen (1999) add that cross-functional teamwork is especially suitable for firms operating in a dynamic environment, which is typical for software firms. By using job rotation a stimulating work environment is created (Mauzy & Harriman, 2003). Cross-functional work thus appears to be a prerequisite for idea generation, but it is difficult to realize. Bernstein & Singh (2006) describe how language barriers pose difficulties for cross-functional communication. Functionalists speak their own language and do not always understand each other's arguments.

Most of these studies focused only on some structural dimensions, thus not taking into account the organizational structure as a whole. This limits the understanding of an organization, because an organizational structure is not simply the sum of the different dimensions, but it also encompasses the interaction between those dimensions (de Sitter, 1998; Mintzberg, 1980). Arguing from a configurational approach, internal fit should be created between all structural elements (Mintzberg, 1980). For example, if we want employees to be creative a high level of formalization would not fit, because rules and procedures reduce freedom. A high level of centralization would also be a mismatch here, because then the decision-making power would lay higher in the hierarchy, thus take away freedom at the lower levels. Arguing from a systems perspective, all structural aspects are interconnected. Organizations can be seen as systems consisting of inter-connected sub-systems. For gaining a thorough understanding of the anatomy of the organization it is thus important to look at the system as a whole. Following this line of reasoning we ought it important to take an integral approach, so that we not only gain an understanding of the structural dimensions themselves, but also how they relate to one another.

On top of that, we argue that an integral approach fits with our research goal because we focus on stimulating idea generation throughout the organization. What is often stated in literature and what is often the case is practice is that an organizational unit is dedicated to coming up with new products and services and develop en implement these ideas (O'Connor, 2008). Often the R&D or marketing departments are assigned these tasks (Barczak et al., 2009). In this paper, however, we take a broader perspective. As mentioned before, creativity of individuals throughout the organization is key to the successful generation of ideas. We therefore do not focus on creating the best R&D department, but rather on how employees across the organization can be stimulated to develop ideas individually and together by means of how tasks are defined, allocated and related. The focus is on creating structural conditions that encourage employees to come up with ideas.

2.6 Socio-Technical Systems theory

A Socio-Technical Systems Design (STSD) approach fits best with our research for several reasons. First, it offers an integral approach to organizational structures. STSD theory considers both human, social and organizational factors, and technical factors (Baxter & Sommerville, 2011). On top of that, STSD theory sees organizations as open system consisting of interconnected sub-systems. It takes into

account multiple parameters to examine an organizational structure (de Sitter, 1998). It therefore offers a comprehensive view on organizations. Second, STSD methods can guide a diagnosis and design of organizational structures, which can contribute to reduce the gap between theory and practice. Recently, the need for practical relevance of academic research has increased (Nenonen et al., 2017; Toffel, 2016). Managers find it hard to translate general theories to specific organizational contexts. By conducting practice-oriented research we as academics can support managers in making theories more applicable. STSD methods are equipped with tools that can be used to diagnose and design organizations, thus to increase practical relevance. Third, in STSD theory people are seen as an end and not as a means. STSD methods formulate social end goals such as the opportunity to feel involved, to learn and to develop (de Sitter, 1998). From a philosophical standpoint we find it important to see people as ends in themselves and when designing organizations this moral should be incorporated. On top of that, it is expected that good social conditions contribute to the generation of ideas. When people feel safe and are given freedom to be themselves they are more likely to show desired behaviour. Fourth, as we argue in the method section, a participative approach is taken in this research. STSD is often applied in combination with a participative approach (Van Eijnatten & Van Der Zwaan, 1998), and it is therefore suitable for this research.

2.6.1 Socio-Technical System Design

STSD sees organizations as open systems which consist of two mutually dependent sub-systems: a social and technical part. The most important objective is to realize joint optimization: find the best match between the technical and social system, thereby optimizing the system as a whole. STSD embraces the idea that all aspects of a system are interconnected and therefore focusing on only one sub-system will lead to sub-optimalization (Clegg, 2000). Because of the open character, organizations should adapt to and pursue goals in external environments (Baxter & Sommerville, 2011).

STSD methods were developed to facilitate the design of such systems. There is a wide range of STSD methods due to different traditions in different countries (Mumford, 2006). There is not yet a successful attempt in integrating these individual methods, because the methods, to some extent, reflect national cultures and approaches to work (Baxter & Sommerville, 2011). In this research the approach developed in the Netherlands is applied, as the organization under investigation is a Dutch organization and this approach is most close to the researcher.

2.6.2 Lowlands Socio-Technical Systems design

For the purpose of describing ideas of the Lowlands Socio-Technical Systems Design (L-STSD) theory we select the work of Ulbo de Sitter (1998; 1997). De Sitter can be seen as the founder of the Dutch elaboration of the STSD method. This method is also named the Modern Dutch Sociotechnical Approach and the Integral Organizational Design Approach. His theory can be used to diagnose, design and evaluate organizational structures.

De Sitter formulated his theory based on a combination of previous STSD literature and cybernetics. De Sitter translated ideas from cybernetics to the context of organizations. Generally, he states that a division of work should attenuate as much disturbances as possible and build regulatory potential (amplification). In this section we first delve deeper into de Sitters understanding of organizations, whereafter we describe his principles for designing organizational structures.

An organizational structure is defined as ‘‘the grouping and coupling of transformations into tasks and the resulting relations between these tasks relative to orders’’ (Achterbergh & Vriens, 2009, p. 240). A transformation is about the change or the transformation that is needed to come from a begin state to an end state (Achterbergh & Vriens, 2009). For instance, doing laundry is a transformation, which can be decomposed into the sub-transformations ‘collecting’, ‘sorting’, ‘washing’, ‘drying’, ‘folding’, and ‘storing.’ A task encompasses a set of sub-transformations that can be assigned to someone or something. De Sitter distinguishes between two types of tasks: operational and regulatory tasks. Operational tasks are concerned with the realization of the transformation, bringing something from the begin state to the end state. Regulatory tasks should ensure that operational tasks can be performed. Regulatory tasks thus involve dealing with and preventing disturbances.

Based on this classification of tasks de Sitter distinguishes between the production and control structure. The production structure consists of all operational tasks and encompasses all activities necessary to realize the primary organizational process. The control structure consists of all regulatory tasks and encompasses all activities necessary for dealing with disturbances in the production structure.

De Sitter formulated three relevant organizational variables that organizations should strive for: (1) quality of work, (2) quality of organization and (3) quality of working relations. These functional requirements respectively refer to (1) the meaningfulness of jobs and work related stress, (2) an organization’s potential to effectively and efficiently realize and adapt its goals, and (3) the effectiveness of communication in organizations (Achterbergh & Vriens, 2009, p. 241).

In trying to realize these functional requirements organizations encounter disturbances. Disturbances are events taking place that (potentially) cause change in one of the three relevant organizational variables. Disturbances negatively affect operational tasks. Disturbances can have internal and external sources. On the one hand, an organizational structure should decrease (attenuate) the probability of the occurrence of disturbances and decrease the proportion of affected tasks by the occurring disturbances. On the other hand, an organizational structure should increase (amplify) the potential to deal adequately with remaining disturbances.

This brings us to the overall design principle of controllability. In sociotechnical theory the goal is not to create organizational capability to achieve a certain goal, but to improve an organization’s controllability: the ability to achieve a range of objectives (de Sitter et al., 1997, p. 506). One of these goals organizations should strive for is innovation. An organizations generic capacity to adapt and realize innovation goals should be designed for. It is thus not about designing the most suitable

innovation structure, but designing for a structure that provides the organization with the ability to reach and adapt, among others, innovation goals.

2.6.3 Design parameters

De Sitter formulated design parameters for the purpose of identifying and analysing the ability of organizational structures to attenuate disturbances and amplify regulatory potential. The parameters can be used to diagnose both the production and control structure of organizations. In a diagnosis, values are given to the parameters to gain an understanding of the complexity of an organizational structure. In this section the seven design parameters and their relation with idea generation will be discussed.

Design parameters related to the production structure

Parameter 1: the level of functional concentration. Function concentration refers to the grouping and coupling of operational tasks with respect to orders (de Sitter et al., 1997, p. 507). In an organization that scores a high value on this parameter the same type of operational tasks are concentrated in specialized departments. The departments are then potentially coupled to all orders, that means that an order potentially goes through all these specialized departments. A low level of functional concentration implies that each order is produced in a dedicated subsystem. The operational tasks needed for some order are then grouped together in a so-called parallel flow.

When functional concentration is high, we expect several problems related to idea generation. Structural complexity increases, because for the realization of an order a lot of communication and coordination has to take place between the functional departments. Employees perform their tasks for potentially all orders, which results in a high amount of switching time and the loss of oversight over orders. Because employees have to deal with a high amount of input variety, this may result in stress and disturbances, which are far from optimal conditions of an idea stimulating environment. On top of that, a high degree of functional concentration causes functional departments to create their own subculture and standards, ‘a way of doing things’ (de Sitter, 1998, p. 378). Subcultures influence employees’ sense making, attitudes, and behaviour (Lok et al., 2005). These functional cultures inhibit idea generation, because it poses a filter to the environmental scanning process (de Sitter, 1998, p. 378). Environmental scanning is far from a neutral activity. A frame, which is developed in line with the subculture, poses limits to what employees sense in the environment. It narrows employees’ view of the environment, so that they only look for information that fits the current way of working, within their own specialism. This contrasts with the need for a wide variety of perspectives, ideas and multidisciplinary knowledge for idea generation. Lastly, ideas are rather the result from multidisciplinary interactions than from disciplinary interactions. However, a high level of functional concentration make fruitful interactions between specialists hard to realize.

Parameter 2: the level of differentiation of operational transformations. De Sitter differentiates between three types of operational sub-transformations: making, preparing and supporting. Making activities are directly related to the realization of output. Preparation activities provide conditions

necessary for the making activities, such as purchase, sales and planning. Both making and preparing activities can be related to specific orders, where support activities cannot. Support activities are indirectly necessary for realizing the output, for example maintenance, marketing and human resource management. A high level of differentiation of operational transformation means that operational tasks involve only make, prepare or support sub-transformations. A low level of differentiation means that operational tasks contain make, prepare and support sub-transformations.

The following consequences for idea generation are expected when differentiation is high. Support and prepare activities should be in the service of making activities and therefore they should be tightly coupled (Achterbergh & Vriens, 2019). When an organization differentiates between the three operational activities, the number of relations increases. It often results in that the support and prepare activities do not match the specific needs of the making activities and that employees lose oversight over the process. Especially employees performing only supporting or preparing activities do not see their direct contribution to the end product. While oversight over the process and broad jobs are important for idea generation (de Sitter, 1998; Herzberg, 1966). Moreover, in an organization with a high level of differentiation support, making and preparing activities are often coupled by means of procedures and rules (Achterbergh & Vriens, 2009). This form of formalization impedes room for the generation of ideas. Lastly, the chance of the occurrence of disturbances increases which causes delays. For example, planning (preparation) was not done properly and causes problems in the making activities. Due to the high level of differentiation, these problems cannot not be solved by the people who experience the problem, but by the people causing the problem, which is planning. As a result, people cannot adequately deal with problems and cannot make full use of the learning opportunity that lays within problems. Distance is created between the ones taking action and the ones experiencing the problems, which negatively affects the possible ideas that can come from solving problems.

Parameter 3: the level of specialization of operational transformations. Specialization of operational transformations refers to the extent to which operational transformations are split up into separate tasks and allocated to different capacities. A high level of specialization implies that an operational transformation is decomposed into many small sub-transformations, and each of these sub-transformations become a separate task, carried out by an employee. A low level of specialization of operational transformations implies that an operational transformation becomes one task, thus integrating the underlying sub-transformations.

Specialization is a prerequisite for idea generation, because a diverse set of employees is crucial for stimulating creativity. A wide variety of specialists provides a broad knowledge and idea base that forms the basis for building on each other's ideas (Alves et al., 2007; Taylor & Greve, 2006; Zhou & George, 2001). However, too much specialization can inhibit idea generation. A drawback of specialization is that tasks become narrow, often repetitive and lack variety (Achterbergh & Vriens, 2009), which impedes creativity. Employees lose oversight over the process and the direct contribution to the end product is unclear. The risk is that employees run out of new knowledge combinations, and

as a result create only incremental ideas (Fleming, 2001). Psychologists found that specialization leads to the so-called Einstellung effect, which explains how repeated practice and prior knowledge becomes a hindrance to creativity (Bilalić et al., 2008). Pre-existing knowledge and prior experiences impedes a specialists ability to come up with alternative ideas or solutions, because the specialist is stuck in his taken for granted thought processes (Bilalić et al., 2008; Sternberg & Frensch, 1989). To overcome this effect and to make full use of specialization, it is important to bring different specialists together so that different thoughts cross one another and that these specialists are challenged.

Design parameter related to the separation between the production and control structure.

Parameter 4: the level of separation between operational and regulatory transformations. Parameter four refers to the allocation of operational and regulatory transformations to different tasks. A high parameter value implies that tasks contain either operational or regulatory sub-transformations. In this case, an employee tasked with an operational sub-transformation depends on another employee who is responsible for regulation. If a task consists of both operational sub-transformations and the regulatory sub-transformations needed then the parameter value is low.

Separation between operational and regulatory transformations is problematic for idea generation in several ways. Problems are often the starting point for idea development. When operational and transformation transformations are separated, a distance is created between the one who experiences the problem and the one who has to deal with the problem, while immediate personal experience is crucial for an optimal learning experience (Matsuo & Nakahara, 2013). As a consequence, problems are not or recognized or recognized too late. The employee with regulatory power is distanced from the operational process and therefore lacks detailed, up-to-date information about the process (Achterbergh & Vriens, 2009). Information about the problem does not flow smoothly to those with regulatory powers (operational, design, and strategic), for whom this information is critical to activate idea generation. Moreover, it limits experimentation and learning possibilities. When the employees most close to the product lacks regulatory power they cannot experiment and learn about the effects of 'improvements'(de Sitter, 1998). The power to experiment lays with the ones who lack involvement with the process and product, because they are separated from the operational processes. This lack of involvement hinders idea generation.

Design parameters related to the control structure

Parameter 5: the level of differentiation of regulatory transformations into aspects. De Sitter differentiates between three types of regulation: operational regulation, regulation by design and strategic regulation. Operational regulation consists of the tasks required to deal with disturbances in the operational transformations, ensuring the continuance of the production process. Regulation by design ensures that the right organizational conditions are installed that make sure that all activities, operational and regulatory, can be performed. Strategic regulation is about setting and resetting goals for the primary

process. Parameter five has a high value when the three types of regulation are grouped into different tasks. When a task contains all three types of regulation differentiation is low.

Differentiation of regulatory transformations into aspects is problematic for idea generation in the following ways. First, employees are more motivated to search for new opportunities and ideas when they feel like they have control about their own job (Atuahene-Gima, 2003; K. James et al., 1999). This positive feeling of job control is created by providing employees with operational regulation, regulation by design and strategic regulation potential, what is not the case when regulatory transformations are differentiated. Moreover, by differentiation of regulatory transformations employees cannot develop a broader view on their job, while this broader view makes employees see more relationships and be more creative (Herzberg, 1966). On top of that, non-routine regulation asks employees to go beyond current patterns and thinking and therefore activates creativity (Amelsvoort, 1992), from which ideas can emerge. When regulatory aspects are differentiated this idea generation behaviour is discouraged.

Parameter 6: the level of differentiation of regulatory transformations into parts. Every regulatory activity involves monitoring, assessing and acting activities. A regulator must monitor the operational sub-transformations and assess whether the operational process is being disturbed. If so, actions should be taken to make sure the operational transformations can continue to realize the desired output. The value of this parameter is high when the three sub-transformations of regulation are assigned to separate tasks. When all these regulatory parts are integrated into one task, the value of this parameter is low.

Again, we will describe how a high level of differentiation is problematic for idea generation. Monitoring, assessing and acting can be seen as a learning process (Matsuo & Nakahara, 2013). This learning process can activate the generation of ideas, because when one encounters a problem the search for causes, a desired state and potential solutions begins. In this process one needs to draw information from different sources and delve deeper into the product and processes. This search can offer the employee new insights, knowledge and perspectives, which stimulates idea generation. Especially when non-routine regulation is required an employee is forced to be creative (Amelsvoort, 1992). When the three regulatory steps are divided over different employees the learning curve cannot be optimally utilized. Because the complete learning experience is no longer part of an employee's job, learning is limited.

Parameter 7: the level of specialization of regulatory transformations. Specialization of regulatory transformations refers to the extent to which regulatory transformations are split up into separate tasks and allocated to different capacities. A high value on this parameter means that regulatory transformations are split up into many sub-transformations and each sub-transformation is allocated to different capacities. For example, a task can be focused on maintenance or product quality only. The value of this parameter is low when regulatory sub-transformations are integrated into one task.

A high level of specialization of regulatory transformations limits an employee's overview over the whole process and product and therefore hinders idea generation. As with specialization of

operational transformations, tasks become narrow, are often repetitive and lack variety (Achterbergh & Vriens, 2009) and therefore inhibit employee's creativity. With a high level of specialization the focus of one's job is very limited and therefore it does not encourage employee to think broadly.

These seven design parameters can guide both a diagnosis and design of an organizational structure. De Sitter argues that the values on these design parameters affect an organization's controllability. Different configurations of parameter-values have different effects on the ability to attenuate disturbances and amplify regulatory potential. Therefore, the design parameters can be used as a base for designing organizations.

De Sitter argues that parameters values should be as low as possible for a specific context. Low parameter values increase an organization's capability to innovate, including the ability to generate ideas. Above, we have argued how the individual parameters are related to idea generation. In fact, it holds for all parameters that a low value reduces organizational complexity, thereby creating the right conditions for idea generation. A system's complexity is a function of the number of its elements, the number of their internal and external relations, and their variability in time (de Sitter et al., 1997, p. 508). For redesigning organizations it is key to minimize organizational complexity for the stimulation of idea generation for multiple reasons. First, the degree of complexity determines the amount of variability and potential for disturbances in the process. A high level of variability and many disturbances increase working pressure and results in less oversight over the process. On top of that, innovation and idea generation often take place in the regulatory activities in which problems are encountered, searched for and solved (de Sitter, 1998). An organizational structure that is designed to increase the chance on effective and efficient idea generation builds in regulatory potential at all organizational levels. Moreover, high organizational complexity inhibits the effective functioning of regulatory activities, because problems are not found and information and knowledge needed for the activation of idea generation does not reach the right people. Finally, organizational complexity hinders fruitful cross-functional contact, because people must interact with a wide variety of people from across the organization, and these contacts can include a wide variety of content.

2.6.4 Design heuristics

Next to the design parameters, de Sitter formulated six heuristics that guide designers in the process of designing organizational structures. The overall logic of the heuristics is that one starts with the production structure and then the control structure should be designed. The production structure (PS) is the best starting point as organizational complexity can be minimized by the right design of operational transformations. Important conditions for idea generation, especially with regard to internal and external contact possibilities, can be created. As a result, the control structure (CS) can be less complex, because the need for regulation is reduced. The design of the control structure deals with dividing regulatory transformations, where it is important to provide teams, segments and flows with enough regulatory

potential so that problems can be solved where they appear. The learning cycle coming from finding and solving problems can then be gone through at the lowest levels, whereby idea generation is stimulated. We will now briefly examine the six design heuristics. For an elaboration of the design steps see Achterbergh and Vriens (2019).

Design step 1: macro level PS, parallelization. The first step in the design process is to identify parallel flows. A flow is a grouping of operational transformations dedicated to realizing an external order, which can operate relatively independent from other flows. In an ideal situation employees do not need to interact with other flows for realizing the external order. An organization can identify multiple of these flows based on a sub-set of orders which can operate relatively independent from each other, thus working parallel. External orders can be categorized, among others, into client characteristics, input characteristics, product/service characteristics.

Design step 2: meso level PS, segmentation. In the second step the designer, if necessary, should identify relatively independent segments within order flows. Segments are relatively independent parts within a parallel flow which together realize the output of the macro flow. Segmentation is often needed because of the high complexity and large amount of people needed in the macro flow, which makes it impossible for one team to realize the output. Segments should be identified in such a way that they can work as independent from each other as possible by splitting up the output into (semi-) finished products. *Design step 3: micro level PS, identifying task groups*. The third and fourth steps aim to create self-coordinating task groups. The designer should assign teams for the realization of the output of a segment. Ideally, these teams can work independently and have all the necessary means to carry out all operational activities needed. Individual jobs within jobs should provide learning opportunities, a wide variety of tasks and the contribution to the segment's output should be recognizable.

Design step 4: micro level CS, equipping task groups with regulatory potential. Task groups should carry as much regulatory potential as possible so that they can locally deal with disturbances. The concept of minimal critical specification applies here: design as little as possible and only specify what is needed (Cherns, 1976). The ability to regulate relies on two conditions: the availability of relevant, timely, complete and reliable information about the object of regulation and the capability to actually deal with problems.

Design step 5: meso level CS, regulation between segments. In the fifth step intersegmental regulation will be designed for. Regulation should be designed to make sure that the teams at micro level are aligned and can contribute to the realization of the output of a segment.

Design step 6: macro level CS, regulation between flows. The last design step is concerned with regulation between flows. The macro flows should be able to operate as independently as possible, but some regulation have to take place on the highest level to align the flows. For example, innovation, common resources, and strategic policy.

3. Method

3.1 Research strategy

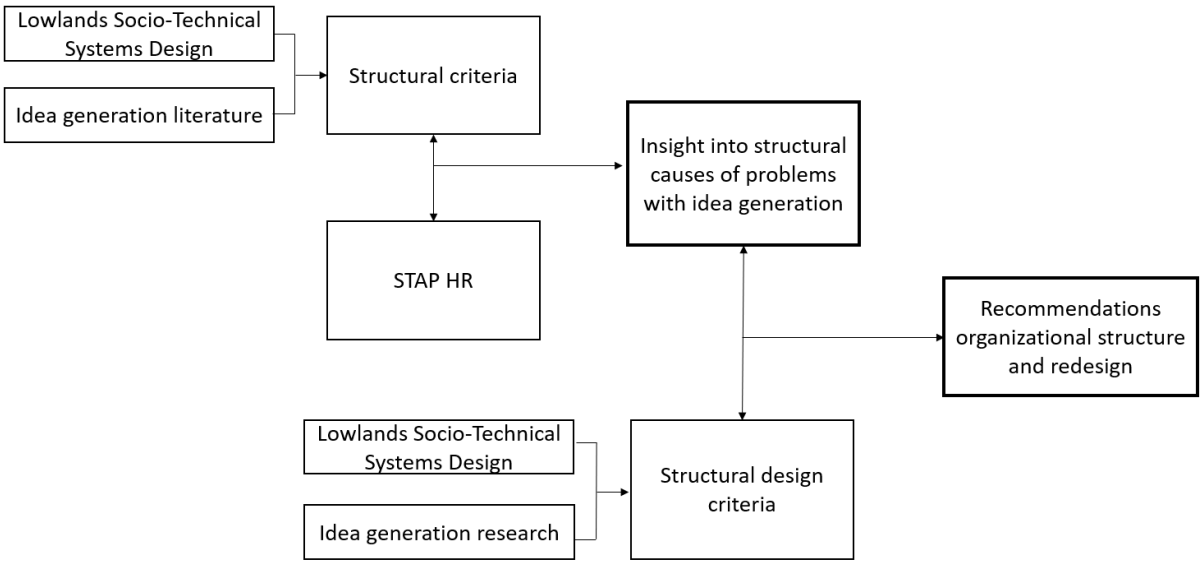
The main goal of this research was to contribute to practice and therefore this research can be classified as practice-oriented research (Verschuren & Doorewaard, 1995). To be able to answer the question 'what are structural causes for problems related to product idea generation within STAP HR and how can the organizational structure be redesigned to increase the generation of product ideas?' both the diagnostic and design phase of the intervention cycle were completed. Because the diagnostic and design phases differed in research goal and method (Verschuren & Doorewaard, 1995), they are described separately in this chapter.

The most suitable research design for the two research goals was a single case study. A single case study was chosen as it allows to gain in-depth insight into a phenomenon in a real-life specific context (Symon & Cassell, 2012), which was needed for both the diagnosis and design. Qualitative methods and data were used and gathered to make the translation from theory to practice and develop situation-specific knowledge. A qualitative approach fitted best with our research goals, because it allows to gain an unique depth of understanding which is difficult to gain from quantitative methods. Because of the combination of the intangible nature of organizational structures and the informal and chaotic idea generation processes it was needed to gain insight into the experiences, thoughts and feelings of employees to be able to draw conclusions on the relationship between the concepts. Qualitative methods can provide this kind of depth and therefore were found the most suitable.

For both the diagnosis and design phases a deductive approach was applied, because theory can provide normative expectations on how structure can stimulate idea generation in the specific context of STAP HR. In the diagnosis phase structural causes for problems related to idea generation were found by confronting reality with structural criteria based on theory. In the redesign phase theory provided normative structural criteria which were confronted with the current organizational structure, which in turn provided input for a structural redesign. Figure 2 provides a schematic representation of the two goals of the research (bold squares) and the global steps that have been taken to reach those goals. It also provides an overview of the relation between the theoretical background and the research goals.

Figure 2

Research model



Due to time constraints it was not possible to go through the whole intervention cycle and therefore the choice has been made to complete the diagnosis and design phases only. However, as the four phases in the intervention cycle are closely related and aim to change a real-life situation, this research used a participative approach to create the right conditions for the implementation and evaluation phases. A participative approach has been practiced for more than two decades in the Socio-Technical Systems Design tradition (Bjerknes & Bratteteig, 1995). User participation refers to the involvement of organizational members during the process (Bjerknes & Bratteteig, 1995). User participation was chosen for three reasons. First, the diagnosis and redesign required detailed knowledge of the organization to translate theory to the specific context. A close cooperation between the researcher and the organizations was important to assure fit between the organization and the intervention. Second, by involving a high number and wide range of employees throughout the organization support for a potential intervention was created. Resistance to change was reduced and the right conditions for the implementation phase were developed (Achterbergh & Vriens, 2019). Third, a participative approach can increase workplace democracy (Bjerknes & Bratteteig, 1995). Following STSD principles, it is important to give people the opportunity to participate in decisions which are likely to affect their work. Employees of STAP HR were involved in this research in three ways. First, a wide variety of employees was interviewed for the diagnosis. This gave the researcher a comprehensive understanding of the current situation, taking into account different perspectives. Second, the outcome of the diagnosis was shared with all employees and discussed in the focus group. Third, the design is a cooperative effort where employees played an important role. We found it important to provide employees with the knowledge and skills to think about the organizational structure themselves. Upon completing this project, people will be more aware of the way the organization works and hopefully take the redesign as a starting point of real change.

3.2 The organization

In this section the research object, STAP HR, will be described extensively to ensure transferability.

STAP HR is an organization that specializes in HR software. The organization was founded in 1997. STAP HR is located in two cities in the Netherlands. A few years ago they were internationally oriented and also operated in the United Kingdom. However, this was not as successful as expected and so they are currently only targeting the Dutch market. In February 2021, the organization had 29 employees.

STAP HR offers two products: BigStep and SmallStep. BigStep is an all-encompassing HR-system for the HR-professional and -manager. There is a high degree of vertical integration, as every activity happens in-house, from software development to after-sale service. Previously, they offered a full-customized product. This high level of customization resulted in not being able to deliver a high-quality service, because the complexity was too high for the employees. The organization became too dependent on only four key persons who were able to adequately provide service to customers because of their detailed knowledge of the product. For this reason they have started to standardize the product more. In addition, they also offer the product SmallStep. SmallStep is a fully standardized all-encompassing HR system, focused on small enterprises (0-50 employees). STAP HR already has 70% of recurring revenue and wants to switch completely to a subscription form. Next to the software, STAP HR also offers payroll and HR services.

The organization's mission is to offer everyone a complete solution for the automation of HR administration including a high-quality service, against competitive prices. The unique selling point of STAP HR is that they are ahead of their competitors when it comes to the functionalities of the HR program. Where competitors take payroll as a starting point and build an HR program around it, STAP HR does the opposite. The long-term vision of the CEO is to eventually sell the organization. Until then, the goal is to expand and increase the customer base.

The software market is highly dynamic, because customer needs change rapidly. The CEO states that market demands are the starting point for STAP HR. The organization constantly adapts to market dynamics. For example, in 2019 there was a shortage on the labour market for HR-professionals. In response to this development STAP HR set up secondment and recruitment services, named salarisdetachering.nl. STAP HR adjusted its resources and took advantage of this opportunity.

Around 10 years ago a bonus scheme was introduced that rewards employees for generating radical ideas that are successfully implemented. Until now, this bonus scheme's effect is close to zero.

3.3 Diagnosis

In this section the diagnostic phase of this research will be explained. The goal of this phase was to gain insight into how problems with the generation of ideas for product innovation within STAP HR can be related to structural conditions.

3.3.1 Research design

The intervention cycle is problem-steered and therefore the first step in the cycle is problem recognizing (Verschuren & Doorewaard, 1995). The problem of ideas that fail to take off within the organization was recognized within STAP HR for a while and some steps had been taken. A diagnosis provides insight into the background and causes of the problem, which often points the way for a solution (Verschuren & Doorewaard, 1995). In this research an organizational design perspective was taken to find structural causes for the problem, using Lowlands Socio-Technical Systems Design. We aimed to gain a greater understanding of the current situation of the organizational structure, how product ideas were generated and how the organizational structure affected the generation of ideas.

3.3.2 Data collection and sampling techniques

For the diagnostic phase three sub questions were formulated. The data sources, collection techniques and sampling methods that were used are described.

The first sub-question aimed to gain insight into the current organizational structure. Employees can provide valuable insight into the current structure. An organizational structure is the way tasks are defined, allocated across capacities (employees) and related (Achterbergh & Vriens, 2019). So employees are the ones who bring an organizational structure into practice. The second sub-question aimed to gain insight into the current state of affairs related to idea generation. The dependent variable, the generation of ideas, is on the individual level and therefore it was useful to collect data on the individual level. Therefore, the data sources for this research were persons.

Because the scope of this research comprised STAP HR as a whole, a representative set of employees was selected. Purposeful sampling was the most suitable sampling technique. The organization provided a list with all employees and their functions, which guided the choices for sampling. Semi-structured interviews were chosen as data collection technique, as it was necessary to deductively guide the interview around the topics of structure and idea generation, but leave room for inductively generated concepts. Interview guides were created up-front and can be found in appendix C. 11 interviews were held, from which four were held online.

The data gathered to answer the first two sub-questions was used to answer the third sub-question, which aimed to understand how the organizational structure influences idea generation within STAP HR. The data was confronted with Lowlands Socio-Technical Systems Design to see whether outcomes fit with theoretical expectations and to argue if and how the organizational structure influences idea generation.

3.3.3 Data analysis

The interviews were recorded and transcribed. Deductive thematic analysis was used to identify, analyse and report patterns within the data based on theory. Fereday and Muir-Cochrane (2006) described and illustrated seven steps of deductive thematic analysis. First, a priori a codebook was developed based on the idea generation indicators and structural parameters. Second, the reliability of the codes was

checked by applying them to two transcripts and to see whether the codes fit with the raw material. If needed, the codebook was modified to fit the data. Third, all transcripts were read to gain familiarization with the data and identify initial themes. Fourth, the codes of the codebook were applied to the raw data. In this step, separate or additional codes inductively arose from the data. Fifth, the codes were connected and themes were identified. The research questions guided this clustering process. Lastly, the themes were clustered further and findings were confirmed.

To ensure fit between a respondents' view and the researcher's interpretation, outcomes of the diagnosis were discussed with employees during the focus group. On top of that, the researcher discussed the data with peers to challenge assumptions and gain different perspectives.

3.4 Design

The design phase of the research was aimed at inventing a new structure in which the values of the design parameters that hinder the generation of ideas are changed in such a way that they no longer cause problems. In turn, this structural redesign was used to advise STAP HR on how product innovation can be stimulated by increasing idea generation. The problem identification and diagnosis outcomes were used as input for this phase.

3.4.1 Research design

De Sitters (1998) design heuristics guided the structural redesign process. As we argued in our theoretical framework, structural parameters should be as low as possible. As figure 2 shows, literature on idea generation was also used, because it showed what the structure should aim for or accomplish. Idea generation literature was used to evaluate and change the design so that the design fits with an innovation perspective.

One workshop was organized on the 31th of August. Together with a wide variety of organizational members first steps towards a desired production structure were taken. The workshop was organized as follows. First, the results of the diagnosis were presented. During and after the presentation discussion was stimulated which revealed the main bottlenecks, different perspectives and the starting point for the redesign. By discussing the current situation common ground on the causes for the problems related to idea generation were established. Second, the basics of STSD and the design heuristics as laid out in the theoretical framework were explained shortly. Third, the respondents were challenged to think about a desired situation with regards to idea generation and innovation by means of asking open questions. The five factors that resulted from the diagnosis were taken as a starting point for the development of this desired future state. Fourth, on the basis of three alternatives a design on the macro level of the production structure was discussed. For more details on the layout of the focus group see appendix D.

Due to time constraints the other five design steps could not be taken together with the participants. Based on the interviews, the discussions in the workshop and STSD and idea generation literature a first attempt was made to develop an organization structure.

3.4.2 Data collection and sampling technique

For the design phase one prescriptive sub question was formulated: how can the organizational structure of STAP HR be designed to increase the generation of product ideas? Two data sources were used for the development of a design: persons and literature. L-STSD methods guided the process and by means of the focus group the theoretical concepts were translated to the specific situation.

The aforementioned workshop was designed as a focus group. ‘‘Focus groups are unstructured interviews with small groups of people who interact with each other and the group leader. They have the advantage of making use of group dynamics to stimulate discussion, gain insights and generate ideas in order to pursue a topic in greater depth’’ (Bowling, 2002, p. 394). Focus groups place particular importance on participant interaction (Kitzinger, 1994), where participants are encouraged to challenge each other and build on each other‘‘ s ideas. The researcher had the moderator role. It’s a moderators’ role to stimulate discussion between all participants and at the same time make sure the discussion is focused on a certain topic. An open and safe environment was created by establishing clear ground rules for participation at forehand and constantly highlighting that everyone’s opinion is appreciated and that people should not be judgemental (Krueger, 2014). A moderator determines to a great extent the effectiveness and usefulness of a focus group (Burns & Bush, 2012) and therefore it is recommended to use an experienced moderator who has excellent communication skills (van Os & Pieters, 2012). However, due to budget constraints and the intent of a master’s thesis the researcher, who is unexperienced, led the focus group.

Of the people interviewed, 7 were invited to participate in the focus group. Due to cancellations, five employees were present on the 31th of August. This number of participants is large enough to have a diverse set of opinions and small enough to provide room for every participant to contribute (Krueger, 2014; Stewart & Shamdasani, 1990). A wide variety of employees was desired for the workshops so that the participants represent the organization as a whole. Because participation in the focus group asked for motivation and some interest in organizational design, participants were selected strategically. The interviews for the diagnosis can be seen as an intervention, because it stimulated people to think about their way of working. Because of this, the same group of people was asked to participate in the focus group. Participants were informed about the goal, process, expectations and rules of the focus group oral and via e-mail.

Due to COVID-19 restrictions, the focus group took place online using Microsoft Teams. Unfortunately, it was not possible to let the participants experience the basics of STSD through a game and make use of physical objects or paper to ease the development of a structural redesign. However,

by challenging the current way of working and discussing alternatives participants got a feeling of basic STSD principles. The advantage of an online focus group is that geographical boundaries can easily be bridged so that the group can be put together quickly and easily (Oringderff, 2004). It was also appealing to employees to participate, because it lowered work-related scheduling problems (someone had to be able to answer customer calls) and they could participate from home. An online focus group also had its limitations. Nonverbal communication may not have been fully captured by the participants and the moderator, which may have negatively affected each other's attention and understanding (Tuttas, 2015). The moderator found it difficult to determine whether the participants understood the theory and the points presented.

3.4.3 Data analysis

The focus group was recorded and summarized afterwards. By combining the results of the diagnosis, design and literature the final redesign was created.

3.5 Research ethics

Because of the influential and important role of academic research in society we find it important to conduct research in an ethical way. The Netherlands Code of Conduct for Research Integrity's guiding principles were leading in this research (KNAW et al., 2018). To ensure reserach integrity several steps were taken. Participants were informed upfront about the content and goals of the research and what was expected of them, whereafter consent was asked. Participant anonymity is guaranteed and participants can withdraw for participation at any time without consequences.

To ensure that the identity of individuals is protected only their function title was used with handling data. The identity is known to the researcher only. Participants have been given the opportunity to provide feedback on research results and their wishes were respected. The results are shared with the participants during the focus group and by means of a shared document. Agreements are made about the availability of the thesis outside the organization.

3.6 Operationalization

The two main concepts in this research, idea generation and organizational structure, are operationalized in appendices A and B. For the dimensions of organizational structure we relied on de Sitter (1998), where the general indicators are adjusted from Achterbergh and Vriens (2019). In addition to general indicators, a column has been added with possible indicators for high values on parameters. These indicators are symptoms of a problematically high value in relation to idea generation. If these indicators are present, it is a signal that a parameter is too high and that idea generation might be hindered.

With regards to the operationalization of idea generation we relied on the dimensions as developed by Birkinshaw and Hills (2007). For the measurement of idea generation two categories of dimensions were used. The first category of dimensions aimed to develop a measurement of the current

state of idea generation. What kind of ideas are generated and how often? Birkinshaw and Hills (2007) dimensions volume of ideas and novelty of ideas are adopted. On top of that, following our literature review the dimensions innovation type and economic potential were added. The second category of dimensions were aimed at measuring the stimuli to which employees are exposed through their role within the organization. The dimensions contextual depth, contextual breadth and breadth of cognitive context were adopted from Birkinshaw and Hill (2007).

4. Results

The result section is divided into two parts: diagnosis and design. First, in the diagnosis part the current situation with regards to respectively idea generation, organizational structure and the relationship between the two concepts is described based on the interviews. The transcripts of the interviews can be found in appendix E. In the text reference is made to the relevant transcripts by means of a T and a number in brackets. In the second part, the results of the focus group are presented and by following the design steps an organizational redesign is developed.

4. Results diagnosis

4.1 Idea generation

4.1.1 Idea characteristics

Based on the examples of ideas that respondents gave the current state of idea generation at STAP HR is described. The characteristics innovation type, novelty and economic potential are used to categorize the ideas of the respondents.

In the interview it was highlighted that the interview's focus was on ideas for new or existing products and thus not processes. However, what stand out was that employees are continuously improving their operational activities, because ''It makes life easier'' (software developer, T6), to prevent mistakes and to improve ease of use for the customer: ''If our processes run smoothly, the customer will notice that too. And if the customer notices, we notice'' (payroll employee, T2).

In contrast with the expectations of the CEO, employees do have ideas concerning product innovations. Where some employees only provided examples of ideas for process innovation, others indicated and illustrated with examples that they generated (many) ideas for product innovation. All respondents, except the CEO, indicated that it is not formally their task to generate ideas, but some employees feel like it is expected from them ''to think about the bigger picture'' (account manager SmallStep, T4) or the drive to (continuously) develop and improve comes from within.

4.1.2 Degree of novelty and economic potential

Most ideas posed by the respondents can be categorized as incremental. Examples of incremental ideas are a link with Outlook in SmallStep (account manager SmallStep, T4), offer pay slips via WhatsApp (manager payroll service, T1), and on-boarding (salesman BigStep, T11). As the consultant illustrated: ''Ideas concern the little things that you come across that would be useful. We keep a small list of what we would like to see improved in the next version'' (T9). As the quote illustrates product ideas are often little improvements to the HR system which can be taken into account in the update. Also, incremental ideas can be product extensions. In that case, when the idea is executed, the product extension is taken into account in the update or customers can purchase these extensions.

This is closely related to the economic potential of ideas. Some incremental product ideas do have economic potential. Product extensions such as on-boarding, manager self-mutations and digitally sign have economic potential, because customers have to pay for these add-ons. However, most ideas can be categorized as continuous improvement, because they do not have an (direct) economic potential.

It is interesting to see that radical product ideas are generated by the CEO and the payroll manager only. The examples of radical product ideas all had economic potential and are, for example, SmallStep time registration (CEO, T5), SmallStep payroll app (manager payroll service, T1), BigStep shop (manager payroll service, T1), and HR service (CEO, T5).

4.1.3 Scope of ideas

The ideas generated by employees have a limited scope. The ideas the respondents gave were often related to their expertise and the product and process they contribute to. For example, payroll employees generate ideas that relate to payroll and they do not generate ideas related to the two HR systems. The HR manager's ideas have a broad scope, because she comes into contact with the products and services from the customer's side.

4.1.4 Perspective

Within STAP HR two overall perspectives with which employees look at the products are present: the technical and customer perspective. Where employees with a customer perspective look at how customers use the product and take into account user-friendliness, employees with a technical perspective look at the technical complexity and possibilities of the product. As the HR manager illustrates: ''It is almost, except for your father, all IT people here. They say it is technically well put together and the customers should therefore understand'' (T10). Ideas can be more technical or more on the customer side, however, it is important to keep both perspectives in mind because of the interplay between the two. Focusing on the technical side only might result in unused and unsaleable software: ''We can write and develop cool code, but if it does not help the customer, it is better not to do it'' (manager software development, T8). On the other side, not everything that the customer asks for is technically feasible. Currently, it seems like most employees only take into account one perspective for the generation of ideas.

4.2 Organizational structure

For the examination of the current organizational structure of STAP HR we make use of the design parameters from de Sitter (1998; 1997). First, a general overview of the company is given. After, respectively the parameters related to the production structure, separation, and the control structure will be discussed.

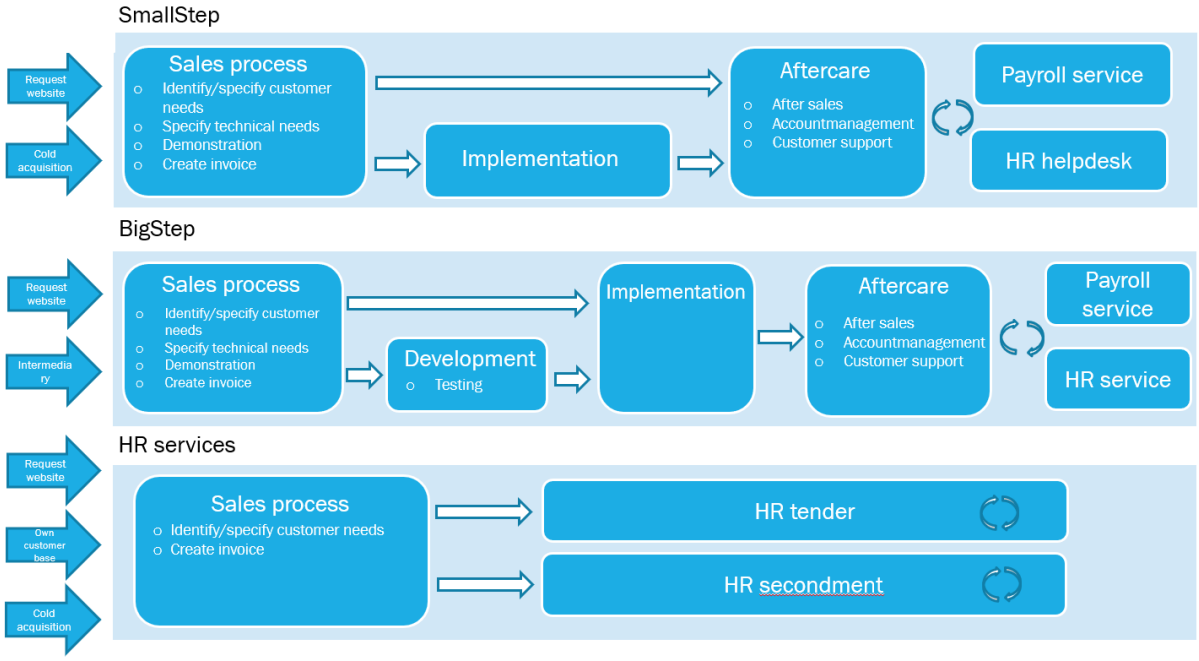
4.2.1 Production structure

The production structure is relative to orders (Achterbergh & Vriens, 2009) and therefore we will first describe the orders of STAP HR. An order refers to a request for the realization of some specific desired effect (Achterbergh & Vriens, 2009, p. 240). Three orders can be distinguished: BigStep, SmallStep and the HR service. Based on the three order types three production flows can be distinguished: SmallStep, BigStep and HR service. A production flow exists of all operational activities needed to realize a specific order. The company offers two HR software systems: SmallStep and BigStep The HR system SmallStep suits organizations from one to hundred employees and is delivered in a standard format. BigStep is a customized HR system for organizations of hundred or more employees. Furthermore, the organization offers HR services. The HR service can be divided into three services: HR tender, HR secondment and the HR helpdesk. Organizations, both customers and non-customers of one of the HR systems, can outsource their personnel matters to STAP HR or make use of the secondment service. Lastly, customers of SmallStep or BigStep can ask HR related questions for free at the HR helpdesk. STAP HR also offers payroll services. The payroll services are integrated within the HR systems and by means of a monthly subscription customers can make use of this service. Because the payroll service is an addition to the HR systems, payroll is not seen as a separate order. Due to personnel constraints the payroll secondment is currently not running and will not be included in this research.

Before delving deeper into the parameters we want to examine the production flow for each order. Figure 3 provides a brief overview of the operational activities required for each order. The blue arrows show how potential customers come in contact with the organization. The blue boxes represent operational activities and the white arrows show the sequence of operational activities. All activities related to aftercare, the payroll and HR service are ongoing, recurring activities. The HR tender and HR secondment are also recurring activities. This overview will be used to explain parameter values by shedding light on how departments relate to these processes.

Figure 3

Overview of the three production flows.



Customers can order one product or service, but often a combination is purchased. For example, about 40% of the SmallStep customers also make use of the payroll service (focus group, appendix F). BigStep customers always ask for customization of the system, but the degree of customization differs. Some customers only need 10% of the system to be customized, where others ask for 80%. Customers can also purchase extra services or add-ons later on. The sales employee of BigStep stated that most BigStep customers first purchase the system only, because of its large impact on the organization (focus group, appendix F).

Parameter 1: the level of functional concentration

Functional concentration is the degree to which operational tasks are related to all orders (Achterbergh & Vriens, 2019). Generally, a team or department performs operational tasks for only one order and are thus situated in one production flow. For example, employees perform sales and implementation activities for either SmallStep or BigStep However, the marketing, payroll, and development activities are in separate departments that perform the operational tasks for multiple orders. The marketing activities for all products and services are concentrated into one marketing department. The operational activities related to the payroll service are carried out for both products and one department is responsible for this. The payroll tasks are almost the same for the two HR systems. The interviewed payroll administrator does not experience problems switching between the two orders: ‘‘basically it is all the same with the processing’’ (T2). One or two years ago the payroll manager invested in reducing differences between the inputs of SmallStep and BigStep: ‘‘The data that employees receive [output of the two HR systems] is virtually the same for BigStep and SmallStep’’ (manager payroll service, T1).

For the developers it is harder to switch between the two HR systems because of the age difference between the systems. As the software development manager illustrates: ‘‘Imagine you are used to driving a modern car [SmallStep] and suddenly you have to drive in an old car [BigStep]. That is what it feels like. The techniques differ and the systems ask for a different way of thinking’’ (T8).

The sales activities are located in each production flow and are therefore carried out separately for each order. However, because the products and services substitute or complement each other employees sometimes have to perform sales activities for products or services other than where they are directly responsible for. For example, a customer combines the system SmallStep with the HR service. In that case, an HR employee has to be involved in the sales process to be able to answer HR-related questions. It also goes the other way around: a seconded employee of the HR service can sell organizations one of the products that STAP HR offers and hands the sales process over to colleagues once organizations are interested. Also, existing customers may buy (additional) services, a HR system or additions/add-ons. As a consequence of these multi-orders internal interactions rise and structural complexity increases.

Within the production flow of the order BigStep specialized departments are present. These departments seem to be coupled to only one order type (BigStep), however, this product is highly complex and has a high level of variety. This complexity results in a high number of internal interactions because knowledge and skills are divided over different departments. The characteristics of the project determines who is involved in the process and who is not.

To conclude, the level of functional concentration is moderate. The organization used product types to identify order types. To some extent departments perform activities for only one order and are therefore situated in one production flow. However, some departments perform operational activities for multiple orders. So, when we lay the departments over the production flows as illustrated in figure 3, we see that some departments cross the production flows.

Parameter 2: the level of differentiation of operational transformations

For each order of STAP HR we will describe to what extent the preparation, making and supporting activities are grouped into separate tasks.

The preparing, making and supporting activities related to the production flow SmallStep are to some extent assigned to different departments. The making and preparation activities are assigned to the team ‘‘ SmallStep’‘ . As the account manager of SmallStep put it: ‘‘Me and my colleague actually do everything concerning SmallStep, except for the payroll and the development itself’’ (T4). Indeed, the support activities marketing and software maintenance are situated in other departments, as is the making activity payroll.

With regards to the production flow related to realizing the HR service, the make activities are grouped together in the HR service department, but for preparation and support activities they often rely on other departments. For the sales the HR service is for the largest part dependent on other sales teams, but they can also take own initiative in the form of cold acquisition. The planning is done within the HR team.

Support activities are marketing and technical support (related to the HR systems) and are situated in other departments.

The support, making and preparation activities are highly differentiated for the order BigStep The preparation activities comprise the sales process and planning and are situated in the sales department of BigStep When the complexity of a potential customer increases, more departments are involved in the sales process. A potential customer becomes complex when they want to make use of the HR service and/or the payroll service and/or when they ask for a customized HR system. The payroll department, the HR department, the CEO and the customer service department can be involved in the sales process. Broadly speaking, the making activities are the customization of the software (development and customer service departments), the implementation (customer service department), the payroll service (payroll department) and aftercare (multiple departments, depends on the question). The supporting activities are also grouped in different departments: marketing and software maintenance.

The degree of differentiation of operational transformations differs for the three production flows. Because the order BigStep comprises the most FTE's and generates the most revenue the degree of differentiation of this production flow weighs more than the other two production flows. In each production flow the preparing, making and supporting activities are to a great extent assigned to different departments. Taken all together, we conclude that the level of differentiation of operational transformations is moderate to high.

Parameter 3: the level of specialization of operational transformations

Again, we will describe this parameter along the three production flows of STAP HR. In the production flow of the product SmallStep operational tasks cover a large part of the operational process. As previously described, there is some differentiation of operational transformations, but for the rest employees have tasks that cover the whole production process. The same goes for the HR services where employees have broad tasks that cover a large part of the operational process. The production flows of SmallStep and the HR service are thus organized in such a way that there are little dependency relations and little sequentially coupled tasks within the production flow. It must be noted that both flows are relatively small: they both contain only two FTE's.

For the customizable HR system BigStep multiple departments are involved in the process. As a consequence, tasks have to be sequentially coupled and dependencies between tasks are created. Within these departments some specialization is present. For example, in the development department they distinguish between front-end and back-end developers (see T6, software developer). Also, within the customer service department some employees are busy with implementations at the customer, where others are mainly performing support activities (see T7, team leader customer service). Contrary, all payroll employees perform the same tasks and are responsible for the entire handling of their customers (see T1, manager payroll service). Overall, the average cycle time of the tasks within STAP HR does not seem to be that short and the tasks do not seem to be monotonous.

Throughout the organization the tasks are divided in such a way that (some) job redundancy is created. Redundancy is mainly created within teams, which means that direct colleagues can take over tasks from each other if needed. A great example is the customer service department where they have a learning trajectory for new employees in which they step-wise get more tasks and responsibilities. ‘‘*One is just better at one thing and another is better at something else. […] In fact, every new employee does support first, because then you get to know and understand everything. And then if that goes well, you will also do implementations’’ (*team leader customer service, T7*)*. Job redundancy is also present across teams. For example, some customer service employees were first responsible for both SmallStep and BigStep Even though SmallStep is now separated from BigStep, the employees who have worked with SmallStep before could still take over tasks if needed.

Summing up, we conclude that within STAP HR the specialization of operational transformations is low. Within the subsystems, departments, tasks often comprise a large part of the operational process. Where some specialization is present, the indicators of a too high degree of specialization, such as a short cycle time and monotonous tasks, are not present.

4.2.2 Separation

Parameter 4: the level of separation between operational and regulatory transformations

This parameter is about the degree to which regulatory and operational activities are assigned to different tasks. The degree of centrality is very limited: the CEO is ultimately responsible for all teams and the teams are directly under him, most of them with a manager on top. The CEO finds it important to give employees their own responsibilities: ‘‘I prefer a very free structure. I believe they [employees] can develop themselves more in such a structure’’ (CEO, T5).

The teams often have enough regulatory potential to deal with their own problems. Employees state that they first try to solve problems on their own and when this is not possible they go to either the manager or to colleagues. The sales and marketing, customer service and development teams have regularly scheduled meetings (daily, weekly) in which problems and solutions are discussed in the group. For example as one of the consultants of told: ‘‘Every morning we have a short 10/15 minutes about today’s activities. We have the same 10/15 minutes at the end of the day about what kind of problems you encountered and what the solutions were‘‘ (consultant BigStep, T9).

Employees relatively often encounter problems that ask for cross-departmental knowledge and skills. For example, the salesman has to reach out to customer service for technical questions. Payroll administrators do not have access to the customer environment of BigStep, which complicates problem solving: ‘‘I always first try to solve it on my own. But often it is not possible to do it alone, because you really need advice from support [customer service]’’ (payroll administrator, T3). Due to the small size of the company, employees find it easy to reach colleagues outside of their team.

The payroll team differs from the other teams with respect to separation of the operational and regulatory activities. As one of the payroll employees stated: ‘‘We have implemented a certain structure

here with build-in controls and a sequence of processing, whereby a layman would still be able to do it'' (payroll administrator, T1). The manager has highly formalized the work process to prevent mistakes. Even though employees have the freedom to solve their own problems, this formalization can be seen as taking away regulatory capacity from employees.

We conclude that the level of separation is moderate within STAP HR. Teams can often solve the problems related to their expertise themselves, but otherwise in many cases they have to leave the problem solving to another department.

4.2.3 Control structure

Parameter 5: the level of differentiation of regulatory transformations into aspects

Operational regulation, regulation by design and strategic regulation are to a large extent assigned to the teams. Each team can often solve their own problems, determine their way of working and set goals for their department. As the account manager of SmallStep stated: ''We decide on most things by ourselves. And as part of my development I also set the goals for SmallStep'' (T4). The managers of the HR and payroll departments also indicate that they feel in control of their own department. The only exception is the development team. Both the development manager and employee state that their work is ''very much determined by other departments'' (manager software development, T8). The development team therefore lacks strategic regulation as they cannot set goals for themselves.

The CEO is mainly busy with strategic regulation with some regulation by design across departments: ''I make sure that we follow the right strategy and that the teams together reach the right point at the right time. […] For more complex customers I usually think out the concept: what are we going to do and is it useful?'' (T5).

Taken all together, the degree of differentiation of regulatory transformations into aspects is low, because the three forms of regulation are present in the teams.

Parameter 6: the level of differentiation of regulatory transformations into parts

Teams can perform the activities monitoring, assessing and intervening by themselves when it concerns a problem that is related to their expertise. Employees encounter problems themselves and solve them themselves. When they are not sure what to do, they involve the team in the problem solving process. For example, within the customer service team, issues are regularly discussed and then "we say you will pick that up and you will figure that one out'' (team leader customer service, T7). Team members discuss operational problems and assist each other in finding solutions. The regulatory tasks are often seen as a joint team responsibility.

Some problems ask for cross-functional problem solving. To carry out the assessment and intervention tasks, employees sometimes have to engage another department due to lack of knowledge about a certain subject. An example is when technical problems arise during the implementation of BigStep The issue is first reviewed within the customer service department, but when more technical

expertise is required, they turn to the development department which will take over the assessment and intervention tasks.

Again, the payroll department is an exception. As one employee illustrates: ‘‘Our method is very fixed. Everyone must adhere to that. So everyone has to take certain steps and do checks. And if you do, a lot of things cannot go wrong’’ (payroll administrator, T1). The payroll employees have to work with a very strict work protocol which does most of the monitoring for them. The protocol has built-in controls so that an error message pops-up when something deviates from the standard. Whether employees can assess the problem themselves depends on the kind of problem. A major issue is that payroll employees do not have access to the BigStep environment of customers. Thus, when something goes wrong they have to go to customer service who can assess what went wrong and they are also the ones who have to intervene. Also, when something is wrong with the protocol payroll employees cannot intervene themselves, but should leave that to the manager.

Summarizing, the degree of differentiation of regulatory transformations into parts is low to moderate. With the exception of payroll, teams can often perform the complete regulatory cycle of monitoring, assessment, and adjustment with respect to their own operational activities. However, when other departments have to be involved the regulatory cycle is cut up.

Parameter 7: the level of specialization of regulatory transformations

The parameter specialization of regulatory transformations measures the degree to which regulatory activities have only small regulatory scope (i.e. cover only a small part of the operational process, or only a small set of other regulatory tasks) (Achterbergh & Vriens, 2019, p. 167).

Overall, teams have regulatory power over their operational process. For the production flow BigStep, the degree of specialization and differentiation of operational activities result in that the object of regulation contains only a part of the operational process. Each department has to a large extent operational, design and strategic regulation and can perform the three parts of regulation, but only with respect to their part of the operational process.

The CEO keeps oversight over the process: ‘‘My daily work is mainly to manage the teams […]. To ensure that everyone, or all teams that work together reach the right point at the right time’’ (CEO, TX). The CEO sets the overall goals for BigStep and the teams have regulatory power over their part of the process only. As the manager of the payroll services stated: ‘‘If it has to do with salary service, I’ll solve it. That is my responsibility’’ (T5).

With regards to organization-wide decisions most do not feel involved. As the manager of software development illustrated: ‘‘I only get involved when it concerns me, the team or technical development’’ (T8). The team leader of customer service does not feel like she is being involved in higher decision-making: ‘‘Sometimes I hear what was decided afterwards. But I don’t get involved beforehand’’ (T7).

To conclude, because teams have regulatory power over their operational process and the CEO is the only one who has process oversight over all products and services the level of specialization of regulation is moderate.

4.3 Relation structure and idea generation

Based on the stimuli and barriers of idea generation the relationship between the organizational structure and idea generation by employees is explained. The relationship between organizational structure and idea generation can be explained via five factors: customer insights, process and product insights, problem solving, contextual depth, (cross-)functional contact.

4.3.1 Customer insights

The main stimulus for ideas are customers, both potential and existing customers. Employees who are in close contact with customers generated more ideas than employees who do not have contact with customers. As the account manager of SmallStep illustrates: ‘‘We know best what customers want and what their needs are. Of course, then you generate ideas more often or have ideas that better fit with customer needs’’ (T4). For the generation of ideas direct customer contact can be stimulating, but it is not desirable that all employees talk to customers. What is most important is that employees have insight into customer needs, how customers use and perceive the system and what problems customers encounter. These insights are useful for the generation or ideas, because ideas for new or existing products and services have to comply with customer needs. It guides the direction of the ideas.

The organizational structure plays an important role in supporting customer contact and to spread knowledge on customer needs. The degree of specialization and differentiation of operational transformations influences the distance between employees and customers. A low level of specialization and differentiation reduces the distance between customers and employees. In, for example, the production flow SmallStep employees are responsible for all operational tasks and have contact with customers. They have insights into the customer and can generate ideas based upon this, see the previous quote. Within the production flow BigStep sequentially coupled tasked are created as a result of a high level of specialization and differentiation of operational transformations. Each department is responsible for performing their set of operational activities and has its own goals to strive for. Because no close cooperation between the departments is needed it seems like a barrier is created between departments. This barrier hinders departments to share knowledge and learnings with one another. For example, the software development manager explained how they are told only what to create, but not what the customer’s original problem was (see appendix F). Both the manager and employee of the development team mentioned ‘‘we do not know well what customers want’’ (manager software development, T8).‘‘We can come up with very nice technical solutions. The question is always whether customers benefit from that. So sometimes there is a mismatch’’ (manager software development, T8). As this

example illustrates, it is important that customer insights are shared throughout the organization, because the absence thereof can hinder idea generation.

We previously argued that the level of specialization of operational transformations is low, however, with respect to idea generation we now see that specialization negatively impacts the spread of insight into customers. Because departments in the production flow BigStep are sequentially coupled, some departments have little to no contact. A department only needs coordination with the department that provides input or to whom they have to deliver. As a result, development, for example, has very little contact with sales. In combination with the moderate to high level of differentiation of operational transformations, we conclude that the organizational structure hinders idea generation, because insight into the customer are not easily spread across employees.

4.3.2 Process and product insights

The data confirms that insights into operational processes and products are important for the generation of ideas. As previously mentioned, employees generate ideas that relate to the process or product to which they contribute. The data also showed that employees who have more insights into the processes and products generate more ideas than employees who are focused on their expertise only. For example, The HR manager works with both HR systems when she is seconded and as a result she generates a broad range of ideas related to HR, payroll and the HR systems. Contrary, payroll administrators only come into contact with payroll and as a result their ideas relate to payroll only.

New employees also show that an understanding of the process and products form the basis from which ideas can be generated. As an employee with one year work experience explained: ‘‘Because you first have to know the existing before you really have a clear idea of what can be adjusted or what news could be useful’’ (consultant BigStep, T9).

All structural parameters related to the production structure influence the degree of process and product insights employees develop, as these parameters are related to the grouping and coupling of operational tasks. Functional concentration determines the orders an employee gets in contact with. From the examples that employees gave it became clear that most ideas that are generated concern the order that an employee is (partly) responsible for. To lower structural complexity Dutch sociotechnical systems theory argues that the degree of functional concentration should be as low as possible (Achterbergh & Vriens, 2019; de Sitter, 1998; de Sitter et al., 1997). But for idea generation a wide range of stimuli is desired. The question is whether a high(er) level of functional concentration, so that employees come into contact with multiple products (and thus stimuli), is desirable. In organizations with a high level of functional concentration employees work in specialized departments in which they perform tasks for multiple products. As a result, employees lack process oversight and only view the product from their expertise. They do work on a wide range of products, but these employees do not have a good understanding of the products and processes as they only see the product in their part of the operational process. Employees mostly work with the same specialists, while for idea generation it is important to bring different perspectives together. In organizations with a low level of functional

concentration employees are part of a team that is responsible for the whole process of only a subset of the orders. Thereby, employees get in contact with multiple perspectives and have insight in the product(s) and process to which they contribute. Therefore we argue that for idea generation it is best to have focus and create the right conditions in relation to only a subset of the order.

Differentiation and specialization of operational transformations lead to cutting up the operational process, which limits the overview over the process that employees have. It also limits the understanding of the product. For example, due to the differentiation of operational transformations the salesman of BigStep does not generate ideas related to the implementation of the software. ‘‘For example, a customer asks if this possible? If so, can I get an invoice for that? Then I always discuss this with the consultants. How much time do you [consultants] think it will take? […] Then I know what to put on the invoice. I have daily contact with the consultants to solve issues’’ (salesman BigStep, T11). Because the salesman of BigStep has no experience with implementation of the software, he lacks an understanding of that aspect of the product. Therefore, generating ideas on that aspect of the product is hard.

What is closely related to specialization is functional breadth. Functional breadth is the extent to which a job crosses disciplinary boundaries or an employee’s working experience in other functional areas (Birkinshaw & Hill, 2007). Within STAP HR, the CEO is busy with creating ‘bridges‘ by positioning an employee between two departments. There are currently two employees at such a position: one connecting development en customer service and one connecting customer service and payroll. As a result, the functional breadth of these employees increases. Functional breadth can positively contribute to process and product insights by broadening the scope employees have. Secondment also increases functional breadth. Payroll administrators can be seconded where they enter the salary data of the customer. In this way they also see the customer's side and learn more about the HR system. A payroll administrator stated that this experience stimulated him to generate ideas ‘‘because at the moment that I was doing that, I encountered problems and clumsy things in the system that could be improved’’ (T1). Functional breadth ensures that employees have a broader view and background and can generate ideas based on multiple perspectives.

Especially with regards to the production flow of BigStep the organizational structure is not creating the desired conditions in which employees can develop insight into the products and processes. Due to the specialization and differentiation employees have oversight over only a small part of the process and product. The moderate level of functional concentration does not seem to be problematic, because the amount of (sub)orders an employee have to deal with is manageable.

4.3.3 Problem solving

Another source for ideas is the problem solving process. An employee who has to find a solution for an encountered problem needs creativity in the search for a solution if a non-routine solution is required. Especially when out-of-the-box solutions are needed employees are stimulated to go beyond current patterns.

The ideas that are generated as a result of the problem solving process are mainly process related: ‘‘to make life easier’’ (software developer, T6) and ‘‘to prevent mistakes’’ (payroll administrator, T3). Products ideas that come out of this process are most likely to be incremental ideas, because the problem that needs solvation is related to (improving) current products or services.

The structural parameters separation of operational and regulatory transformations and differentiation of regulatory transformations into parts are related to the problem solving process. First, a low level of separation is important, so that employees can deal with disturbances in their operational process themselves. The employees with the operational tasks have the best insight into the process and product, see above, which forms the basis on which ideas can be generated. When minimizing the distance between operational and regulatory tasks, employees can experiment in their job and creativity is stimulated.

The regulatory activities ‘monitoring’, ‘assessing’, and ‘intervening’ comprise the problem solving process, because it is about seeing problems and dealing with them. When the level of differentiation is low, as is the case at STAP HR, teams can oversee their process, determine whether problems need intervening and intervene.

To further stimulate idea generation through problem solving, conditions should be created in which employees share problems, thoughts and alternatives. Then employees can build on each other's ideas. Within STAP HR several departments organize (regular) meetings in which employees share problems, solutions and ideas. For example, the software development team have so-called beamer sessions each Friday in which ‘‘we look at what everyone else has been up to. We look at what is possible. How could we do it otherwise? Are there other types of solutions possible?’’ (manager software development, T8). The same concept is used at the customer service department where problems are shared and someone is given the responsibility to delve into the problem. In this way more people are engaged in the problem solving process and employees can follow up on each other’s problems and ideas.

The way functional problem solving, within departments, is done within SmallStep Netherlands, stimulates the generation of ideas. Employees go through the problems solving process alone or as a team. However, cross-functional problem solving is not common in the organization. Currently, in most cases employees with similar functions and background meet to solve problems related to their specialism, while for idea generation it is important to bring together different perspectives and knowledge bases. Within STAP HR specialists do not cross one another very often due the degree of differentiation and specialization of operational transformations. And because the degree of specialization of regulatory transformations is linked to the way operational activities are assigned to tasks, the problem solving scope is limited.

4.3.4 Contextual depth

A stimulus that is also about creating ideas during a search process is contextual depth. Contextual depth is the extent to which search (active scanning or passive attention) extends beyond local search within

the boundaries of a given knowledge field. Contextual depth is not about trying to solve a problem but about paying attention to the context. At STAP HR, especially managers or team leaders are actively scanning the environment or passively pay attention to the context. Some examples: ‘‘Of course I sometimes look left and right who is doing what. But then it’s related to my area: payroll’’ (manager payroll service, T1), ‘‘It is very easy to see what competitors are doing. […] I take a look at their support to see how they do certain things and how to integrate that’’ (account manager SmallStep, T4), ‘‘I am most stimulated by the outside world, I think. So what is going on? What are other companies doing? What are competitors doing? Where do I think we can do better than the competition?’’ (CEO, T5). From the examples we can extract that employees go beyond local search and ‘go out there.’ The search does often not go beyond the own knowledge field or product/service that an employee contributes to.

That is where the organizational structure plays an important role. Due to a low level of functional concentration employees are focused on only one or a subset of the orders and as a consequence an employees’ contextual depth narrows. But as we previously argued, a low level of functional concentration is still preferred above a high level of functional concentration, because then the search becomes more focused and structured. The parameters specialization and differentiation of operational transformations also influence this factor. If parameter values are high, an employee’s view is being narrowed, because an employee then contributes to only a part of the operational process. This narrow view can be problematic for idea generation, because in this search employees find the ‘raw material’ for novel ideas.

Especially with regards to the production flow BigStep the organizational structure negatively influences the contextual depth of employees. The parameters specialization and differentiation are too high and hinder idea generation within the organization. The argument we used for the factor process and product insight also applied for contextual depth. By splitting the operational process, employees are only part of a part of the operational process and their view is narrowed.

4.3.5 (Cross-) functional contact

When employees are exposed to people and issues in other organizational units of the organization, idea generation is stimulated (Birkinshaw & Hill, 2007), as they come into contact with new information, knowledge, ideas and values (Zhou & George, 2001). This is also called cross-functional contact.

An organizational structure determines with whom cooperation and coordination is required. Therefore, an organizational structure determines the extent to which an employee comes into contact with other experts. Mainly the parameters related to the production structure influence the degree of internal company stimuli. The structural parameters functional concentration, differentiation and specialization of operational transformations determine the extent to which cross-functional contact can take place.

Within departments the interactions are strong within STAP HR: thoughts are shared, problems are solved together and tasks can be taken over. As a payroll administrator illustrated: ‘‘That is indeed just thinking out loud and then you automatically get feedback from colleagues, especially the manager:

well that is something or we should see that or well do not do that. You will get that right away'' (T3). Some degree of specialization of operational transformation is desired, because by sparring with colleagues with the same function, you can come up with improvements, incremental ideas. For example, the software development department has meetings in which ideas are shared: ''Then we look at what is possible? How could we do it differently? Are there other types of solutions? People come up with, depending on experience, other possibilities'' (manager software development, T8).

However, cross-pollination is not very common. As a result of functional concentration, specialization and differentiation of operational transformations there is little cooperation between functional departments. Each functional department has its own goals and resources. Some cross-functional contact is present, but this is mainly problem-steered: ''A customer calls me with a question about how to register leave in SmallStep. I don't know exactly. So then I connect to support [customer service] and then I ask if they want to arrange that'' (payroll administrator, T2). Due to the small size of the company people can easily reach out to each other, coordinate and ask for help, but departments operate merely individually.

A while ago the CEO introduced a newsletter, because he noticed that employees were not aware of what is going on in other departments. ''Every week there is a newsletter from a department. […] In this way, everyone gains insight into what a department does and what they are currently busy with (payroll administrator, T3). This newsletter was a good first step, but for creating more synergy between experts a new organizational structure is needed in which the degree of functional concentration, specialization and differentiation of operational transformations is low. By means of a redesign the right conditions in which thoughts from different experts cross each other on a regular basis can be created.

4. Results design

In this second part of the results a redesign of the organizational structure is presented. First, a summary is given of the most important results of the diagnosis that have to be taken into account in the design. Then, based on the six design steps (de Sitter, 1998) and the results of the focus group redesign of the organizational structure of STAP HR is created.

Input from organizational members is of high importance for a successful redesign, because they have valuable insights into the current organizational processes and can estimate the consequences of potential interventions. Also, because of the social character of organizations, it is important to not only focus on developing a new organizational structure, but also make sure that employees will eventually integrate the new way of working (Achterbergh & Vriens, 2019). By already involving organizational members in the redesign process, a good basis is created for the integration process (Achterbergh & Vriens, 2019). A focus group was therefore organized in which five employees participated. Due to time constraints and long fruitful discussions only the macro/meso level of the organization was discussed. In line with the integral approach used in the diagnosis, the object of the redesign is STAP HR as a whole.

4.4 Summary diagnosis

Mainly the structural parameters related to the production structure hinder idea generation at STAP HR. Specialization and differentiation of operational transformations limit the horizon and range of stimuli of employees. In the new design a low level of functional concentration first limits the horizon of employees, but brings focus and overview. From there it is important to design for cross-functional cooperation, broad tasks that provide insight into the process and product, conditions that allow the spread of customer insight, and increasing contextual depth. These four design specifications mainly concern the production flow BigStep, because they are already present for the production flows SmallStep and the HR service.

Problem solving possibilities are also of importance for idea generation and can be improved within STAP HR. Employees have regulatory power over the operational process that they contribute to .The degree of separation and differentiation of regulatory transformations is generally low, but because problem solving does not happen across functional departments, this is still problematic for idea generation. This is merely the result of the way the production structure is designed.

4.5 Building an organizational structure

4.5.1 Production structure

Macro/meso. Just as it is now, we parallelized the organization on the macro level by product type. Several alternatives were developed (by size of customers, business sector, product combinations, complexity), but by parallelization on product type the macro-flows could operate most independently from each other. The orders of STAP HR can be typified as semi-heterogeneous. Even though STAP HR offers a relatively small number of products and services, the activities needed to realize an order can highly differentiate. The products SmallStep and BigStep seem to have similar operational transformational processes. However, in terms of variety, predictability and size the two HR systems highly differ. Where SmallStep customers are more or less similar and ask for a standardized approach, BigStep customers are unpredictable, ask for customization and project sizes vary a lot. Because of these differences the two products are assigned to different macro flows. Because the operational process of the order HR service is very different from the other two, a third macro-flow is designed.

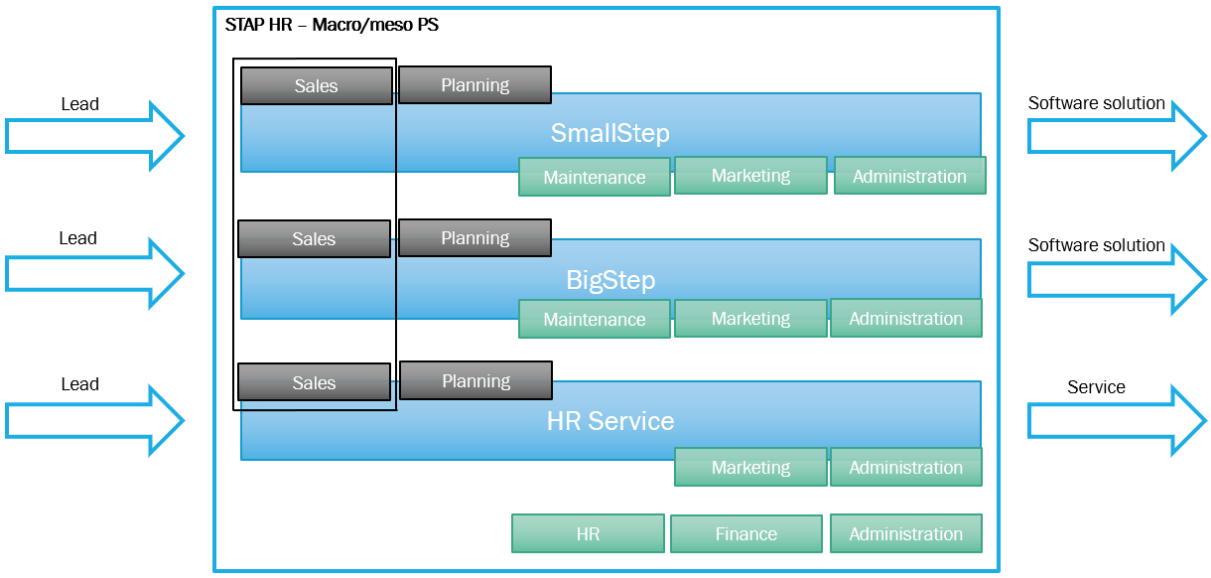
In the interviews and focus group it became clear that based on the degree of complexity of the customer's request more or less people were involved in the production process of BigStep During the focus group an alternative was presented where the macro flow BigStep was divided in two meso flows: a 'BigStep basic' and a 'BigStep complex' flow. The respondents recognized this alternative: ''These teams already exist [informally] without being fixed [formally]'' (HR manager, appendix F). Therefore, we delved into the possibilities of this design. We concluded that it is not desirable to parallelize on the meso level, because no good criteria can be formulated to distinguish the flows from one another: when is a customer 'basic'' and when 'complex'? The degree of customization of the system could be used as a criterium, however the question arises at what percentage to cut the line and whether this distinction is relevant. For example, for customers who ask for 50% customization the degree of variety, predictability and size can still highly vary. One can also divide the flows based on the people who have to be involved in the process. However, no best cut can be made and an unequal occupation would result. For example, for customization of the software one can change the current software or create something new. For the creation of new software development has be involved, however most of the time it is sufficient that customer service changes the software. Another example is that the CEO and a technical expert (part of the customer service and development departments) are involved with complex customer requests. However, they are mainly involved in the sales process and for the rest the operational process is the same for the two flows. Also, complexity increases when customers purchase product combinations. Then, specialist have to be brought together in the sales and implementation process. However, the degree of involvement of these specialists can be minimal. Also, customers often decide later in the process or after implementation to add additional extra's or services, which would create interactions between the flows. On top of that, the team responsible for BigStep currently exists of 13 employees (excluded payroll and CEO), which is a good team size. To sum up, one can find some leads

for meso flows. Some criteria lead to too much internal interactions between flows, where other criteria are not able to distinguish the two flows enough. Therefore, we decided to not parallelize on the meso level and thus the meso level equals the macro level.

Figure 4 visualizes the design of the production structure on the macro/meso level. With regards to the preparatory activity sales a link is made between the macro flows, because the two systems are closely related and a customer must be sold the right system. Moreover, the products and the HR service complement each other well and can generate customers for one another.

Figure 4

Redesign macro/meso production structure STAP HR



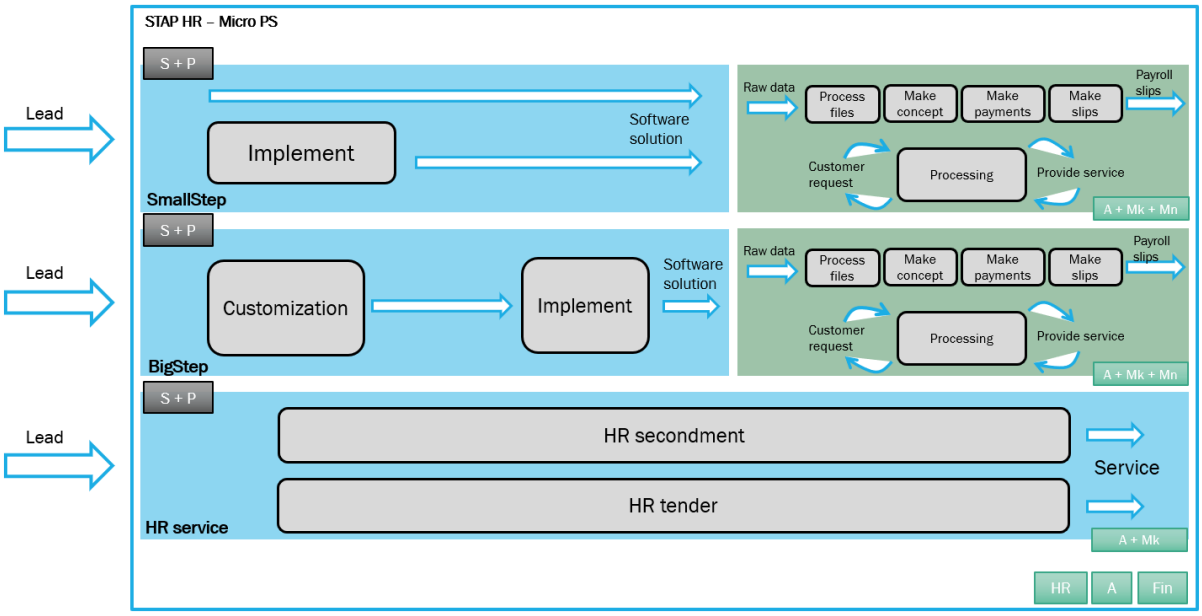
Each macro flow is responsible for the operational transformation of the product or service, thus all necessary preparatory, making and supporting activities are included. In that way, a team has complete oversight over the process and the product. Administration is important to deal with exceptional customers and customers who purchase both a system and the HR service. Administration can serve as a link between macro flows when customers deal with multiple macro flows. For example, when an SmallStep customer wants to transfer to BigStep customer information can be shared easily internally. Therefore, administration should be on both the organizational and macro flow level.

Micro. Figure 5 illustrates the design of the production structure on the micro level. One team is assigned to each order flow. Team sizes are not equal as the number and size of client are larger for BigStep The size of a team corresponds with the capacity needed for a flow. The organizational processes in each production flow are visualized in a static manner. By using colours more or less one-off processes (blue) are distinguished from ongoing processes (green). Organizational processes that are presented in the blue area are finished after a certain amount of time, where organizational processes in the green area

are recurring. This distinction is made, because the nature of these processes differs and ask for different design specifications.

Figure 5

Rede*sign micro production structure STAP HR*



We want to highlight two elements of the visualization of the redesign. First, the ongoing processes consist of the processes needed for the realization of the payroll service and providing support and service. The organizational processes account management, after sales and customer support are integrated into one box, because often interaction takes place between these activities. Contact can be established in two ways: the customer reaches out or STAP HR contacts the customer. When contact is established, often multiple activities take place. For example, when a customer has a specific question employees often do not only answer that question, but also ask further (account management) and stay alert to sell extra's. Second, SmallStep customers can choose to implement and install the system themselves and in that case the making activities comprise the ongoing processes only. Therefore, arrows are used to visualize the two different paths orders can take.

4.5.2 Model microstructure

We want to delve deeper into the internal structure of the teams. All operational activities, except for planning and administration, ask for specialist knowledge, skills and experience for a good performance. The ideal types the collegiate model (Kuipers et al., 2010, p. 364) and the overlap model (Kuipers et al., 2010, p. 366) are taken as the starting point for the microstructure, because these models are aimed at structures in which the deployment of several specialists is required to realize an order.

For the design on the micro level several results from the diagnosis must be taken into account. The diagnosis pointed to the problem that there is little cross-functional cooperation, while it could be a

source for idea generation. In the new design contact between specialists in a team is stimulated by creating broad tasks, task redundancy and learning opportunities. By creating task overlap, product and process insight are increased and employees recognize their contribution to the whole.

To realize this, three layers (junior, medior and senior) are created within a team, based on a master and apprentice relationship. The seniors are multi-deployable and have oversight over the whole process. The senior ensures that the contributions of the specialists are closely coordinated. Juniors, on the contrary, mainly perform tasks in their area of expertise. Mediors have broadened their tasks and view and are multi-deployable in some areas. By creating this learning path, employees are continuously challenged by giving them an increasingly broader perspective. This concept is not applicable to the HR service team, while it currently contains only 2FTE.

Where development and payroll employees currently work for both products, in the new design employees contribute to one product. Even though payroll employees did not experience problems with switching between the input from the HR systems, for the creation of a strong team full commitment is necessary. Development employees generally work for one product, but still have to be deployable for both HR systems, because some development projects require multiple developers.

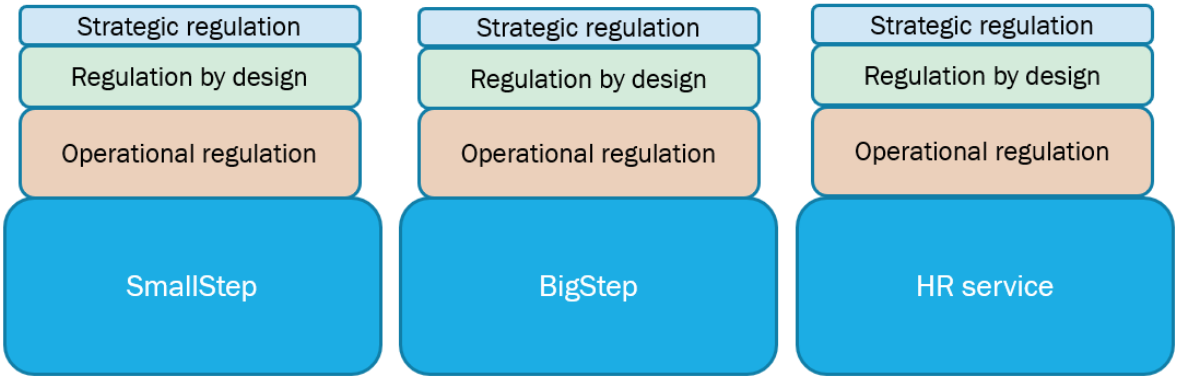
4.5.3 Control structure

Micro. Figure 6 visualizes the control structure on the micro level. All operational regulation required for the day-to-day management of the preparatory, making and supporting tasks is placed within the teams, so that problem solving can be done by the employees themselves. In the current structure employees also have much operational regulation power. However, due to the specialization of regulatory activities and the way operational transformations are assigned to tasks, problems are solved by a group of the same specialists. To stimulate creativity and out-of-the-box problem solving different perspectives have to be brought together. The new design of the production structure ensures cooperation between specialists and conditions are created that problems can be solved within this team of different specialists. The senior and mediors have a coordinating role and act as the external point of contact of the team in a rotating manner.

The same construction is used for regulation by design and strategic regulation: as much as possible is accommodated in the teams. Mainly the seniors are busy with strategic regulation and they involve the mediors in this process.

Figure 6

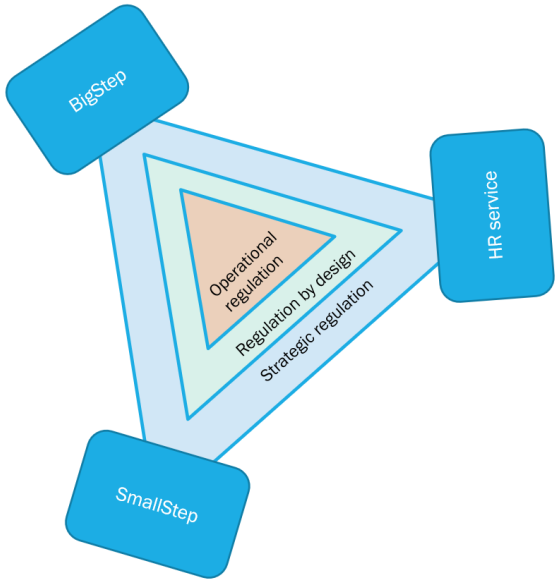
Redesign micro control structure STAP HR



Meso/macro. The design of the macro/meso control structure of STAP HR is based on the star model as explained by Kuipers, van Amelsvoort and Kramer (2012, p. 363). The star model is an ideal type for the microstructure of the production structure. It is a model that brings people from different teams (corners of the star) together (in the middle) to create synergy. This principle can also be used on other levels. In the case of STAP HR, the star model can be used to create synergy between the three production flows (see figure 7).

Figure 7

Redesign macro/meso control structure STAP HR



For all regulation activities that cross production flows the external point of contact of the teams (seniors and mediors) come together. With regards to operational regulation, an example is when an SmallStep customer wants to switch to BigStep With regards to regulation by design it is important to create synergy to share learning points across production flows. The production flows SmallStep and BigStep contain more or less the same activities and can therefore share best practices. For example, when in the

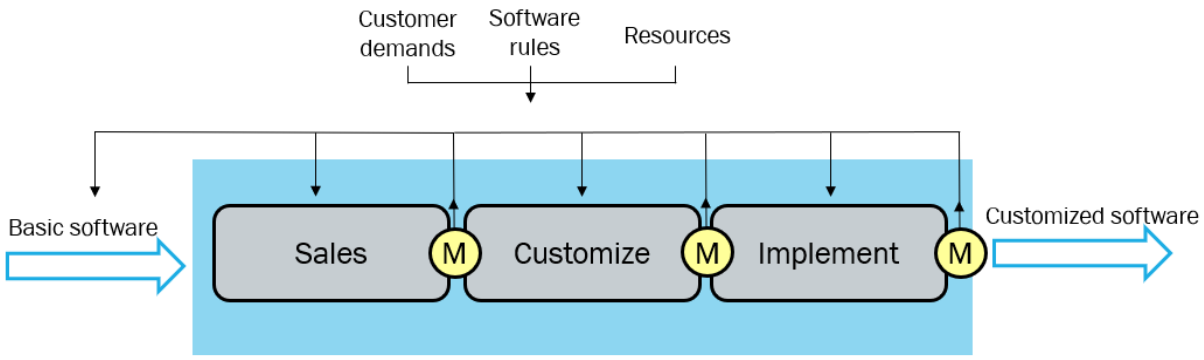
production flow BigStep a way to automize a part of the process is developed, it is important to share this internally. For strategic regulation it is important that contact persons from the three flows come together to align goals and determine the direction of the organization as a whole.

4.5.4 How does it all come together?

The previous illustrations and descriptions of the redesign represented the new organizational structure in a static manner. However, idea generation is a dynamic process. To highlight how the redesign facilitates idea generation we need to look at organizational processes from a different angle. Figure 8 presents a BigStep order as a project: the input is the basic software and the project is finished when the software is customized and implemented according to customer demands. The success factors that have to be taken into account during the project are customer demands, software rules (what is possible and what is not) and resources (knowledge, time, budget etc.).

Figure 8

Dynamic organizational processes showing idea generation loops



By using a project-based approach the dynamic organizational processes emerge. The yellow circles are checkpoints where it is measured whether the project is still in line with the success factors. As a result of these checkpoints feedback loops are created. Figure 8 shows how stimulating organizational conditions for idea generation are realized in the new redesign. First of all, because one team is responsible for the whole production flow, cross-functional problem solving conditions are created. In the current structure at STAP HR the teams also have much operational regulation power, however, problem solving is done within teams consisting of the same specialists. In other words, the feedback loops are separated and assigned to different tasks. To stimulate creativity and out-of-the-box thinking, the problem solving process now takes place within a team of different specialists and is illustrated in the feedback loops. On top of that, insights into the product, processes and customer is created. Employees are part of a team that is responsible for the realization of an complete order and because of that they have insight into the input, output, the processes and success factors. The feedback loops are not only activated when problems are encountered, but also when ideas arise for improvements or radical new products. For example, during the implementation an employee finds an improvement to

the basic software which eases the implementation. From there, the idea can be discussed in the group where different perspectives can shed light on the usefulness of the improvement. Because oversight over the whole process and product is present within the team the consequences of the possible improvement can be estimated.

5. Conclusion

The ability to generate product innovations is critical for software companies. The starting point of this research was the question of the software firm STAP HR on how to stimulate innovation. This research contributed to this problem in two ways: by means of a diagnosis and design. First, insight into how the current organizational structure influences idea generation by employees was provided. Second, to ease the application of the results a redesign of the organizational structure was developed in which stimulating conditions for idea generation were incorporated.

Employees mainly generated incremental product ideas related to the product and process that they directly contribute to. The relationship between the organizational structure at STAP HR and idea generation was explained via five factors: customer insights, process and product insights, problem solving, contextual depth and cross-functional contact. Mainly the design of the production structure was hindering idea generation, by narrowing an employee's view, reducing the range of stimuli and hindering interaction between specialists.

As a result of the differentiation of preparing, making and supporting activities and specialization of operational transformations, employees lacked (complete) insight into customer needs, products and processes. Especially for the generation of incremental ideas a good understanding of the current product and operational processes seems important, because from here improvements can be found. Insight into how customers use and perceive the HR system can guide these improvements. The differentiation and specialization of operational activities also resulted in a lack of cross-functional cooperation, so that employees were not exposed to different ideas and perspectives much. In line with this, regulatory transformations were specialized and resulted in that employees did not look beyond the operational process part that they contribute to and product and process oversight lacked. The departments dealt with their own problems and did not involve others in this process, while cross-functional problem solving can stimulate creativity by bringing together different views.

In the redesign three production flows were created, based on the three product types of STAP HR: SmallStep, BigStep and the HR service. To ensure product and process oversight one team is responsible for a whole production flow and includes preparing, making and supporting activities as much as possible. A team consists of different specialists and close cooperation is needed for the successful realization of the product. On the micro level, master and apprentice relationships were created to continuously challenge employees and to create job overlap. The control structure was designed in a such a way that the masters (seniors) of each production flow cooperate to create synergy between the production flows. Because these masters see the big picture they are more likely to generate radical ideas.

A strong connection between an organizational structure and idea generation by employees was found. Therefore, to be able to increase the utilization of the talents and creativity of its employees STAP HR could use this variable to its advantage.

6. Discussion and limitations

The findings highlight a number of practical and theoretical implications worthy of exploration. This section respectively examines the practical implications, the theoretical implications and limitations.

6.1 Practical implications

Efforts have been made to develop practical insights and tools for STAP HR. The interviews and focus group have already realized the first step towards change by making people think about their way of working in relation to idea generation.

Three recommendations for STAP HR:

1. *Continue the intervention cycle with a dedicated team.* The first two steps towards change have been taken (diagnosis and design). We recommend to appoint a team that continues this path towards an organizational structure that creates the right conditions for idea generation. This change team should continue the design phase and use input from organizational members. The same team is also responsible for the implementation and evaluation of the intervention. We recommend composing the team from the invitees of the focus group, because they are already familiar with the topic and so that a diverse set of team members is created.

2. *Use the five factors as a guide and quick scan*. The five factors (customer insights, process and product insights, problem solving, contextual depth, cross-functional contact) should be used as a guideline during the intervention: what does the desired level of these factors mean in practice? The factors could also be used in the form of a quick scan: where are we currently and are we still on the right track?

3. *Delve into other stages of the innovation generation process.* Idea generation is the first stage of the innovation generation process and for a successful realization of innovation capabilities we recommend to also create intervention teams around the later stages. To keep oversight and focus, only one stage at the time should be the object of change. Team members can already inform themselves about the next stages to ensure a connection between the different stages.

Other practitioners mostly relevant to this study include those who run or work in small and medium-sized software firms. The study findings suggest that by redesigning the organizational structure conditions that facilitate idea generation can be created. Organizations wishing to promote product innovation need to recognize and take advantage of the connection between the organizational structure and idea generation. The five factors that explain the relationship (customer insights, process and product insights, problem solving, contextual depth, cross-functional contact) offer practical tools to get started. Caution must be taken by directly applying the results to other organizations. The results of the

diagnosis and design are organization-specific and should only be used as inspiration and as starting point for other small and medium-sized software firms. Because the nature of operational processes of software firms differs significantly from other firms the findings cannot be applied to other industries. In addition, this study confirms the view that employees are valuable for generating innovation, because they can provide valuable input into the idea generation process. We want to encourage practitioners to find ways to utilize the talents and knowledge of employees.

6.2 Theoretical implications

Despite the practice-oriented nature of this research, there are also implications for theory. Theoretical contributions are made to STSD, idea generation and product innovation literature. This research analytically refined STSD theory by providing fresh empirical evidence of an application to a knowledge-intensive context. Specifically, we learned that the parameters as described by de Sitter (1998) are useful in a software context. On top of that, we specified de Sitter's outcome variable innovation by taking a process-based approach to product innovation. The stages in the innovation generation process are supported by different organizational conditions. This research made a first contribution to gaining a deeper understanding of the relationship between organizational structure and the first stage idea generation. For the refinement of STSD more research should be conducted on the different stages and the relationship with organizational structure. The challenge is then to develop normative guidelines on how an organization should be organized so that the right conditions are present of can be created for all stages in the innovation generation process.

This research contributes to several streams of literature that have taken a process-oriented approach to studying innovation (Adams et al., 2006; Alves et al., 2007; Khurana & Rosenthal, 1998; P. Robbins & O' Gorman, 2015). Specifically, this research adds to a recent literature stream which aims to gain a deeper understanding into the innovation generation process by focusing on individual stages (Hansen & Birkinshaw, 2007; Keum & See, 2017; Pichlak, 2015). Our findings highlight how an organizational structure plays an important role in bringing thoughts together (de Sitter, 1998) and facilitating idea generation. This research provided first insights into this relationship and proved it to be of interest for further research.

We recommend incorporating insights from network theory into this discussion. Recent literature already proved network theory to be of interest for idea generation (Maitlo et al., 2020; Mannucci & Perry-Smith, 2021; van Osch & Bulgurcu, 2020). Especially with regards to the link between organizational structure and idea generation network theory could deepen our understanding of the idea generation process and its determinants, because these concepts are all about bringing people together. Our discussion was dedicated to the formal organizational structure or formal network. Authors highlight the importance of the informal network for innovation (Allen & Cohen, 1969; Khurana & Rosenthal, 1997; Reinertsen & Smith, 1991; Taminiau et al., 2007). Future research can expand our

knowledge by studying the impact of the formal and informal organizational structure on the stages of innovation generation process in conjunction.

6.3 Limitations

The study must be viewed in light of its limitations. We focus on three limitations that we consider most serious, discussing their immediate implications for future research. First of all, a selective memory bias is likely to be present, because the research relied on self-reported data (Hammersley, 1994). The generation of ideas can be seen as a personal, cognitive process (Valacich et al., 2006) and therefore we felt that a self-report methodology was largely unavoidable. After the interviews most employees stated they found it hard to come up with examples of product ideas they generated. Respondents could more easily memorize ideas that were already at a further stage in the innovation generation process. Most examples of product ideas had already been investigated or implemented. Therefore, it seems like people found it hard to memorize ideas that have crossed their mind. We recommend future research to use data collection methods that minimize the time between when an idea crosses the mind of an employee and the reporting of that idea. In addition, data should be collected over a longer period of time, so that the data consists only of ideas that are written down almost immediately, instead of depending on the respondents memory. For example, respondents can be asked to note all ideas that cross their minds for a certain period of time.

Second, based on the data a relationship between organizational structure and idea generation is found, however, this research cannot make any statements about the strength of this relationship and how it relates to other organizational factors. Other organizational factors might be as important as or more important than an organizational structure for stimulating idea generation. The data already showed other factors that might influence idea generation by employees: e. g. safe environment, open to suggestions, culture. Changing the organizational structure requires a lot of effort from an organization and for that reason the results have to outweigh this. We encourage researchers to increase our understanding of the relationship between multiple organizational factors and idea generation by conducting a quantitative study. By means of a regression analysis insights can be given into relative importance of organizational factors for the idea generation stage.

Lastly, the researcher may have been biased due to the personal relationship (father-daughter) with the payroll service manager. Because of this close relationship, the researcher was likely to be biased and more likely to adopt that manager's opinion and perspective than of other organizational members. Also, the researcher did not share the managers' view on employees and was eager to prove otherwise in the study. To minimize this effect results were discussed in the first focus group to make sure that other participants can also represent their perspective. By means of this discussion a common idea on the results of the diagnosis was developed, which reduced the influence of the researchers bias.

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Appendices

Appendix A Operationalization idea generation for product innovation

Characteristics ideas

Dimension	Indicator
Economic potential: The potential of an idea to create a new source of economic gain for the organization.	Continuous improvement: The idea does not have the potential for the creation of an economic gain for the organization, but the idea is to continuously improve existing products. Idea for innovation: The idea has the potential to create a new source of economic gain for the organization.
Innovation type: The object of innovation: what is being innovated?	Process: Ideas related to innovating organizational processes. Product: Ideas related to innovating products, services or product-service combinations.
Novelty: The degree of novelty of ideas for innovation.	Incremental: The prospect of applying new knowledge, or applying knowledge in a novel manner to make marginal improvements to existing products, services or product-service combinations, such that a new source of economic gain may be realized. Radical: The prospect of applying new knowledge, or applying knowledge in a novel manner to products, services or product-service combinations that differ significantly from the current portfolio, such that a new source of economic gain may be realized.
Volume: The amount of ideas generated.	

Idea generation stimuli

Dimension	Indicator
Breadth of cognitive context: The range of stimuli to which employees are exposed through their role(s) within their organization.	Internal company stimuli: Employees are exposed to people and issues in other organizational units of the company through their role(s) within their organization. Industry stimuli: Employees are exposed to people and issues in other industries through their role(s) within their organization. Functional breadth: The extent to which a job crosses disciplinary boundaries. Also: An individual's diversity of working experience in other functional areas within the organization. External stimuli: Employees get in contact with customers, suppliers, lead users and competitors through their role(s) within their organization.
Contextual breadth: The range of stimuli outside of an individual's immediate domain.	
Contextual depth: The extent to which search (active scanning or passive attention) extends beyond local search within the boundaries of a given knowledge field.	

Dimension/Design parameters	*Description of parameter*	*Indicator*	*Indicator for a problematic high value*
Functional concentration	Degree to which operational tasks are related to all (external/internal) orders	Average number of external order types per operational task. Average number of internal order types per operational task. Tasks of the same type are concentrated into specialized departments, where they are performed with respect to (potentially) all orders.	○ Employee is having problems switching between orders. ○ Employee cannot give individual orders the attention they need. ○ Employee has no oversight over orders. ○ Strong functionalist cultures. ○ Employee is part of a functional department, with similar specialists. ○ Employee experiences a language barrier between departments.
Differentiation of operational transformations	Degree to which making, preparation, and support activities are assigned to different tasks	Number of tasks dedicated to making, to support, and to preparation. Number of preparatory or support activities which are not part of operational tasks. Number of dependency relations in the network of operational tasks	○ The support en prepare activities do not match the specific needs of the make activities. ○ Support, making and preparing activities are coupled by means of procedures and rules. ○ Employee experiences delays due to long time to solve problems related to the split between the three operational activities. ○ Lack of process oversight.
Specialization of operational transformations	Degree to which operational activities are split up into tasks covering only a small part of the operational process. The number of different occupational types or job titles among organizational members	Number of sequentially coupled tasks in operational process. Average cycle time per operational task. Number of dependency relations in the network of operational tasks. Number of different job titles.	○ Employee is for carrying out tasks dependent on others, whereby a problem in one of them will delay and/or cause other problems in subsequent tasks and/or the final output. ○ Employee does not cooperate much with colleagues within own department. They share the same workspace, breaks, etc., but in the workflow they are separate from each other. ○ Colleagues cannot easily take over tasks in case of absence. ○ The employee experiences a lot of repetition in the tasks. ○ High need for coordination by management. ○ Lack of overview over process.

Dimension/Design parameters	*Description of parameter*	*Indicator*	○ *Indicator for a problematic high value*
Separation between operational and regulatory transformations	Degree to which regulatory and operational activities are assigned to different tasks	Number of hierarchical layers. Number of operational tasks without regulatory possibility to solve own problems. Scores of operational employees with respect to the question whether they have the regulatory potential to deal with their operational problems.	○ In case of problems, employee has to go to someone else for a solution. ○ Lack of a reliable, complete and up-to-date insight into the process. ○ Employee feels like responses to problems are not adequate and on time. ○ Employee cannot experiment within own job.
Differentiation of regulatory transformations into aspects	Degree to which 'strategic regulation', regulation by design', and 'operational regulation' are assigned to different tasks	Number of tasks dedicated to strategic regulation, to design regulation, and to operational regulation.	○ Employee cannot set and reset goals for their work. ○ Employee cannot design and redesign the infrastructure of their work. ○ Employee cannot deal with day-to-day disturbances in carrying out operational tasks (given the existing goals and infrastructure). ○ Employee does not feel in control of the job.
Differentiation of regulatory transformations into parts	Degree to which regulatory activities 'monitoring', 'assessing', and 'intervening' are assigned to different tasks	Number of tasks dedicated to monitoring, to assessing, and to intervening.	○ Learning curve is not integrated into employee's job.
Specialization of regulatory transformations	Degree to which regulatory activities have only small regulatory scope (i.e. cover only a small part of the operational process, or only a small set of other regulatory tasks)	Number of regulatory tasks.	○ Employee is only responsible for the regulation of a small part of the operational process. ○ Employee is only responsible for the regulation of separate aspect-systems (product quality, maintenance) ○ Object of regulation contains only small part of the operational process. ○ Loss of oversight over process and product. ○ Tasks are narrow, repetitive and lack variety.

Appendix C Interview guide

a. Zou u een korte omschrijving kunnen geven van uw functie binnen het bedrijf?
b. Van welk team maakt u onderdeel uit? Waar is uw team verantwoordelijk voor?
    a. Aantal medewerkers, verdeling van taken/functies
c. Aan welke producten en/of services van BigStep levert uw team een bijdrage en op welke manier? Kunt u deze producten en/of services kort omschrijven?

Een innovatie begint altijd met een idee. In dit interview wil ik het hebben over ideeën voor verbeteringen van bestaande producten en services en voor nieuwe producten en services. Voorbeelden: het integreren van een nieuwe functie in bestaande software, de lay-out van bestaande apps aanpassen naar behoefte van de klant en een nieuwe app ontwikkelen en lanceren. Ook (kleine) verbeteringen vallen dus onder de term innovatie.

a. Heeft u weleens ideeën voor het verbeteren van de huidige producten en services van BigStep of voor nieuwe producten of services voor BigStep? U hoeft de ideeën nog niet met anderen te hebben gedeeld.
    a. Aantal in de afgelopen 6 maanden
b. Zou u een aantal van deze ideeën kunnen toelichten?
    a. Radicaal of incrementeel
c. Hoe kwam u op deze ideeën?
    a. Interne stimuli
    b. Externe stimuli
d. Hoe wordt u binnen BigStep wel of niet gestimuleerd om nieuwe ideeën voor producten of services te bedenken of voor verbeteringen van de huidige producten en services?
    a. Formele programma's
    b. Facilitatie van idea generation
    c. Onderdeel van dagelijkse werkzaamheden
e. In hoeverre vindt u het belangrijk om ideeën voor verbeteringen of nieuwe producten en services te bedenken? Waarom wel of niet?
    a. Betrokkenheid bij eigen werk
    b. Betrokkenheid van organisatie
f. Hoe zou u meer gestimuleerd kunnen worden om ideeën voor verbeteringen of nieuwe producten en services te bedenken? Wat zou BigStep volgens u kunnen doen?

Externe and interne stimuli

a. Met wie werkt u nauw samen? Van welke afdeling/team maken zij deel uit?
    a. Afhankelijkheden input en output

b. Hoe brengen deze contacten u wel of niet op nieuwe ideeën voor verbeteringen of nieuwe producten en services voor BigStep?
c. Heeft u voor uw werk regelmatig contact met mensen buiten de organisatie? Zoals klanten of andere bedrijven? Met wie? Waartoe dient dit contact?
d. Hoe brengen deze contact u wel of niet op nieuwe ideeën voor verbeteringen of nieuwe producten en services voor BigStep?
e. Kunnen problemen waar u of uw collega's in uw team tegenaan lopen vaak binnen uw team worden opgelost? Kunt u beschrijven hoe dit gaat?
f. In hoeverre wordt u betrokken bij besluitvorming over uw team en de organisatie? Bijvoorbeeld de doelen, de werkzaamheden en de werkwijze.

Appendix D Focus group guide

1. Welkom
    a. Welkom en bedanken voor deelname.
    b. Toestemming opname.
    c. Agenda: inleiding, resultaten diagnose, discussie resultaten, herontwerp, afsluiting
2. Inleiding
    a. Korte introductie van het onderwerp. De relatie tussen organisatiestructuur, innovatie en idea generation uitleggen.
    b. Benadrukken dat het gaat om idea generation door medewerkers. Hoe kunnen we de medewerkers stimuleren om ideeën te bedenken?
3. Resultaten diagnose
    a. Aantal interviews en kanttekeningen.
    b. Weergave huidige organisatieprocessen. Is dit juist?
    c. Aantal punten uitlichten. Alvast kort iets zeggen over de hoeveelheid interne interacties.
    d. Ideeën creatie: kort overzicht van de resultaten.
    e. Stimuli ideeën: kort overzicht van de resultaten.
    f. Resultaten samenvatten, de relatie tussen structuur en idea generation: dichterbij de klant, samenwerking tussen disciplines, proces overzicht, synergie tussen systemen en services.
4. Herontwerp
    a. Korte toelichting STSD: gaat om creëren onafhankelijke stromen. Interne interacties tussen stromen verminderen, binnen stromen sterke samenwerking.
    b. Voorbeeld/warming-up. Laat de deelnemers nadenken en discussiëren over de klant die de meeste interne interacties veroorzaakt.
    c. Gewenste situatie m.b.t. idea generation en structuur in kaart brengen.
    d. Korte uitleg macro productiestructuur ontwerp.
    e. Presenteren en bediscussiëren van 3 alternatieven macro productiestructuur.
    f. Korte uitleg meso productiestructuur ontwerp.
    g. Bediscussieren meso productiestructuur ontwerp a.d.v uitkomst macro ontwerp.
5. Afsluiting
    a. Bedanken voor deelname.
    b. Uitleggen verder verloop: mogelijkheid tot feedback op uitwerking.