Employee creativity and innovation activity

– a case study of Sunnaas University Hospital

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Abstract

Background: The healthcare sector is facing challenges to meet growing demand with limited resources. There is a widely held belief that innovation is the key to solve the challenges ahead. However, research on healthcare innovation insofar has almost exclusively focused on the organizational level – black-boxing the inner workings of the innovation process. Individual creativity is an essential prerequisite for innovation; thus, we cannot fully understand hospital innovation without accounting for individual creativity.

Purpose: In this thesis, I present a novel approach to how research from the field of psychology on individual creativity can be combined with established theories of organizational innovation to further our understanding of hospital innovation. The purpose of the study is to investigate how individual creative confidence relates to other factors of the organization's innovation capabilities, work environment, and innovation activity.

Methodology: A cross-sectional quantitative self-report survey was conducted among employees at Norway's largest specialist hospital in physical medicine and rehabilitation, Sunnaas (n = 161). The data was analyzed using several techniques such as hypothesis tests, one-way analysis of variance, and linear and multiple regression models.

Findings: My analysis finds a significant positive relationship between creative confidence, having R&D as a work requirement, and knowledge of routines for submitting ideas. Moreover, I found indications that well-established measures for assessing the work environment are subject to mediation by factors not included in previous studies.

Implications: My findings suggest that the previously overlooked factor of individual creativity may have a much more significant impact on hospital innovation than prior research implies. I propose that changing the hiring processes in hospitals to account for creative potential is warranted. Moreover, hospital managers are advised to incorporate innovation activities, such as submitting ideas, as a work requirement and engage the entire organization in its innovation efforts. Particular attention should be paid towards employees outside the R&D department that are less naturally exposed to the organization's innovation goals and established routines.

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1 Introduction

Securing good health and well-being is on the list of UN's sustainability goals and one of the grand challenges of our time. An aging population, new disease patterns, and ever-increasing expectations for the quality of life are putting our health care system under pressure (Dias & Escoval, 2015). From a global perspective, health care is an essential component in the fight to reduce poverty and raise living standards in the third world. The fragility and interconnectedness of the national and global health care system became particularly evident during the COVID-19 pandemic. 2020 has arguably been one of the most powerful demonstrations of our dependence on healthcare innovation in human history. It is a widely held belief that innovation is the key to overcome the challenges ahead and to meet the growing demand with limited resources (García-Goñi et al., 2007; Patterson & Zibarras, 2017). For these very reasons, innovation is high on the political agenda both internationally and domestically.

Developing competence and a culture for innovation in the public sector is singled out by the Norwegian government as a top priority for the years to come (Kommunal- og moderniseringsdepartementet, 2020). The healthcare sector is highlighted as an area where innovation will be essential due to the steep increase in demand for health services, while at the same time, government revenue from the oil and gas industry is expected to decline.

Research on healthcare innovation has been surging in recent years (Länsisalmi et al., 2006; Thune & Mina, 2016). However, there are still important areas not sufficiently covered by existing research. Two independent literature reviews have revealed prior research on healthcare innovation to focus mainly on the organizational level (Länsisalmi et al., 2006; Thune & Mina, 2016). Only a small collection of studies has investigated individuals' contribution to innovation, and next to none have accounted for individual prerequisites. This one-sided focus may potentially blindside us from important influences originating from the individual level. In fact, the organizational innovation process is believed to be inextricably linked to several individual traits (Amabile & Pratt, 2016, s. 160; Woodman et al., 1993, s. 294). Innovation is often stated as the successful implementation of ideas (Amabile, 1997; Shalley et al., 2004). However, generating ideas requires creativity – which is an inherently

individual trait. As such, creativity is a prerequisite for innovation (Runco et al., 2017b). Innovation can therefore not be fully understood without accounting for creativity.

Within the hospital innovation literature, creativity is a vastly under-researched topic. In the broader field of organizational research, efforts have been made to explore how the work environment affects the employees' engagement with creativity (Amabile & Coon, 1996; Woodman et al., 1993). However, this research tends to focus exclusively on contextual influences (Paulus & Nijstad, 2019, s. 7). Neither research on healthcare innovation in particular, nor organizational creativity research, properly account for individual creative predispositions or abilities. Put bluntly, most existing research explains "how to make the best of the employees you have" but fails to account for the fact that employees have individual prerequisites for creativity in the first place.

Excluding individual-level differences as a factor in innovation studies is highly problematic because, in effect, it black-boxes one of the main influences of the very process we investigate. The innovation literature acknowledges that novelty is part of the solution but does not provide an explanation of how it occurs. To investigate the inner workings of healthcare innovation, I therefore suggest we look to the psychology literature.

Within psychology, there is an extensive body of research specifically concerned with individual creativity, understanding the sources of novelty, creative prerequisites, what motivates creativity, and the processes involved (Glăveanu & Kaufman, 2019). Furthermore, a flourishing stream of research has investigated how individual creativity can be measured (Plucker et al., 2019). Despite the tight interconnectedness between creativity and innovation, research from the fields of innovation, organizational creativity, and individual creativity remains to a large degree disconnected. This is unfortunate because individual creativity research is particularly concerned with the missing pieces of the innovation puzzle.

In my opinion, research on healthcare innovation, organizational creativity, and individual creativity seems to be conceptually compatible. However, up until relatively recently, there have been few efforts to bridge the gap between these three strands of research, besides a few exceptions (Patterson & Zibarras, 2017; Slåtten et al., 2020). I propose that to further our understanding of healthcare innovation, individual creative prerequisites need to be accounted for and included in the analyses. My contention is that because individual

creativity is a prerequisite for innovation (Runco et al., 2017b), it is also an indispensable key to solve the grand challenges facing our healthcare system.

With this thesis, I hope to spotlight the importance of individual creativity for healthcare innovation. Moreover, I contribute with a novel approach to how the aforementioned research fields can be combined in a meaningful way. Specifically, I suggest that previously established methods of assessing organizations' innovative capabilities and factors of the work environment should incorporate a measure of individual creativity.

This thesis demonstrates and discusses my suggested approach through a survey-based case study of a Norwegian hospital. The conceptual framework ties together research from innovation management, innovative and creative work environment (Amabile & Coon, 1996), and individual creativity (R. Beghetto, 2006; Plucker et al., 2019).

1.1 Research question and theoretical framework

The overarching research question investigated in this thesis is:
How does employee creative confidence influence innovation activities in a healthcare environment?

To investigate the research question, I analyze data from a cross-sectional quantitative survey of organizational innovation capabilities, work culture, and individual creativity conducted among 161 employees at the Norwegian rehabilitation hospital Sunnaas. This survey is a continuation of a pilot study on hospital employees' contribution to innovation and how the hospital work environment is conducive for innovation activities (Thune & Gulbrandsen, 2016). The pilot study aimed to identify the diversity of innovation activities in hospitals to develop a tool more adept at capturing hospital innovation. The present study expands upon the insights on how to capture hospital innovation by taking a closer look at the interplay between organizational capabilities, creative work culture, and individual creative confidence in relation to innovation activities (Thune et al., 2020). The survey was created by Taran Mari Thune from the TIK center at the University of Oslo, in collaboration with Sveinung Tornås from Sunnaas and me. I contributed to the survey design and in refining the final set of questions. The measures of employee creative confidence were included explicitly for the purpose of this thesis. I utilize the survey data specifically to investigate the relationship

between employee's creative confidence and innovation activities and its relation to other creativity stimulants in the workplace.

Prior research has found specialist hospitals with high levels of R&D activity to be more likely to foster innovation (Thune & Mina, 2016). This is attributed to innovation capabilities such as resources, clear mandates to prioritize innovation, highly skilled employees, and supportive management (Thune et al., 2020). The findings from the hospital innovation literature essentially confirm prior research on organizational work cultures inducive of creativity and innovation (Amabile & Coon, 1996). However, few previous efforts have been made towards exploring how individual prerequisites relate to the organizational context and how it affects innovation activities.

The basic assumption behind our survey is that innovative and creative performance is unequally distributed among individuals and organizations and that specific capabilities cause some individuals and organizations to invest more in creative and innovative endeavors (Thune, 2020). As such, the survey includes measures on innovation capabilities based on the previous pilot study (Thune, 2015) and a set of questions about work culture developed based on the conceptual model underpinning Amabile and Coon's (1996) instrument for assessing perceived stimulants and obstacles to creativity in organizational work environments (KEYS). What sets our survey apart from most prior surveys on organizational capabilities is that these measures are supplemented with a measure of the respondent's self-assessed creative confidence – bridging the gap between individual creativity and the organizational context. A modified version of Beghetto's three-item creativity scale (2006) was used for the creativity self-assessment.

The idea behind this structure is threefold. Firstly, it allows to control for individual prerequisites in the environmental variables and potentially yield more precise estimates on the effect of culture. Secondly, when investigating the effects of individual prerequisites for creativity on innovation activities it serves the opposite purpose, controlling for external influences. Thirdly, it reveals the relative effect of the individual's creative abilities versus other organizational capabilities conducive to innovation.

The primary independent variable in the survey is innovation activity. This was chosen to remediate the previously mentioned misalignment between traditional innovation indicators

and the true nature of hospital innovation (Morlacchi & Nelson, 2011; Salge & Vera, 2009; Thune & Gulbrandsen, 2016; Thune & Mina, 2016). OECD defines innovation activities as "[…] all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations" (OECD & Statistical Office of the European Communities, 2005). Specifically, we operationalize innovation activity as the act of contributing ideas for innovations. This is a highly subjective measure, but it effectively captures the wide range of innovation activities in hospitals (Thune & Gulbrandsen, 2017). We do not assess the quality of the ideas, nor if they turn into actual innovations. This is outside the scope of the survey and this thesis. The main focus of this study is employee involvement in innovation activities.

The analyses and discussion will be structured around three hypotheses introduced in conjunction with the relevant prior literature over the next chapter.

2 Prior literature: Where do we stand?

2.1 Level of analysis and scope

Innovation is a complex concept encompassing a wide range of different domains of research. For this reason, innovation studies are often concerned with different analytical levels. For instance, a vast body of literature investigates the systemic nature of innovation – how different countries or organizations interact and which mechanisms are involved in the diffusion and adaption of innovations. Several models have tried to capture this process, such as the multi-level perspective (Geels & Schot, 2007), triple helix (Etzkowitz & Leydesdorff, 2000), and national innovation systems (Edquist, 1997; Lundvall, 2007). Explaining overarching trends and tendencies requires a macro approach where the more fine-grained nuances are not measured directly. For this reason, innovation is often framed in different ways to illuminate different aspects of the concept. The innovation systems model is an excellent illustration of the nested nature of innovation: it depicts how the innovation system is made up of organizations and institutions, how they cluster in networks based on region and industry, and how these, in turn, are dependent on institutional conditions.

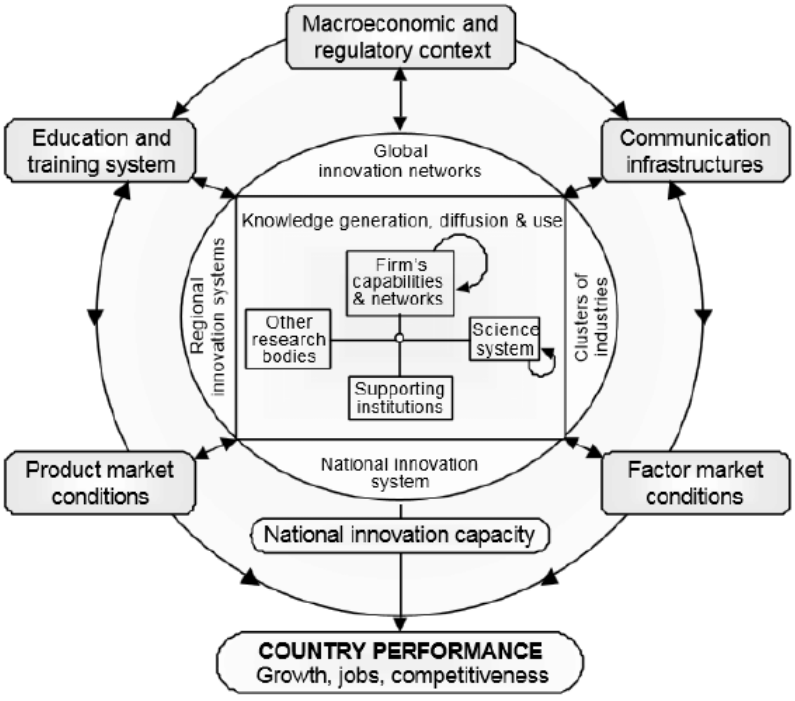

Figure 1 – The National Systems of Innovation Concept(OECD, 1999)

The model clearly illustrates how different frames for innovation create natural boundaries for research and define analytical levels. The same logic can be applied to zoom in or out based on the area of interest. An international framing might look at differences between countries as a whole and may reveal important knowledge about how national policies and prerequisites affect innovation at a high level. A within-organizational framing reveals how internal processes, management, and team dynamics impact the organization's innovation potential. Just as with a camera, the bigger the picture – the blurrier the details will get.

A large part of the healthcare innovation literature is concerned with relatively high-level analyses at the systems and organizational level (Thune & Mina, 2016). Some studies have investigated the contributions from certain occupational groups such as doctors (Thune & Mina, 2016). Very few have zoomed even further in and investigated within-individual differences (Slåtten et al., 2020). This marks a clear gap in current research and our knowledge about healthcare innovation.

This thesis takes a micro-level approach, investigating how within-individual differences in employees' creative confidence are related to innovation activities in a healthcare organization. However, this framing requires drawing on several different bodies of literature. The choice of literature for this review follows a funnel logic: starting at the broad end with a short introduction to innovation in general and a presentation of current literature on healthcare innovation in particular, before gradually narrowing the scope to research on organizational factors inducive of creativity and innovation, and ultimately individual level creativity. Lastly, I present research on creativity assessment underpinning the variables aimed at measuring creative confidence.

2.2 Defining innovation

Innovation is seen as the driving force behind economic and societal change ever since Schumpeter published his famous work, The Theory of Economic Development (Schumpeter, 1934). He argued that economic development and societal change derived from changes to the status quo caused by introducing new products, production methods, supply sources, entering new markets, or finding new ways to organize business (Fagerberg, 2006). Schumpeter defined innovation as "new combinations of new or existing knowledge, resources, equipment, and other factors" (Schumpeter, 1934). This definition is arguably still

the most widely used today. There are several different versions with slightly different wording, but they are mainly variations over the same theme. For instance, OECD utilizes the following definition in their manual for innovation surveys, the Oslo Manual: “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations” (OECD & Statistical Office of the European Communities, 2005, s. 46). It contains some extra clarifications but is otherwise relatively similar to the definition proposed by Schumpeter almost a hundred years ago. In this thesis, I ground the understanding of innovation in the definition used by OECD. A few remarks have to be made regarding this definition.

Firstly, attention should be made to the choice of the term *implementation.* This term describes an essential criterion for what constitutes an innovation and distinguishes it from an invention or idea. An invention is the first occurrence of an idea, while innovation is the attempt to carry it out into practice (Fagerberg et al., 2006). As such, creativity differs from innovation in the sense that creativity is concerned solely with the development of ideas, which may (or may not) result in inventions, while innovation is associated with the successful implementation of ideas (Amabile, 1997; Shalley et al., 2004).

The second important takeaway from the innovation definition is the many different types of innovations it encompasses. Innovation is not restricted to products but may also happen in less tangible areas such as improved organization of work, new business models, and political instruments. Historically, goods have been seen as superior to services because they typically scaled better (Bloch & Bugge, 2013, s. 2). However, this view has shifted in recent years as digitalization has greatly improved scalability for services, and our understanding of the importance of incremental and practice-based innovation has matured. Moreover, the public sector is in large a provider of services, which highlights the importance of utilizing a broad understanding of innovation when investigating the public sector (Bloch & Bugge, 2013). This is especially true for healthcare innovation, where the sector's complexity has raised the question whether the traditional research-based innovation indicators are suited to capture the entire specter of hospital innovation. In fact, prior studies suggest that hospital employees are more likely to be involved in developing new services than products (Thune, 2015).

The consequence of the above takeaways has two practical implications in my study. Firstly, from the innovation definition, it is clear that there can be creativity without innovation, but there can be no innovation without creativity. This substantiates the claim that individual creativity needs to be accounted for when studying innovation. Hence, measures of individual creative confidence were included in our survey. Secondly, innovation is not limited to tangible outcomes such as products, patents, or publications. For this reason, a deliberate choice was made not to measure innovation per se, but rather focus on the submission of ideas – a specific type of innovation activity (steps intended to lead up to the implementation of innovations (OECD & Statistical Office of the European Communities, 2005)).

2.3 Hospital innovation

In this section, I will outline literature from the field of hospital innovation that is specifically important to illuminate my research question. My aim is to reveal the research gap that my dissertation is trying to cover and highlight recent studies investigating similar and related topics.

Healthcare innovation has garnered much attention from researchers in recent years because of its potentially high societal impact. Indeed, healthcare is among the areas where science and technology have yielded the most impressive progress over the last decades (Consoli & Mina, 2009). Inheriting the logic behind the theories of innovation systems, a proposed analytical model for healthcare innovation is that of a health innovation system (Consoli & Mina, 2009). Hospitals are deemed a central node in a highly diverse network of actors and institutions. They are engaged in all stages of the innovation process – both as consumers and producers of knowledge and innovations (Salge & Vera, 2009). Moreover, hospitals are complex organizations bridging a wide range of professions, positions, and functions to facilitate the provision of healthcare services. Consequently, some areas of organizations are directly engaged with research and development, while others are patient-oriented and concerned with the practical execution and delivery of services. Due to this complexity, it has been debated whether standard R&D indicators such as publications, patents, and licensing data are suitable to capture the entire breadth of hospital innovation (Djellal & Gallouj, 2005; Thune & Mina, 2016, s. 1550). Several prior studies have found support for the fact that a significant part of hospital innovation emerges from practical problem-solving in clinical practice and by frontline employees (García-Goñi et al., 2007; Hicks & Katz, 1996;

Morlacchi & Nelson, 2011; Salge & Vera, 2009). Moreover, research has found innovation to happen at all levels of healthcare organizations (Djellal & Gallouj, 2005; García-Goñi et al., 2007). This highlights the importance of establishing innovation indicators capable of capturing the formal and the more informal innovation activities in hospitals. Moreover, the fact that innovation is not confined solely to R&D departments demonstrates the critical role played by individual employees for the hospitals' innovation activity.

Unfortunately, the contribution of individual employees in relation to hospital innovation activity is a largely under-researched topic as of yet. This is clearly stated by several independent literature reviews (Länsisalmi et al., 2006; Thune & Mina, 2016). Länsisalmi et al. (2006) identified 704 reports on innovation in healthcare organizations, of which only 31 were empirical studies published in peer-reviewed international journals. From this selection, only 13% investigated individual-level innovation. Similarly, Thune and Mina (2016) identified over 15 000 documents across three different databases, ultimately narrowing it down to 46 articles primarily focused on how innovations are actively generated by, or in collaboration, with hospitals. The final set of articles were categorized into three strands of research: (1) micro-level focus on particular hospital staff's contribution to innovation, (2) hospitals' innovation activities, primarily focused on organizational features, and (3) macro-level analysis of health care in a systems perspective. The literature review reveals that research on the individual level is considerably more limited than on the organizational and systems levels. Only seven articles were selected for this category versus 21 and 16 in categories two and three.

Looking more closely at the research exploring individual contributions to innovation in healthcare organizations, it tends to focus almost exclusively on clinical staff and medical doctors in particular (Thune & Mina, 2016, s. 1549). This is problematic because medical doctors and clinical staff represent only a tiny pool of the human resources available in a healthcare institution, while innovation can happen at all levels of the organization (Djellal & Gallouj, 2005). To maximize the innovation potential, it is crucial to involve the entire organization in problem seeking and idea generation (García-Goñi et al., 2007). Furthermore, a closer examination of the research methods deployed by the papers concerned with the micro-level also reveals that most of them treat individual contributions and creativity circumstantial. They examine the *effect* of practitioner's involvement for innovation, but the individual contributions are aggregated and black-boxed. To elucidate, I have expanded on

Thune and Minas' overview of papers on practitioners in healthcare and their role in innovation (2016, s. 1550) by adding a column describing the research methods used (Table 1). For readability, I have not included all the columns from the original table.

Table 1 - Modification of table by Thune & Mina (2016, s. 1550).

Paper	Empirical object	Key issues explored	Data	Method
Bullinger et al. (2012)	User involvement in innovation through open innovation platforms.	Investigates the role of user oriented, open innovation platforms in healthcare	Quantitative; communication analysis	Analyzes communication between users of the German open health platform GemeinsamSelten.
Chatterji and Fabrizio (2014)	Medical doctors in the US.	The contribution of medical doctors to innovation in medical devices.	Quantitative	Uses panel data and OLS regression to examine if innovative performance changes if a firm collaborates with physicians or not.
Chatterji et al. (Chatterji et al., 2008)	Medical device firms.	The effect of prior collaboration with medical doctors on innovation performance (new products)	Quantitative	Uses patent data combined with the American Medical Association Physician Masterfile to examine the contribution of physicians to medical device innovations.
García-Goñi et al. (2007)	Hospital managers and front-line staff in six European countries.	The perceptions and motivations of different kinds of hospital staff toward innovation in healthcare services provision.	Quantitative	Uses a survey among front-line employees and managers in public health institutions in six European countries.
Kesselheim et al. (2014)	Clinical doctors as “physician inventors.”	The processes and individuals involved in coronary artery stents.	Qualitative	Semi-structured interviews with innovators in the field.
Smith and Sfekas (2013)	Medical devices	Premarket approval applications filed by medical device firms and medical doctors contribution to them.	Quantitative	Matches text from premarket-approved medical devices with text in patent applications from startups founded by

				physicians and non-physicians.
Xu and Kesselheim (2014)	Patents connected to stent technologies.	Contribution to medical devices by medical doctors.	Qualitative	Semi-structured interviews with 127 innovators responsible for patents rated by experts as "most transformative" within their field.

In sum, most of the studies exploring practitioner's involvement in innovation report a positive impact on innovation outcomes (Chatterji et al., 2008; Kesselheim et al., 2014; Smith & Sfekas, 2013; Xu & Kesselheim, 2014). Further research is needed to investigate the relationship between non-clinical staff and innovation, but the few studies looking into this so far have yielded interesting results. A study analyzing the motivation for innovation among different employees found managers to be most involved in innovation, highly motivated, and less dependent on overall organizational performance (García-Goñi et al., 2007). Since most of the few prior studies on individual contributions mainly investigate doctors, this suggests that there are significant contributions to the innovation performance of hospitals that are largely unresearched as of yet.

Research on the individual level would also benefit from investigating individuals' contributions to innovation based on other classifications than position. Considering the research on personality types and creativity from psychology, it is very well possible that our understanding of innovative behavior can be broadened by looking at commonalities at a deeper, more personal level. For example, Lee and Hong (2014) suggest hospitals should actively employ individuals who possess innovative tendencies. Furthermore, Patterson & Zibarras (2017) point out that the selection systems used to recruit professionals to the healthcare sector are not identifying creative and innovative potential. This is quite paradoxical, given the seemingly widespread consensus about the importance of innovation for the healthcare sector. Hence, it seems plausible that examining the innovative behavior of individuals in a healthcare environment, based on other common denominators than position, should provide valuable new insights going forward.

Research on organizational features promoting and inhibiting creativity is, on the other hand, plentiful and heterogeneous. A handful of studies test the empirical theories found in the

general innovation and creativity management literature in a health care environment (Dias & Escoval, 2013, 2015; García-Goñi et al., 2007; Schultz et al., 2012). Schultz et al. (2012) explored how innovation management practices at 87 German hospitals affected their innovation portfolios. They found that informal measures, such as employee encouragement, increased the degree of innovativeness, while formal mechanisms, such as reward systems, enforced exploitation (Schultz et al., 2012).

Notably, many papers concerned with organizational characteristics promoting innovation and creativity in hospitals take a learning perspective. This is primarily derived from the theory of absorptive capacity, which states that organizations' access to, and diffusion of, knowledge is vital to recognize and exploit new information (Cohen & Levinthal, 1990). However, it is theorized that the increasing speed at which new knowledge is created has led to a gap between available knowledge and current practices in hospitals (Dias & Escoval, 2015). Dias and Escoval (2015) found a hospital's learning orientation and absorptive capacity to impact its innovative potential significantly. Their findings indicated that institutions with the most robust learning capabilities were five times more likely to develop innovations than those on the other end of the spectrum (Dias & Escoval, 2015). The results align with previous research finding significant positive correlations between organizational learning dimensions and innovation (Ugurluoglu et al., 2012).

In recent years, a handful of studies have focused on the intersection between creativity and innovation in healthcare.

Liu et al. (2020) explored the link between creative personality traits, creativity as measured by the Torrance test of creative thinking (TTCT), and innovation among Taiwanese nursing students. They found a positive relationship between the personality trait curiosity and innovation. The authors suggested that implementing methods to increase curiosity could prove beneficial for nursing students' abilities to innovate. However, they seem to overlook the fact that personality traits are relatively stable (Cobb-Clark & Schurer, 2012). This makes their conclusion deficient. Instead, their study suggests that an effective way to increase innovation among nursing students is to include creative potential as part of the study's admission criteria – a finding largely supporting the arguments posed by Patterson and Zibarras (2017) presented previously.

A refreshing angle on hospital innovation is found in Harvey and Mullers' research on the idea selection process (Harvey & Mueller, 2021). They report that organizations typically establish internal teams tasked with evaluating contributed ideas. However, it turned out that these teams often showed a preference towards proven ideas and discarded more novel ideas early in the process. Specifically, in situations where the evaluating team shared a common understanding of the criteria for usefulness, novel ideas were rejected. Novel ideas were more likely to be approved when group members had divergent opinions about what usefulness entailed (Harvey & Mueller, 2021, s. 9). This is an interesting finding in conjunction with the survey we conducted. Where we investigated the idea generation stage, Harvey and Mueller (2021) investigated the next phase, namely the idea selection stage. They did not assess individual creativity. However, they reported that groups recommending ideas had to address a wide range of issues and that one of the core reasons for people to reject novel ideas was that they entailed uncertainty. One of the main personality traits consequently reported as a predictor of creativity is openness to experience (Feist, 2019). Furthermore, the theory of absorptive capacity suggests that individuals inhibiting knowledge across a broader range of domains are more likely to produce novel ideas and recognize the value of new information (Cohen & Levinthal, 1990). Hence, an empirical argument can be made that assigning the more creative employees to the groups tasked with selecting ideas could help remediate the novelty bias.

Especially in line with the topic for this thesis is a recent paper exploring hospital employees' innovative behavior in relation to individual creativity, psychological capital ("an individual's positive psychological state of development" (Slåtten et al., 2020, s. 4)) and leadership autonomy support (Slåtten et al., 2020). The study was conducted on a sample of 1008 Norwegian hospital employees. The study serves as an interesting comparison to this thesis. Although employing slightly different concepts, their survey includes many similar items. Moreover, they essentially seek to investigate the same phenomenon, namely the effect of individual creativity on innovative behavior and its relationship with other work environment factors in a health care organization. Slåtten et al. (2020) found individual creativity to have the most significant impact on innovative behavior among the constructs in their study. Moreover, they found that all constructs were mediated by employee's creativity. Finding evidence that individual creativity is related to innovative behavior in hospital employees proves how important it is to account for individual creativity when studying innovation. Moreover, finding that individual creativity mediates effects previously

prescribed to organizational capabilities have potentially huge implications for healthcare innovation research and innovation research more generally. It should be clear from this that individual prerequisites may have a far more significant impact on innovation activity than the limited focus in previous research implies. Including individual-level measures may even invalidate some of the well-established theories on organizational creativity.

In sum, research on hospital innovation is growing but is still lacking in important areas. Most research is concerned with the organizational level, while only a small portion of research has investigated the individual level. However, individual contributions are largely black-boxed, and research efforts are mostly confined to doctors. From a healthcare perspective, research on the connections between individual creativity and organizational innovation is close to nonexistent, with a few exceptions that have surfaced over the last few years. The results from these studies are, however, highly interesting and make a compelling argument for further research on how individual creativity can be harnessed to foster healthcare innovation. This thesis picks up the ball by further investigating the preliminary findings reported by Slåtten et al. (2020). Being able to replicate the findings in a different context would strengthen the case for individual creativity. Moreover, our survey includes a broader range of organizational innovation capabilities and may illuminate how individual creativity relates to several previously untested work environment factors.

2.4 Defining the intangible: what is creativity?

In the next chapter, I will present research bridging the gap between innovation and creativity. However, to investigate how these two concepts are related, it is first necessary to understand what creativity is and how it is defined. The term is somewhat fuzzy and holds different meanings and associations depending on whom you ask. Moreover, creativity in the context of innovation research may differ from the general societal understanding of the term. To establish a common frame of reference to how creativity is understood in the context of this thesis, I will take you on a short detour. This chapter will briefly introduce the history of creativity as a research field and how the term is defined.

The history of creativity is as old as humanity, and the understanding of what it is has evolved over the course of history. During the renaissance, the view on creativity gradually shifted, from something seen as divine intervention, to a trait that originates within the

individual (Kaufman & Sternberg, 2019, s. 15). The academic and scientific research on creativity was greatly intensified around 1950 (Runco, 2004), making it a relatively new field compared to other scientific fields. The view of creativity has since the 50's been defined as a combination of novelty/originality and value/appropriateness (Kaufman & Sternberg, 2019, s. 17; Mednick, 1962). Even though the view of creativity as a concept requiring two criteria is widely accepted (Runco & Jaeger, 2012), it is surprisingly difficult to find a verbatim definition (Mumford & Gustafson, 1988). The term is often introduced more fluently and descriptive than the usual scientific definition. Runco & Jaeger (2012) described it in terms of its requirements: "Creativity requires both originality and effectiveness" (s. 92). George (2007) defines it as "the generation or production of ideas that are both novel and useful" (s. 441). Based on this, it should be clear that the definition of creativity gives ample opportunity for interpretation. Both effectiveness and originality are highly context-specific terms. Effective towards which means? Original compared to what? Besides, a question of quantification arises as the definition "makes no assumptions about the relative value of incremental vs. radical ideas" (Shalley et al., 2004, s. 934).

The weighting between novelty and usefulness varies greatly across domains. It is particularly visible when comparing two domains frequently associated with creativity: the arts, where novelty and originality arguably play the more prominent part; and sciences, where value and appropriateness carry more weight (Kaufman & Sternberg, 2019, s. 18). The ratio between these two components can have far-reaching consequences for what is considered creative. Take the arts, for example. A piece of music may be categorized as "sellout" or "mainstream" if it is too finely tuned to the current demand – even though it creates much more value, at least in a short-term monetary sense, than a more novel piece. In the realm of business, the picture is often the complete opposite. If an idea is very novel, it often lacks a clear attribution, and hence the value creation is more uncertain and distant. In effect, businesses tend to up-weight appropriateness and value in their understanding of creativity. Public organizations, on the other hand, find themselves somewhere in the middle. To remedy potential market failures emerging from the private sector's natural tendency towards risk aversion, the state often takes an active role in supporting early-stage research and innovation (Mazzucato, 2015). In other words, the state and public organizations can afford a slightly bigger emphasis on novelty.

As we can see based on these three examples, creativity is a highly context-dependent concept, and the definition thereof requires a clear frame of reference to be applicable. The introduction of a usefulness dimension is interesting as it aligns it more with the goals for innovation. Moreover, it remedies the potential prejudice against creative individuals as eccentric artists. Introducing usefulness as a criterion makes creativity an act of both strategic thinking and domain knowledge.

Due to the importance of context, I suggest that the definition of creativity would benefit from embodying a reference to the context on a case-by-case basis. In this thesis, I will look at creativity as a precursor to innovation in a Norwegian specialist hospital. Creativity in this context requires a potential for practical application resulting in some form of value creation for the organization (George, 2007). Based on the above reasoning, I will base the following research on a definition of creativity as the generation or production of ideas that are both novel and useful for the organization or other actors in the healthcare sector.

2.5 Innovation and creativity: how it all connects

Now that we have established an understanding of both innovation and creativity, it is time to see how the two concepts relate. As described in section 2.1, this requires a micro-level approach where we zoom in close enough to reveal the details of how individual creativity interacts with factors of the organizational environment. Creativity is in itself not valuable to an organization. As the definition of creativity showed us, creativity needs to be both novel *and* useful. However, it is not until this potential usefulness is exploited in some form or the other that value is generated for the organization (Shalley et al., 2004). This implementation of ideas is what constitutes innovation (Amabile, 1997; Shalley et al., 2004). In this chapter, I will present theories from organizational creativity aimed at describing the interplay between the individual and the organizational level.

Creativity can be described as a vital prerequisite for innovation (Amabile & Pratt, 2016; Runco et al., 2017b). The importance of creativity for innovation is also evident in the most recognized models of the innovation process. The first step in the traditional linear innovation model is research, while the first two steps in the chain-linked model of innovation are (1) market finding and (2) invent and/or develop (Kline & Rosenberg, 1986).

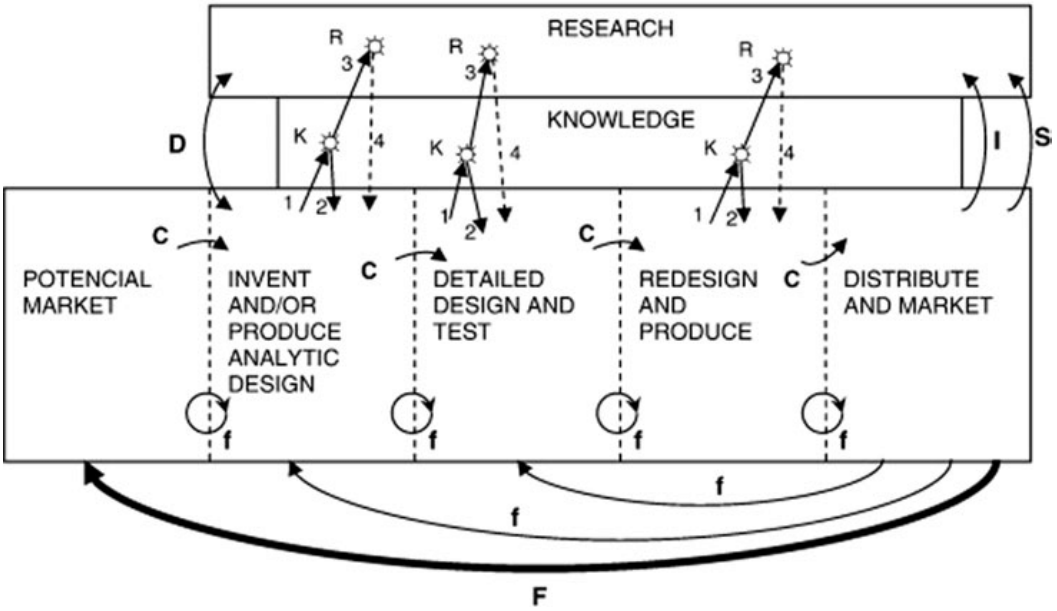

Figure 2 – The chain-linked model of innovation (Kline & Rosenberg, 1986).

Being able to get past step number two requires an idea. Without an idea, the cycle would stop, and there would be no innovation. In addition, the chain-linked model also describes the ties between innovation and research. In light of creativity as the production of novel and useful ideas, research is an endeavor that is inherently dependent on creativity. Hence, it could be argued that creativity is not only a precursor to innovation (George, 2007) but a potential resource in all steps of the innovation process.

Both the definition of innovation and creativity includes a reference to the term, novelty, which arguably can be seen as the common multiple between the two concepts. But how does novelty come into existence? Understanding novelty was by Schumpeter seen as the greatest scientific challenge yet to be solved (Schumpeter, 2005). Years later, innovation research is still largely black-boxing the inner workings of the innovation process – leaving the exploration of how novelty comes about to other research fields (Fagerberg et al., 2006, s. 3). For the most part, psychology and creativity research has picked up the ball. Creating ideas is a cognitive act originating from within the individual. However, the motivation to engage in creative thinking and the individual prerequisites are found to be strongly influenced by the social environment – making creativity and innovation highly interlinked processes (Amabile & Pratt, 2016).

It is somewhat problematic for innovation research to outsource a topic that, in its very essence, is the foundation of our field. The fragmentation of research efforts can make it harder to see the complete picture and discover significant connections. That being said, some notable efforts have been made to bridge the gap between organizational innovation and creativity. One of them is Amabile and Pratt's (2016) dynamic componential model of creativity and innovation (Figure 3). Below I will present the model to describe how the individual creative process and the organizational innovation process relate. Further, the model will serve as a structural frame for the subsequent presentation of relevant literature on organizational factors inducive of creativity.

At first sight, the model looks almost parodically complex, but the underlying logic is relatively easy to follow with a bit of explanation. In short, the model builds on the insight that the organizational innovation process and the individual creative process essentially mirror each other through a series of five steps and that the two processes mutually influence each other in a work environment through a set of individual and organizational components. The stages are represented by the filled purple boxes. The contextual influences are represented by the boxes with a purple frame.

In the first stage, a problem or goal needs to be identified that motivates the organization or individual to find a novel solution. In stage two, necessary preparations are made, such as gathering required knowledge and resources. Stage three is concerned with the generation of ideas and prototypes. In the fourth stage, ideas are tested against defined success criteria and ultimately implemented. Lastly, in stage five, the outcome of the effort is assessed, and the process is either considered finished, terminated, or subject to a progress loop. These steps should look very familiar for those who know the chain-linked model of innovation (see Figure 2).

The five steps are expanded by introducing the organizational and individual components A, B, and C. These are containers for factors promoting or inhibiting creative and innovative engagement. Again, the organizational and individual components largely mirror each other. What makes the model complicated is that the different components influence multiple stages in the process. Moreover, these components are in turn mediated by external influences and perceptions, illustrated by the green boxes. In the next chapter, I will look more closely at prior research underpinning the various components.

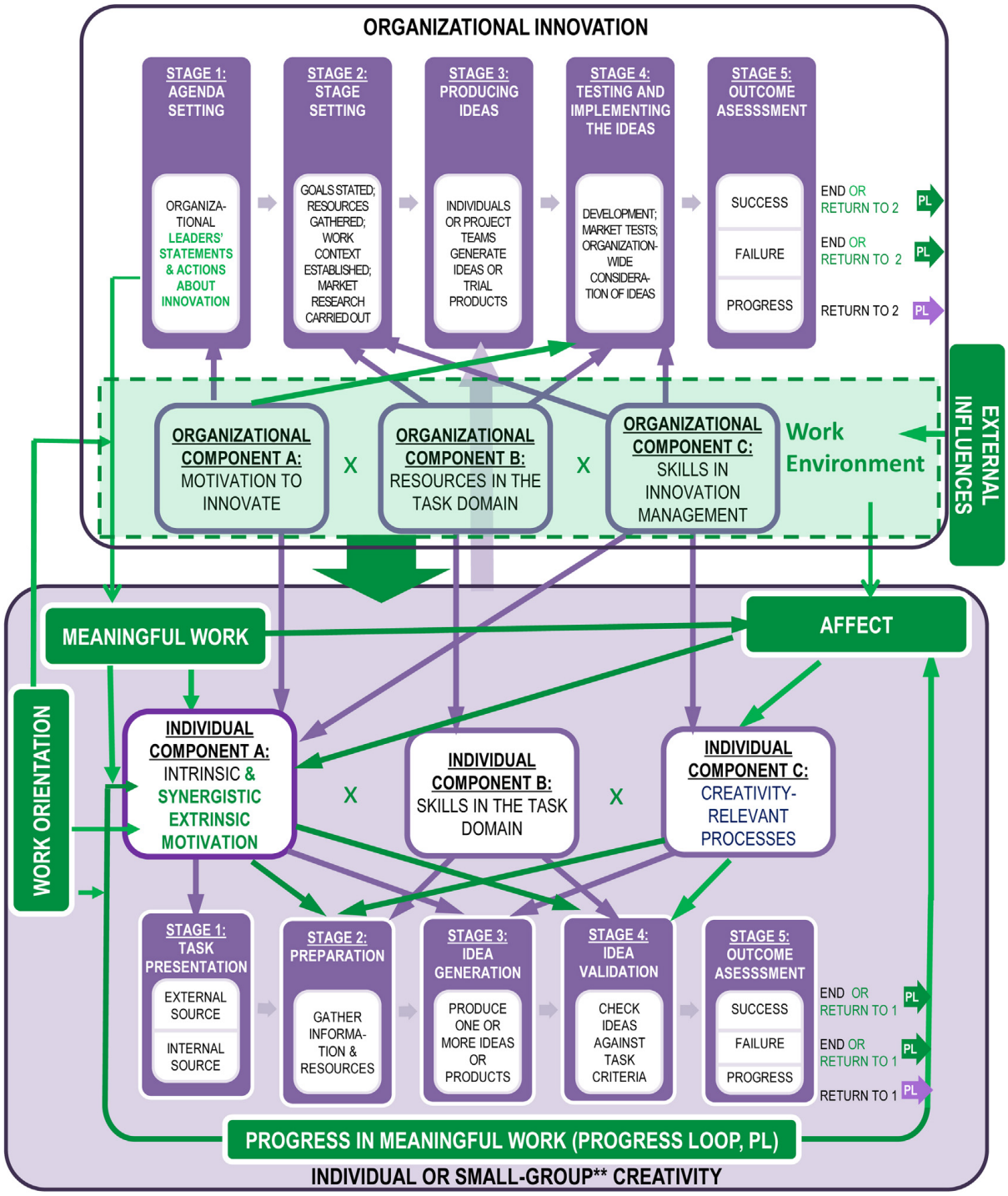

Figure 3 - The dynamic componential model of creativity and innovation (Amabile & Pratt, 2016).

Of particular interest to this thesis is the individual component C (to the right in the middle of the purple area): creativity-relevant processes. However, in the paper introducing the model, this component is devoted very little attention. One of the few references to the component states: "if managers are sufficiently creative themselves and use creativity-enhancing managerial practices (Organizational Component C), individuals will be likely to develop

their own creativity-relevant processes (Individual Component C)" (Amabile & Pratt, 2016, s. 166). Indeed, creative role models are found to positively impact creativity – especially among less creative individuals (Zhou, 2003). However, the creative abilities of individuals are much more complex and encompass a wide range of mental processes. Some of these processes can be learned (Sternberg, 2019), but some traits, such as personality and cognitive style, are more stable and even to some degree genetic (Barbot & Eff, 2019). With this knowledge, the component of creativity-relevant processes could potentially have a much more significant impact on the overall creative process, and consequently innovation, than the current focus implies.

Creativity-relevant processes are, however, a broad concept. In our survey, we have combined measures of the environmental factors with a measure of creative confidence. I will go into further detail about creative confidence in a later chapter, but in short, it can be seen as a product of prior experience with creative endeavors, which may fuel a virtuous cycle (Karwowski et al., 2019). Assuming that individuals producing more creative work possess better creativity-relevant processes, creative confidence can be understood as a proxy or aggregated measure of this component. Skills in creativity-relevant processes are likely to increase the probability of a positive outcome, which in turn should be reflected by increased creative confidence.

As such, our survey is designed to assess the perception of both the individual and organizational components as well as the exogenous influences. In the next chapter, I will explore the research behind these components in further detail.

2.6 Creativity in organizations

Up until now, I have presented research on hospital innovation, how creativity can be understood in an innovation research context, and an empirical model describing the relationship between organizational innovation and creativity. Creativity in the workplace is a complex interplay between the individual and the social environment. This section will zoom in on specific empirical findings from prior research on organizational factors found to promote and inhibit employee creativity. The introduced concepts represent current knowledge in the field and serve as the theoretical foundation for our survey design.

Organizational creativity can be understood as a multi-level concept with reciprocal interactions. According to current research, individual creativity is mediated by interactions between personal characteristics and the contextual surroundings (Shalley et al., 2004). As such, organizational creativity is a function of its components: the employee's individual characteristics, their interaction in workgroups, and the larger organizational structures and culture (Woodman et al., 1993, s. 5). Two notable models exist trying to encompass the complexity of interactions and influences at play in organizational creativity: The revised dynamic componential model of creativity presented in the previous section (Amabile & Pratt, 2016) and the interactionist model of organizational creativity (Woodman et al., 1993). Both models acknowledge organizational creativity as a multi-level concept with inputs, processes, and outputs (Amabile & Pratt, 2016). They differ, however, in terms of the division of levels. The dynamic componential model of creativity consists of two primary levels: the organizational and personal/small-group creativity levels. The interactionist model has three levels: the organizational, group, and individual levels. I find the dynamic componential model better suited to illustrate the tight interconnectedness between individual creativity and organizational innovation. However, when seeking to explore how individual prerequisites relate to environmental factors, combining small-group and individual creativity at a joint level, as in the dynamic componential model, is not ideal.

To structure a review of the literature, I find that a division into three levels provides the greatest clarity. Both the interactionist model and the dynamic componential model are very complex. To illustrate the three levels and their interactions at a more abstracted level, I have simplified and reinterpreted the three levels in a hierarchical chart of organizational creativity (Figure 4).

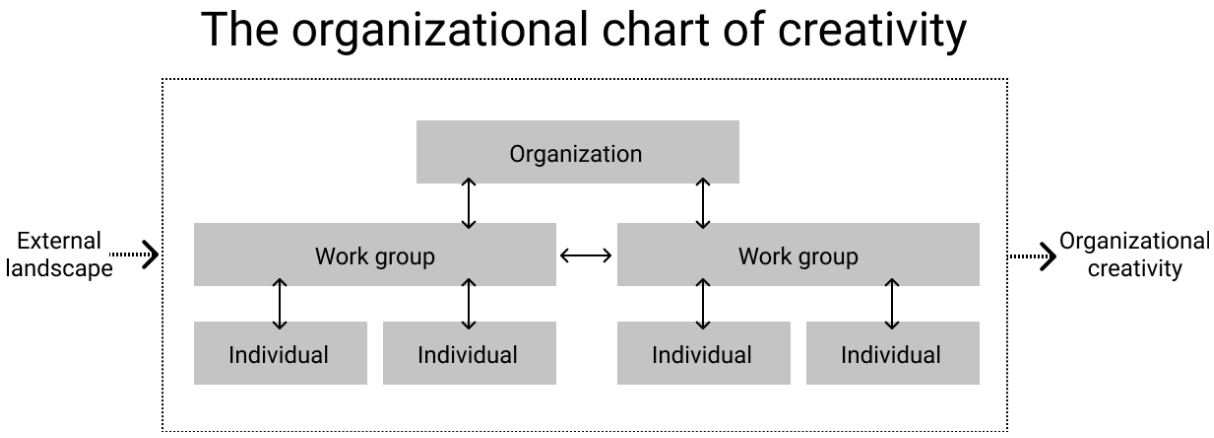

Figure 4 - The organizational chart of creativity

The model illustrates how all three levels of an organization are interconnected and mutually influence each other (Woodman et al., 1993). In the following sections, I will present relevant literature concerned with each of the levels. Many of the organizational and group level influences are working through concepts related to the individual level. For this reason, I will start with the individual level and move up through the hierarchy.

2.6.1 Individual influences

The personal characteristics inducive of creativity can be divided into three main concepts: intrinsic motivation, skills in the task domain, and creativity-relevant processes (Amabile & Pratt, 2016).

Intrinsic motivation

Intrinsic motivation is an individual's internal motivation to perform a specific task. Many scholars deem the concept the link between external influences and the individual's creative efforts. In fact, Shalley et al. (2004) presume that *all* contextual factors influence the individual through their effect on intrinsic motivation. High levels of intrinsic motivation are found to increase cognitive flexibility, curiosity, and persistence, which in turn are precursors to creativity (Shalley et al., 2004). Although previous research generally described intrinsic motivation as beneficial to creativity and extrinsic motivation as detrimental, more recent studies have produced a more nuanced picture (Amabile & Coon, 1996; Amabile & Pratt, 2016; George, 2007; Shalley et al., 2004).

Skills in the task domain

As previously established, usefulness is a requirement for creativity. Hence, it is necessary to have certain skills and knowledge of the relevant domain to produce a creative outcome (Hirst et al., 2009). Given the complexity of many tasks, skills in multiple domains may prove beneficial (Amabile & Pratt, 2016). On the face of it, it seems logical that the more relevant knowledge one possesses, the more possible combinations are available. However, more experience can also lead to path dependency – sticking to tried and proven strategies instead of experimental ones (Sternberg, 2019, s. 94).

Creativity-relevant processes

The last concept, creativity-relevant processes, encompasses all types of mental processes that influence creativity (Amabile & Pratt, 2016). Among others, creativity has been found associated with certain personality traits (Cattell & Mead, 2008; Costa & McCrae, 2008; Gough, 1979), cognitive style (Kirton, 1976, 1994; Woodman et al., 1993), mood (Ashby et al., 1999; George, 2007; Hirt et al., 1997; Madjar et al., 2002; Vosburg & Kaufmann, 1997), creative self-efficacy and creative confidence (R. Beghetto, 2006; Gong et al., 2009; Karwowski, 2017; Karwowski & Beghetto, 2019).

Based on the notion that creativity is a prerequisite for innovation (Runco et al., 2017b) and creative confidence is believed to affect an individual's engagement with creative activity, I expect employees exhibiting higher levels of creative confidence to submit more ideas than their less creative counterparts.

H1: Employees with higher levels of creative confidence submit more ideas for innovations.

2.6.2 Group influences

At the group level, interactions among individuals with different creative prerequisites occur. Depending on how these interactions and the group climate are perceived, they may amplify or weaken the individual's creative engagement.

Supervisors and leadership style

The role of supervisors has received much attention over the years, and several studies report that leadership style influences creativity. In general, supportive supervisors that are good at giving feedback, set clear goals, and provide a safe work environment are found positively related to creativity (Amabile et al., 2004; Amabile & Coon, 1996; Gilson & Shalley, 2004; Madjar et al., 2002, 2002; Škerlavaj et al., 2014). Another positive factor is employees' cognitive trust in their supervisors – meaning they see them as knowledgeable and competent (George, 2007, s. 458). On the flip side, micromanagement, low levels of autonomy, and strict rules are found to inhibit creativity (Zhou, 2003). The effect of supervisors'

management style can in part be explained by the anticipation of critical assessment. In short, the expectation that work will be critically reviewed is found related to lower levels of creativity, while the opposite is true for constructive feedback (Zhou & Shalley, 2003).

Colleagues and workgroup support

Not surprisingly, colleagues and the composition of workgroups are found to impact creative behavior. A supportive social environment with mutual openness to ideas and a high tolerance for experimentation and unusual suggestions positively impact creative thinking (Amabile & Coon, 1996). Prior research has also discovered that discussing ideas with coworkers and being constructively challenged is an important part of the creative process (Albrecht & Hall, 1991). Furthermore, the presence of creative coworkers is found to positively impact creativity because it allows for the adoption of creativity-relevant skills (Shalley & Perry-Smith, 2001). Theoretically, this would suggest that infusing an organizational unit with a few highly creative individuals could have the potential to create a butterfly effect and raise the overall level of creativity in the group. However, prior research on the topic has reported mixed results (Zhou, 2003) and pointing towards more conditional circumstances. Zhou (2003) examined the relationship between the presence of creative coworkers, leadership style, and creative personality. Interestingly, the effect of creative role models was found to be particularly strong among employees with lower creativity levels (Zhou, 2003). Exploring how "planting" creative individuals can help achieve organizational transformation could be a fruitful area for further research.

2.6.3 Organizational influences

The borders between the organizational and group level may be somewhat fluid. I have chosen to attribute concepts that are a result of top management decisions to the organizational level, although some of them are effectuated at the group level. For instance, time pressure affects the individual, but resource allocation and work design are primarily up to the management. As such, I have decided to treat it as an organizational influence.

Organizational encouragement

As with supervisory encouragement, research has also found organizational encouragement positively correlated with creative engagement among employees (Amabile & Coon, 1996). Establishing a culture across all levels of the organization where risk-taking and idea generation are encouraged will set the stage for supervisors at the department levels. Preferably, this should be carried out by clearly communicating creativity as a priority for the organization as a whole – as well as putting money where your mouth is by devoting resources to the task (Amabile & Pratt, 2016).

Creativity prompts

In addition to creating a safe work environment, organizations can also ask employees to be creative more directly – referred to by George (2007) as creativity prompts. Issuing rewards and recognition for creative endeavors are mechanisms that substantiate the organization's creative ambitions and spike intrinsic motivation levels through motivational synergy (Amabile & Pratt, 2016). Creativity prompts can also be even more upfront. Unsworth, Wall, and Carter (2005) allege that the creative requirement of a job could be a neglected predictor of employee creativity. Their research on health service employees revealed that having creativity as a job requirement mediated the effects of supportive leadership in full, and in part, the effect of empowerment and time pressures (Unsworth et al., 2005). Another study nuances the picture by finding that a change in job design only yields the desired results if there is consistency between the described job requirement and the actual work carried out (F. Lee et al., 2004). On the same account, Gilson and Shalley (2004) found that the more creative teams perceived their tasks as demanding high levels of creativity.

Due to the significant effects of creative requirement reported by Unsworth et al., I wanted to test if my data reported the same findings. In our survey, we asked whether the respondents had R&D as part of their work tasks. This can serve as a measure of creative requirement.

H2: Employees with R&D as a job requirement submit more ideas for innovations.

I suspect that one possible explanation for the effect of creativity requirement on creative activity is that there could be selection effects in play. By that, I mean that positions with creativity as a requirement may naturally attract more creative employees. This does not necessarily mean that highly creative individuals cannot be found in other parts of the

organization, but I hypothesis that we can expect a higher density of creative individuals in positions with an R&D component. This is an important clarification to make in conjunction with hypotheses one and two. A clustering of creative employees in R&D positions would question whether potential effects found in hypothesis one are actually caused by higher levels of creativity or merely a result of the creativity requirement measured in hypothesis two. Therefore, my third hypothesis is aimed at investigating whether employees with high levels of creative confidence are clustered in R&D positions.

H3: Employees with R&D as a job requirement perceive themselves as more creative.

Autonomy

Following up the theme on job design, multiple studies have found evidence that experiencing ownership and control over how to perform a task is encouraging creativity (Amabile & Gitomer, 1984; Bailyn, 1985; West, 1987). This is notoriously tricky in a healthcare environment where strict protocols are necessary to ensure patient safety. However, a recent study on employees in a Norwegian hospital explored the effects of leadership autonomy support on individual innovative behavior and found the effect largely mediated by individual creativity and psychological capital (Slåtten et al., 2020).

Resources

Research has found that the willingness to follow up on ideas and allocate the necessary resources is what separates high- and low-innovation organizations (Delbecq & Mills, 1985). Investment in research and development is also believed to increase organizations' absorptive capacity (Cohen & Levinthal, 1990). This is not only a monetary aspect, however. Studies have also revealed that the sheer *perception* of the organization's willingness to follow through with ideas is affecting employees' intrinsic motivation.

Time pressure

As with many of the other factors, time pressure can swing both ways. An interesting theory proposed by Mednick (1962) is that the likelihood of finding a creative solution will increase according to the number of associations an individual is capable of producing in relation to

the problem. As the generation and connection of associations can be a time-consuming endeavor, this would suggest that sufficient time may play a part in finding a truly creative solution. More recent research only partly supports this theory, however. Baer and Oldham (2006) and Schmitt et al. (2015) both found a curvilinear relationship between time pressure and creativity. The findings support the currently held view that some time pressure will enhance creativity, while too much will have the opposite effect (Amabile & Coon, 1996).

In general, the common theme seems to be that most of the factors found to promote creativity are context-dependent and can swing either way depending on the totality of the different inputs. For example, time pressure can both promote and inhibit creativity. Likewise, creativity requirements may contribute positively – but only if consistent with job design. There is, unfortunately one might say, no quick fix to build a creative organization. It is the sum of all contributing factors that count.

On a personal note, I find it somewhat peculiar that most research attributes the external effects on individual creativity almost entirely to intrinsic motivation. Especially because this primarily seems to be a theoretical assumption that, according to Shalley et al. (2004), has yielded mixed research results. Their suggested explanation, that this might be because of inadequate assessment instruments, seems unconvincing. For example, time pressures need not necessarily work through intrinsic motivation. One can just as easily imagine that the lower levels of creativity found in relation to time pressures are simply due to the lack of time to develop creative ideas, independent of motivation. Moreover, it is also a possibility that external influences work through other personal capabilities than motivation. Individual creativity, as researched in this thesis, may be one such capability (D. Liu et al., 2016). Since so much of the literature leans on intrinsic motivation as the gateway between individual creativity and external influences, further research into this topic seems rather pressing.

After reviewing papers coming at innovation from both a creativity angle and an innovation angle, it is striking how little overlap there is in the research cited and used as the empirical foundation. Seemingly, these two perspectives represent isolated strands of research. The innovation research is principally pulling on insights derived from a learning perspective. However, the dimensions believed to constitute a learning organization generally coincide with organizational attributes that promote creativity and innovation. For example, the dimensions of a learning organization in Dias and Escovals' (2015) research are cross-

occupational workgroups, integration of functions, softening demarcations, delegation of responsibility, and self-directed teams. There are clear parallels to concepts described in the organizational creativity literature, such as work autonomy (Amabile & Pratt, 2016), team diversity (Amabile & Coon, 1996), and the impediments to creativity caused by rigid and formal management structures (Amabile & Coon, 1996). Within the field of creativity research, employee learning orientation has also been associated with higher levels of creativity (Gong et al., 2009). Based on the papers reviewed in this thesis, the learning approach seems to be the most widely used among hospital innovation researchers. However, the field of creativity research has come much further exploring the organizational environment and individual influences. A fruitful avenue for future research would be to bridge the two strands of research, creating a holistic framework. It seems plausible that we miss out on valuable insights by treating the two fields separately. This thesis is a preliminary attempt to bridge the gap between creativity and innovation research. Based on some of the most recent papers reviewed (H.-Y. Liu et al., 2020; Patterson & Zibarras, 2017; Slåtten et al., 2020), research on individual creativity from an innovation perspective seems to have gained increasing interest the last few years.

2.7 Measuring creativity

Up until this point, I have looked at existing research on creativity in organizations and healthcare innovation. Furthermore, I have identified how measures of the organizational environment for creativity can provide further insight into the innovation process by including a measure of individual creativity. Creativity is, however, an intangible concept, and how to measure it has been the subject of extensive research over many years. In fact, the use of psychological measurements can be traced all the way back to 2200 BC (Miller & Lovler, 2019). Today, psychometry is a separate research field with a long-standing history. In this section, I will outline relevant theories on how to assess creativity and present an overview of existing measurement instruments. The literature presented was used to decide what type of creative construct I wanted to assess and which instrument design to use as a foundation for assessing creativity in the survey.

Firstly, creativity is not a unitary construct, and different instruments measure different aspects of creativity. The first step is, therefore, to decide *what* to measure. The survey is a self-assessment. As such, it does not measure *objective* creativity but *creative self-beliefs*.

The understanding of creative self-beliefs has evolved quite a lot over the past decades and is now usually thought to comprise three main categories with one or two sub-concepts (Karwowski et al., 2019). The three categories are creative confidence, creative self-awareness, and creative self-image. I will mainly focus on creative confidence, which consists of two sub-categories: creative self-efficacy and creative self-concept (Table 2). The main difference between the two lies in the time dimension. Creative self-efficacy is a person's confidence in being able to creatively solve a *specific* task (future orientation), while creative self-concept is a more general belief in one's creative abilities reflective of previous experience (Karwowski et al., 2019). Thus, creative self-efficacy can vary from task to task and across domains, whereas creative self-concept is more stable. Bong and Skaalvik (2002) suggest the two concepts can be distinguished by thinking of self-efficacy as the precursor to self-concept. The top-level category, creative confidence, resembles creative self-concept and is concerned with the more global features. The distinction between different types of creative self-beliefs has created some confusion in the field – especially in recent years when researchers have developed a more fine-grained understanding of the concepts. In fact, many of the assessment instruments that, at the time of creation, were thought to measure self-efficacy are later found to tap the more global and stable features of creative confidence (Karwowski et al., 2019). I will get back to this later in this section.

Table 2 - Excerpt of a table about creative self-beliefs (Karwowski et al., 2019, s. 399)

Category	Specific Types	Dimensions
Creative Confidence *Beliefs in one's ability to think or act creatively in and across particular performance domains.*	**Creative Self-Efficacy** *Perceived confidence to creatively perform a given task, in a specific context, at a particular level.*	**Future orientation** *(prospective judgments),* **specific** *(focused on a specific task and situational features) &* **dynamic** *(highly malleable).*
	Creative Self-Concept *Holistic cognitive and affective judgments of creative ability in and across particular domains.*	**Past orientation** *(based on retrospective judgments),* **general** *(more holistic appraisals within and across tasks and domains) &* **stable** *(changes more gradually, over time).*

Since we surveyed employees across all positions and disciplines at the hospital, a measure of self-efficacy would have been impractical. Firstly, because self-efficacy is task-specific, it

requires the respondent to consider a specific case. The type of work differs greatly across departments in the hospital and would demand separate versions of the survey with tailored cases for each department to be applicable. Secondly, since self-efficacy is so context-specific and malleable, the findings could mainly be taken to account for the specific case in question. The global concept of creative confidence seemed therefore like the more appropriate measure for my purpose. It is both reflective of previous efforts and more stable, making it a more versatile predictor of future behavior across performance situations (Bong & Skaalvik, 2002). Furthermore, prior research has shown that a general view of oneself as creative usually relates to higher levels of creativity across different domains (Karwowski et al., 2019)[1].

A second consideration when choosing an assessment instrument is concerned with the number of items. Hospitals are generally thought of as work environments with high workloads and busy employees. Therefore, researchers experienced in the field advised keeping the survey as short as possible to minimize respondent dropouts. However, most creativity assessment instruments have a daunting number of response items, making them unsuitable for the task at hand. Much of the prior research and instrument development is done using students as respondents (R. Beghetto, 2006; Carson et al., 2005; Kaufman, 2012; Kaufman & Baer, 2004; Rimm & Davis, 1976; Runco et al., 2014; Silvia et al., 2012). The choice is understandable as students are generally more easily accessible than domain experts in full-time jobs. The downside is that years of research are used to develop instruments not really applicable in a real-life setting. From my understanding, researchers in the field would be well advised to develop instruments with a more limited set of items. Even though the level of detail obtained by shorter tests would be reduced, it would facilitate research across a broader range of domains and still have satisfactory reliability (Runco et al., 2014, s. 189).

In sum, the primary selection criteria used to evaluate potential self-assessment instruments for our survey were, firstly, that it measures creative confidence, and secondly, the number of items. Also, some consideration was given to the newness of the instrument. As the field is rapidly progressing, the most dated instruments should be avoided, but at the same time, the instrument of choice should have existed long enough to have at least some demonstrated validity.

[1] This proved true for all domains in the study, with a curious exception only in the field of mathematics.

Below is a comparison of a collection of pre-existing self-report instruments. There are way too many instruments to cover them all in this paper, but the following table gives an overview of some of the most widely used. The instruments differ in approach. Some are more general personality assessment instruments found indicative of creativity, and others are aimed at measuring general creativity or creativity across different domains.

Instrument	No. of items*	Author and year published	Description
Group Inventory for Finding Talent (GIFT)	32-34	By Gary A. Davis and Sylvia Rimm, 1976/1980	Developed to screen elementary school students for programs for the creatively gifted (Rimm & Davis, 1976).
Group Inventory for finding Interests (GIFFI)	60	By Gary A. Davis and Sylvia Rimm, 1982	Identify students at middle and high school levels with attitudes and values associated with creativity. (Rimm & Davis, 1982)
Creative Activity and Accomplishment Checklist (CAAC)	50	First version by Holland in 1961. Many subsequent revisions. One of the more recent by Runco et al. (2017a).	Assessing quality and quantity of creative achievement in different domains.
The Self Report of Creative Traits (SRCT)	12	First published by Barron & Harrington in 1981. Several revisions in recent years by, among others, Runco et al. (2017a).	Measure of traits indicative of a creative personality.
NEO-Five Factor Inventory (NEO)	60	First published by Costa and McCrea in 1985. Multiple revisions by same authors. Latest in 2005 (NEO-PI-3).	A self-report measure of the five personality domains: neuroticism, extraversion, openness, agreeableness, and conscientiousness. For age 12 and above (Costa & McCrae, 2008).
Adjective Check List (ACL)	300	Initially created by Harrison G. Gough & Alfred B. Heilbrun, Jr. in 1952. Gough released a creativity-focused version in 1979 (Gough, 1979).	Instrument to identify common psychological traits. 37 scales in five categories. A creativity-focused version exists.

Creative Behaviour Inventory (CBI)	90	Created by Hocevar in 1979	Self-report checklist assessing creativity across the domains literature, music, crafts, art, math/science, and performing arts. (Carson et al., 2005, s. 39)
The Sixteen Personality Factor Questionnaire (16PF)	185	Developed by Raymond B. Cattell, Maurice Tatsuoka, and Herbert Eber. First released in 1949. Fifth edition released in 1993 (Cattell & Mead, 2008).	Assessment instrument to measure normal-range personality across 16 different traits. Can at a higher level be grouped into the five general traits ("the big five") (Boyle et al., 2008, s. 135)
The Creative Personality Scale (CPS)	30	Published by James C. Kaufman and John Baer in 2004.	Self-assessment of general creativity and domain-specific creativity. Derived from Hogan Personality Inventory and 16pf. (Kaufman & Baer, 2004)
Torrance Test of Creative Thinking (TTCT)	-	First administered by E. Paul Torrence in the 1950s (Runco et al., 2010)	Test of creativity based on theories of divergent thinking. Comes in a figural and verbal version.
Creativity Achievement Questionnaire (CAQ)	96	Published in 2005 by Carson, Peterson, and Higgins.	Assesses creative achievement across ten different domains (Carson et al., 2005)
Runco Ideational Behavior Scale (RIBS)	74 / 19	Originally published 2001 by Runco, Plucker & Lim. Released in a shorter form with 19 items in 2014.	Scale aimed at measuring creative ideation (Runco et al., 2001, 2014)
Kaufman Domains of Creativity Scale	50	James C. Kaufman, 2012.	"[…] a self-report, domain-specific measure assessing creativity in 5 domains: Everyday, Scholarly, Performance, Science, and the Arts." (McKay et al., 2017).
Beghetto's three item scale	3	Published by Ronald A. Beghetto in 2006.	Short scale to measure creative self-efficacy (R. Beghetto, 2006).

Creative Mindsets Scale (CMS)	10	Developed by Maciej Karwowski in 2014.	Ten-item scale to measure creative mindset – the perception of creativity as a fixed or malleable trait (Karwowski, 2014).
The Short Scale of Creative Self (SSCS)	11	By Karwowski, Lebuda, & Wiśniewska, first occurrence in 2012.	Measures creative self-efficacy (6 items) and creative personal identity (5 items) (Karwowski, 2012).

** Approximate figures. Many of the instruments exist in several different versions.*

The comparison depicts the lengthiness of most instruments. The high number of items is usually due to the fact that many of the instruments seek to assess creativity across a wide range of domains and distinguish between different facets of the trait. This is valuable in some research contexts but not necessary for the more high-level aims of this study.

2.7.1 Beghetto's three-item scale

Based on the assessed instruments and recommendations from my co-researcher, Beghetto's three-item scale showed the most promise. It is by far the shortest of all instruments considered and is relatively new compared to the field as a whole. The three-item scale was initially used as part of a more extensive study looking at correlations between creative self-efficacy, motivational beliefs, classroom experience, academic beliefs, and after-school activities in middle and high school students (R. Beghetto, 2006, s. 449). Beghetto's application of the scale is somewhat similar to our survey, as both are exploring correlations between creativity, motivational factors, and contextual experiences (classroom and workplace). The three items of the original scale were: (1) I am good at coming up with new ideas, (2) I have a lot of good ideas, and (3) I have a good imagination (R. Beghetto, 2006, s. 450).

There are some important comments to be made about Beghetto's items. Firstly, they are constructed based on previous research on creative self-efficacy and the more general concepts of creativity and self-efficacy (R. Beghetto, 2006, s. 450). However, as previously mentioned, there have been advances in the field, and the most recent theories about self-efficacy state it as highly context-specific (Karwowski et al., 2019, s. 398). Measuring self-efficacy, therefore, requires questions to specify a task and situation (Karwowski, 2017, s.

10). Given the general wording of Beghetto's items, it can be discussed whether the scale is, in fact, measuring creative self-efficacy or rather the more general level of creative confidence. After all, this has been a common misconception in prior creativity research (Karwowski, 2017; Kaufman & Sternberg, 2019). Hence, although Beghetto's scale is described as a measure of self-efficacy, it seems more applicable as a measure of creative confidence and should therefore serve the purpose of our survey. However, it should be noted that the original scale was used mainly as a theoretical foundation and that modifications were made to the three items in our final survey. The changes are presented and discussed in chapter 3.3.3.

3 Methodology and measures

A review of literature on hospital innovation revealed that the current body of research is skewed mainly towards research on the organizational level. However, I pose that investigating individual creative abilities in relation to hospital innovation is essential for our understanding of how hospitals can exploit the full potential for healthcare innovation. This thesis is a preliminary attempt to bridge this gap in the current research.

The basis for this thesis is a cross-sectional quantitative self-report survey of organizational innovation capabilities, work culture, and individual creativity conducted among 161 employees at the Norwegian rehabilitation hospital Sunnaas. The study was conducted in collaboration with Taran Mari Thune from the center for Science and Technology Studies at the University of Oslo and the leader of the innovation department at Sunnaas, Sveinung Tornås.

The main research question investigated is: *how does employee creative confidence influence innovation activities in a healthcare environment?* As a framework and jumping-off point for investigating the research question, I have posed the following hypotheses:

H1: Employees with higher levels of creative confidence submit more ideas for innovations.
H2: Employees with R&D as a job requirement submit more ideas for innovations.
H3: Employees with R&D as a job requirement perceive themselves as more creative.

The selection of research presented in the previous chapters serves as a theoretical underpinning for my methodical framework and the survey design. The final survey tied together measures on innovative capabilities, work climate for creativity, and creative confidence alongside a selection of control variables. The dependent variable was a measure of innovation activity operationalized as the submission of innovation ideas.

One of the main concerns when designing the survey was tailoring it to the hospital environment. The pilot study from 2015 was developed by interviewing key personnel and gathering feedback from the regional innovation network representing the four involved hospitals (Thune, 2015). Building upon insights from the previous study, the present study was tuned in collaboration with the innovation manager at Sunnaas before it was internally

tested on five employees at Sunnaas. We received some suggestions for more precise wording along with overall positive confirmation of understandable language and time scope. Feedback from the test group was used to adapt the questionnaire further. The final survey included a total of 27 variables.

3.1 Research object

The survey was conducted on employees from Sunnaas rehabilitation hospital in Norway. Researchers at TIK have conducted several prior studies investigating this particular hospital's innovation activities – including the precursor to this survey from 2015 (Thune, 2020). Sunnaas is Norway's largest specialist hospital in physical medicine and rehabilitation. The hospital employs in total 777 people, 75.5% of whom are full-time employees. There is a clear predominance of women. Men account for only 20% of the workforce. Among full-time employees, the distribution is even more skewed (84% vs. 16%). The mean age is 43.7 years, and patient-oriented positions account for the largest share of employees (277). This category includes a wide range of occupational groups such as social workers, speech therapists, physiotherapists, and occupational therapists. Nurses make up the second largest group (169). Combined, the two categories account for roughly 54% of the total workforce.

As a rehabilitation hospital, Sunnaas are tasked with complex issues demanding a high degree of individual customization and interdisciplinary expertise. This makes them an interesting research subject in terms of creativity and innovation as their day-to-day operations differ from general hospitals and specifically tick several boxes believed to be inducive of creativity in organizations such as team diversity, collaboration, experimentation, and professionally challenging work tasks. Furthermore, the hospital has consciously sought to improve its innovative capabilities for several years. An innovation management tool is used to systemize ideas and track innovation processes. To better understand the nature of innovation projects and submitted ideas, I was given access to a few descriptive reports containing the number of submitted ideas, categorization, and project status. Sunnaas has actively positioned itself as an innovation partner for founders and businesses, and a vast part of ongoing projects are collaborations externally initiated. Internally sourced ideas go through a screening process where they are categorized as either an improvement or an innovation project. Improvements are suggestions that fall outside the scope of innovation (i.e., environmentally friendly coffee cups and anti-slip mats for patient showers) and stand

for the majority of submitted ideas. These ideas get assigned to the relevant supervisors and archived. Suggestions categorized as potential innovations follow a set path through a stage-gate process. The hospital has well-established systems for innovation management, allocated resources, and expresses a positive attitude towards innovation. An interesting point to be made here is that the benefits from these innovative capabilities, although objectively present, can arguably only be reaped if perceived in the same way by employees. A self-assessment survey may therefore provide the hospital management with knowledge about how well the organizational structures have been implemented across the organization and which areas require further attention going forward.

To encompass innovation activity and creativity across the entire spectrum of positions and areas of expertise, the questionnaire was designed agnostic to specific work tasks and distributed to employees across the entire organization.

3.2 Participants

In total, n = 201 employees at Sunnaas rehabilitation hospital in Norway answered the survey. After removing incomplete responses, I was left with a subset of n = 161. The hospital has in total 777 employees, which makes the subset 20.7% percent of the population size.

3.3 Measures

In total, the survey included 27 items: Eighteen items for assessing the organization's innovative and creative capabilities, three self-report creativity items, five variables capturing various demographic information, and one variable assessing innovation activity.

3.3.1 Innovation activity

As suggested by other researchers, hospital innovation may be largely underestimated (Morlacchi & Nelson, 2011; Salge & Vera, 2009; Thune & Gulbrandsen, 2016; Thune & Mina, 2016). The high levels of practice-based and incremental innovation found to happen in hospitals (Morlacchi & Nelson, 2011; Salge & Vera, 2009) undermines the use of traditional innovation indicators such as patent data, publications, and licensing.

To capture the entire breadth of hospital innovation and remedy some of the potential pitfalls, we decided on a micro-level approach utilizing self-assessment of creative activity as our primary dependent variable. Innovative activities are understood as "[…] all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations" (OECD & Statistical Office of the European Communities, 2005). We operationalize this concept by an item asking the respondents if they have submitted ideas.

Since the production of ideas is particularly essential for the first steps of the innovation process (Kline & Rosenberg, 1986), the submission of ideas is arguably reflective of a wide range of internal organizational innovation efforts. An organization may conduct many different innovative activities; however, they are ultimately all anticipated to culminate in ideas with innovative potential. As such, the production of ideas can arguably serve as an outcome measure capturing the effects of various internal innovation efforts.

We asked respondents whether they, personally or as part of a team, had submitted an idea for an innovation to an innovation department or through the hospital's innovation management system. The question had four response items: never, once, several times, don't know. For the analyses, two versions of this variable were created. Version one was a dummy variable where the options never and don't know were assigned to zero, while once and never was assigned to one. Version two was a variable with three categories: never, once, and several times. In both versions, I made the assumption that respondents not knowing if they had submitted an idea most likely had not and merged them with the respondents in the never-category. The two different variables for submitted ideas are used as the dependent variable in several of the analyses.

The variable, being a self-report measure, does not discriminate between different types of ideas. Based on previous studies, hospital employees seem more frequently involved with service innovation than product innovation (Thune, 2015). As previously mentioned, data from the hospital's internal innovation management system has revealed that the majority of submitted ideas are categorized as improvements rather than innovations. The ideas categorized as having innovation potential are typically very practice-focused. For instance, there were several ideas for digital tools concerned with various rehabilitation treatments

such as virtual intensive hand training, tele-speech therapy, and digital exercise plans for patients.

3.3.2 Innovation capabilities

Whilst innovation *activities* are the concrete actions taken towards the implementation of innovations, innovation *capabilities* cover all the organization's skills and resources aimed to support and promote such activities among its employees (Thune & Gulbrandsen, 2016).

There is a vast body of research on creativity and innovation in organizations (Amabile, 1997; Ekvall, 1996). The lion's share of our questionnaire was devoted to capturing different aspects of the organization's innovative capabilities and its ability to nurture creativity. We used the main empirical categories found in the dynamic componential model of creativity and innovation (Amabile & Pratt, 2016), alongside the conceptual model behind KEYS (Amabile & Coon, 1996) and theories underpinning the 2015 pilot study (Thune, 2015) as a blueprint for the cultural and environmental measures. We also drew upon insights from the interactionist model of organizational creativity (Woodman et al., 1993), literature from innovation research exploring innovative capabilities (Lorenz & Lundvall, 2011), and measuring practices in public sector innovation (Bloch & Bugge, 2013).

Prior research has found organizational features such as encouragement of creativity (Amabile & Coon, 1996), R&D investments and allocation of resources (Amabile & Pratt, 2016), supervisors leadership style (Amabile, 1997; Lorenz & Lundvall, 2011; Škerlavaj et al., 2014; Zhou, 2003), learning orientation (Dias & Escoval, 2015; Gong et al., 2009), workgroup climate and work design (Amabile & Coon, 1996; Elsbach & Hargadon, 2006), time pressure and various organizational impediments (Amabile & Coon, 1996; Amabile & Pratt, 2016) to impact organizational creativity and innovation. A more detailed description of the theoretical background for these concepts was presented in chapter two.

Based on the existing literature, we developed a conceptual model with corresponding items to tap each empirical construct. In light of the high demands for patient safety in health care institutions, autonomy and freedom are hard to achieve – especially in clinical positions. We decided to refrain from tapping this specific construct in order to keep the survey as short and relevant as possible for the respondents.

Analytical level	Empirical construct	Items*
Organizational level	Motivation to innovate	1. I experience that working with innovation is an important task in this organization 2. The management of this hospital is interested in innovation
	Skills in innovation management	3. I know where to go if I get an idea for an innovation 4. Ideas for innovations are followed up in this organization
	Resources in the task domain	5. The organization has resources available to follow up on good ideas
Group level	Supervisors' leadership style	6. There is room to take risks and make mistakes when we try out new solutions 7. You get recognition when coming up with creative suggestions 8. You can suggest unusual ideas without being afraid of appearing stupid
	Workgroup support	9. My colleagues and I regularly discuss ideas for how things can be improved or done differently 10. If I come up with creative suggestions, I often meet opposition from my colleagues
	Work design	11. I often collaborate with others 12. We often experiment with new solutions 13. The workload pressure is so high that we don't have time to develop new ideas
Individual level	Meaningful work (intrinsic motivation)	14. I experience my job as meaningful 15. The organization has a great need for me and the job I do
	Learning orientation (intrinsic motivation)	16. My work challenges me professionally 17. My work often makes me learn new things 18. In my job, I often have to deal with new problems and situations

** Items are translated to English. The original language of the questionnaire was Norwegian.*

The final survey included 18 items measuring aspects of the work environment and innovation capabilities. The respondents were asked to what degree they agreed with the presented claims. All items were measured on a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). A four-point scale was chosen to avoid a natural midpoint and force the respondents to make an active choice. However, reducing the number of options also reduces the possible variation and may affect the answer distribution.

A common issue with self-report measures is the possibility of inflated ratings. Inflated ratings may happen due to an overestimation of personal abilities (Kaufman et al., 2010;

Kruger & Dunning, 1999) or uncertainty regarding the information privacy causing the respondent to opt for socially favorable options. Karwowski has suggested that the use of longer-range answer scales could help remediate potentially inflated ratings and provide more accurate predictions (Karwowski, 2017, s. 11). This is, however, relatively uncommon for respondents and may make the questionnaire seem overly complicated. To avoid this, we opted for a more traditional solution in this survey, but the suggestion is an interesting proposal for future versions of the instrument.

3.3.3 Creative confidence

Three items were developed to form a creativity scale based on Beghetto's three-item scale (R. Beghetto, 2006). The items of the original scale are (1) I am good at coming up with new ideas, (2) I have a good imagination, and (3) I have a lot of good ideas. As discussed in the previous chapter, I have reframed the scale as a measure of creative confidence rather than creative self-efficacy. Creative confidence has a broader scope than creative self-efficacy. However, creative confidence is still domain-specific. Although whether creativity is domain-specific or domain-general is an ongoing debate among creativity researchers (Kaufman & Baer, 2004), it is generally believed that it takes a certain level of expertise in a field to produce a creative outcome (Amabile & Pratt, 2016). In other words, a person exhibiting significant levels of creativity in one domain may not necessarily perform at the same level within a completely different domain. Hence, even after reframing the scale to the level of creative confidence, the original scale items seem too general to capture domain specificity. Therefore, the following modifications were made:

1. **I am good at coming up with new ideas to solve problems.**
   Original item: I am good at coming up with new ideas.
   In combination with the fact that the hospital management administers the survey, this rephrasing should give it clearer direction towards creativity in the context of work and with a sense of usefulness as the desired outcome in accordance with current definitions of creativity and innovation (George, 2007; Kaufman & Sternberg, 2019, s. 17; Mednick, 1962).

2. **I have a good imagination.**
   Original item: I have a good imagination.

This item was kept as is in order to supplement the first item with a broader understanding of creativity. Where the first item is quite specific, this item aims to capture a trait associated with more general levels of creativity. A similar item is found in the CPS instrument (Kaufman & Baer, 2004). The underlying rationale is that individuals may be proficient at coming up with practical solutions without necessarily scoring high on other creativity indicators. Hence, individuals with a high score on both items should exhibit higher levels of creativity in total. It is worth noting that this reasoning suggests a formative approach to measuring creativity – which is not uncontroversial (Diamantopoulos & Siguaw, 2006; Edwards, 2011; Sullivan & Ford, 2010).

3. **I am more creative than most of my colleagues.**
   Original item: I have a lot of good ideas.
   We considered the original item too similar to item number one and possibly confusing for the respondents. Instead, we replaced it with an item aimed at adjusting for inflated self-ratings in the other two items by providing a frame of reference. Social comparison is described as a key feature associated with creative self-concept (CSC) (Bong & Skaalvik, 2002, s. 3; Karwowski, 2017, s. 9).

3.3.4 Additional variables

The variables assessing the work environment and creative confidence are supported by six additional variables.

An essential prerequisite for creativity is having skills in the task domain (Amabile & Pratt, 2016). The reasoning is that creativity is an act of recombination and that higher levels of expertise provide more possible linkages and thus enables a greater pool of possible fruitful combinations, at least up to a certain point (Cohen & Levinthal, 1990; Garud et al., 2013; Nelson & Winter, 2004). Some research also suggests that too deep knowledge may cause myopia and inhibit innovation (Kaplan & Vakili, 2015). To gauge this trait, our survey asks respondents to report how many years of relevant experience they have. Assuming skills develop over time, the variable *years of relevant experience* serves as a proxy for the individuals' expertise.

Educational level is another measure tied to expertise and knowledge. Where the previous variable measures expertise relative to the position and educational level of the respondent, a measure of educational level can be used to uncover group differences. Furthermore, hospital innovation is traditionally attributed to clinical research efforts (Thune & Mina, 2016). To test this assumption, we introduced response items differentiating between clinical and non-clinical educations. Educational level was measured as a categorical variable containing six options: Other education, clinical bachelor's degree, other bachelor's degree, clinical master's degree, other master's degree, and Ph. D.

Prior research suggests that one of the most effective ways of increasing employee's creative engagement is to make it a job requirement (Unsworth et al., 2005). Hence, we anticipate employees having R&D as part of their work to submit more ideas. Furthermore, we wanted to investigate whether employees holding positions requiring R&D are more creative than employees in positions where R&D is not expected (hypothesis 3). To capture this, a binary variable asking the respondents whether R&D is part of their work requirement or not was included.

Hospitals are complex organizations serving many different functions and containing an extraordinary heterogeneous selection of work tasks. Hence, the work carried out differs significantly between positions. It is reasonable to assume that innovation activity may differ between positions for various reasons, such as job design, individual leadership qualities among supervisors, varying work climate across departments, and differing perceptions of organizational capabilities. Although not essential for this specific thesis, the ability to investigate differences between positions should be valuable for organizations working to improve their innovative capabilities – allowing them to explore how different parts of the organization respond to the organizational efforts. The survey included a categorical variable with the following response items: management, administration/support, nurse, health professional, doctor, occupational therapist, physical therapist, psychologist, other.

In addition to the above variables, the questionnaire also included a question about the respondent's gender.

3.4 Procedure

The survey was distributed by staff at Sunnaas to all employees in November 2020. Participation was voluntary, and the respondents did not receive any reward for completing the survey. The survey gathered no directly identifiable data. Furthermore, the variable selection was considered in collaboration with the hospital management with regards to preventing identifiable combinations of items and secure respondent privacy. Staff at Sunnaas compiled the data into a spreadsheet before sharing it with me and my co-researcher, both external to the organization. As such, the data obtained was anonymous and did not require reporting to NSD. The research was carried out in accordance with NESH[2] ethical guidelines.

3.5 Methods

3.5.1 Data analysis

The data was analyzed with several different techniques. First, descriptive statistics were generated to get an overview of the dataset. Further, an exploratory factor analysis was conducted to inspect the variable structure. This analysis technique groups items that the respondents tend to answer similarly and explores whether several items measure the same overlying concept (Thrane, 2018). I used factor analysis to compare my results to the underlying theoretical models and investigate if the data justified aggregating single items into scales.

The data was examined using a variety of different techniques depending on the types of variables included in the analyses. For bivariate analyses where one of the variables is dichotomous, t-tests are conducted. This test compares the mean difference in the independent variable between the groups of the dependent variable. Bivariate analyses where the dependent variable contained more than two categories were tested using a one-way analysis of variance. Tukey post hoc tests were used to expose group differences. Analyzing the relationship between two categorical variables was done using cross tables, and significance was investigated with chi-square tests.

Finally, both bivariate and multivariate regression models were calculated. Logistic regression models are traditionally seen as the most appropriate when having a binary

[2] Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora

dependent variable (Thrane, 2018). However, this view has shifted in recent years, and researchers are now increasingly using linear regression models also for binary outcome variables (Thrane, 2018, s. 106). Research has found linear regression to give equally good estimates as logistic models (Gomila, 2020). Furthermore, results from linear regression are more easily interpretable, and hence Gomila (2020) argues that linear regression models are, in sum, a safer choice. I have used logistic regression in places where the goal was to explore odds ratios; elsewhere, I used linear regression. The final regression model was built by conducting the forward selection method (Halinski & Feldt, 1970). First, bivariate regression estimations with submitted idea dummy as the dependent variable were conducted for all independent variables to decide on the order of inclusion. Further, variables were introduced in a stepwise manner and kept if they displayed significant results below the 5% threshold.

3.5.2 Challenges for survey methodology

There are several challenges worth mentioning concerning the choice of survey method. Firstly, since the survey was voluntary and anonymous, we could not follow up with non-responders. As a result, primarily employees interested in the topic may have responded, which could cause a selection bias. Further, and as previously mentioned, self-assessment surveys are susceptible to inflated ratings (Kaufman et al., 2010; Kruger & Dunning, 1999). Many existing self-assessment instruments have been tested for reliability and validity. However, there is still uncertainty whether self-assessment can predict actual performance. Within the domain of creativity research, a few studies have tried to tackle this question. Some studies report measures of creative self-assessment to coincide with expert ratings, but only modestly (R. A. Beghetto et al., 2011). Others have tested the convergence between different instruments and report self-assessment instruments to perform better than expected (Silvia et al., 2012). On the other end of the spectrum, a few studies report self-assessment not to be predictive of expert ratings (Kaufman et al., 2010; Priest, 2006).

Even though this survey is based on validated instruments, there is no guarantee for the validity of our survey. Tests of validity and reliability are not yet conducted and should be carried out if the instrument is developed further. Moreover, the data from this survey should be taken for what they are, namely self-reports. The data gathered does not necessarily represent an objectively accurate image but reflects the employee's *perceptions.* Our survey also contained far fewer items than most prior and similar instruments. This was a deliberate

choice to maximize the response rate, but it also increases the pressure to find the optimum set of questions to capture each construct accurately. In future versions of the instrument, a more comprehensive range of items could be tested to further explore which will yield the best possible results.

3.5.3 Delimitation

As both Sunnaas and most Norwegian hospitals are public organizations, this will be a natural delimitation in this study. Public and private sector organizations operate under radically different terms, and hence often with diverging interests. For instance, public sector organizations do not operate in a market environment the same way as private corporations (Bloch & Bugge, 2013). This makes the public sector an interesting research subject in terms of creativity because the rules of the game are, potentially, fundamentally different. Whereas the private sector's primary focus is economic viability, and often limited to a relatively short time horizon, the public sector often has different considerations and prerequisites. This is especially true within the healthcare system, where the economic benefits can be far into the future, difficult to isolate, or altogether non-existent. Instead, the public sector seeks value creation in the form of improved services, social outcomes, and public trust and legitimacy (Kelly et al., 2002). There has long been a perception that most innovation happens in the private sector, while the public sector plays the role of facilitator (Windrum, 2008). However, this assumption has largely been refuted in recent years (Mazzucato, 2015), and public sector innovation has received an upsurge of attention (Bloch & Bugge, 2013).

Much of the empirical foundation for my survey has been validated on both private and public sector organizations. However, due to the above arguments, the findings presented in this thesis can, at best, be generalized to public healthcare institutions in Norway. Primarily, the research should be seen in relation to the organization in question. Further research in other healthcare institutions and sectors is needed to capture the complete picture and find support for the results.

4 Results

In this part, I will present results from the survey and analyses carried out. The overarching research question is considerably broader in scope than the stated hypotheses. As such, I will give a broader overview of the data than strictly necessary to investigate the specific hypotheses. The aim is to facilitate a discussion about the effect of employee creativity on innovation activity more generally, in addition to zooming in on specific areas of interest.

Before delving into the analyses, I will present descriptive information about the respondents and how their responses are distributed on the demographic variables. Proceeding, I will introduce the results from the factor analysis as a backdrop for the discussion about innovative capabilities and the survey's empirical model in relation to prior research. Moving on, results from bivariate analyses and hypotheses tests are presented. Lastly, all relevant variables are integrated into a multivariate regression model.

4.1 Descriptive statistics

Firstly, I looked at descriptive statistics to get an overall feel for the data.

16.77% of respondents in our sample are male, 77.64% are female, while 5.59% did not want to state their gender. Overall, the gender distribution in our data is representative of that in the total population[3].

		Freq.	Percent
Gender	Male	27	5.59
	Female	125	77.64
	I don’t want to answer	9	5.59
Position	Management	28	17.39
	Administration / support	35	21.74
	Nurse	21	13.04
	Health professional	6	3.73
	Doctor	10	6.21
	Occupational therapist	10	6.21
	Physical therapist	11	6.83
	Psychologist	5	3.11

[3] According to Sunnaas 2019 HR report 84% of employees are female while 16% are male.

	Other	35	21.74
Education	Ph. D	16	9.94
	Clinical master's degree	16	9.94
	Other master's degree	43	26.71
	Clinical bachelor's degree	43	26.71
	Other bachelor's degree	24	14.91
	Other education	19	11.80
R&D as part of work	Yes	88	54.66
	No	73	45.34

The largest group of respondents by position work in administration/support (21.7%) and other (21.7%)[4]. Relative to the distribution on positions in the hospital as a whole, our survey has a slight predominance of employees holding management and administration positions. Among employees with a master's degree, a non-clinical master is the more common. The opposite is true among employees with a bachelor's degree, where there is a predominance of employees with a clinical education. A little more than half of the respondents report having R&D as part of their work (54.66%).

Table 3 displays the answer distribution on the main dependent variable, submitted ideas. The majority of respondents in our survey have never submitted an idea (55.9%) or did not know (7.45%). For my analyses, I made the assumption that those who did not know if they had submitted an idea most likely had not. As such, a total of 63.35% of respondents were categorized as never having submitted an idea.

Table 3 – Submitted ideas

Submitted ideas	**Freq.**	**Percent**
Never	90	55.90
Once	27	16.77
Several times	32	19.88
Don't know	12	7.45
Total	161	100.00

[4] To ensure the anonymity of the respondents, positions with relatively few employees were merged in the category *other*. This category includes positions such as: social worker, speech therapist, sociologist, health secretary, clinical nutritionist, deacon and hospital chaplain, among others.

Of the respondents having submitted ideas, 27 respondents had submitted an idea once, while 32 had submitted an idea several times.

A mean estimation of all Likert-scale items revealed an overall positive image. For most variables measured on the four-point Likert scale, a higher score is better. Observations for the variables with a reversed logic (creative resistance and workload barrier) are inverted in Table 4 for ease of comparison. All positively phrased questions received a score above the middle mark, most of them even above 3, implicating that we are dealing with a highly skewed dataset.

Table 4 – Descriptive statistics of items on innovation capability and work climate

	Mean	Std. Err.	95% Conf. Interval	
Organizational level				
Innovation is important to this organization	3,30	0,06	3,18	3,42
Leadership interest	3,30	0,06	3,18	3,42
I know where to go if I have an idea	3,27	0,08	3,12	3,42
Ideas are followed up	3,02	0,07	2,89	3,15
Available resources	2,68	0,07	2,54	2,82
Group level				
Risk tolerance	2,84	0,09	2,67	3,01
Recognition for creativity	3,25	0,06	3,13	3,38
Accept of unusual ideas	3,11	0,07	2,97	3,24
I discuss ideas with colleagues	3,19	0,06	3,08	3,30
Resistance to creativity among colleagues	2,70	0,09	2,51	2,88
I often collaborate with others	3,24	0,03	3,17	3,31
We often experiment with new solutions	2,81	0,08	2,66	2,97
Excessive workload	2,15	0,08	1,98	2,32
Individual level				
I experience my job as meaningful	3,27	0,04	3,19	3,36
The organization has a need for me	3,30	0,04	3,22	3,38
My work often makes me learn new things	3,34	0,05	3,24	3,43
My work challenges me professionally	3,31	0,05	3,21	3,41

Looking at the distribution of answers in stacked bar charts (Figure 5, Figure 6, Figure 7) gives a quick visual overview of the skewness[5]. It is also worth noting that the negatively phrased items (workload pressure and creative opposition from colleagues), which were reversed in the table, are not so in the charts.

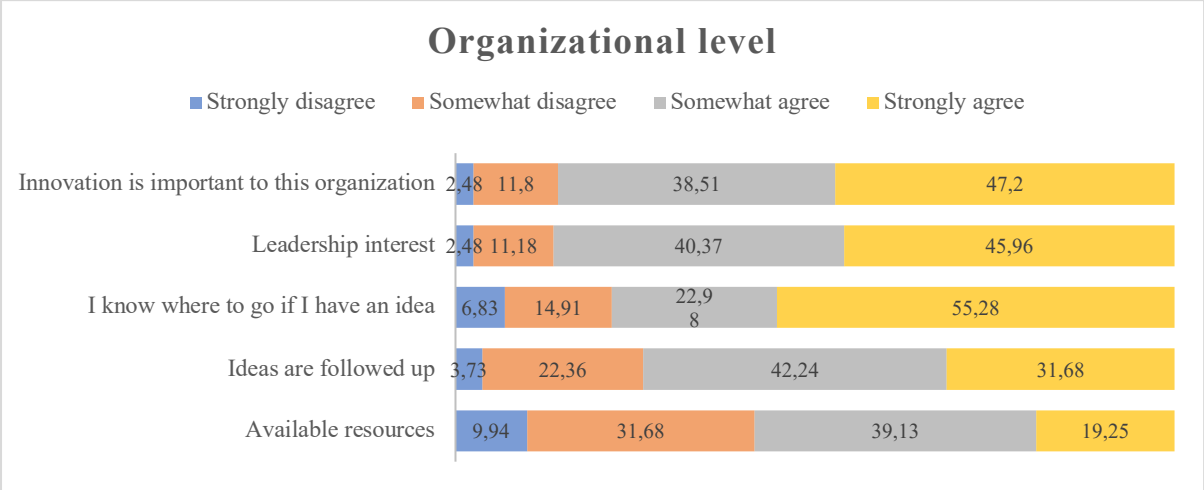

Figure 5 – Distribution of answers on organizational level variables

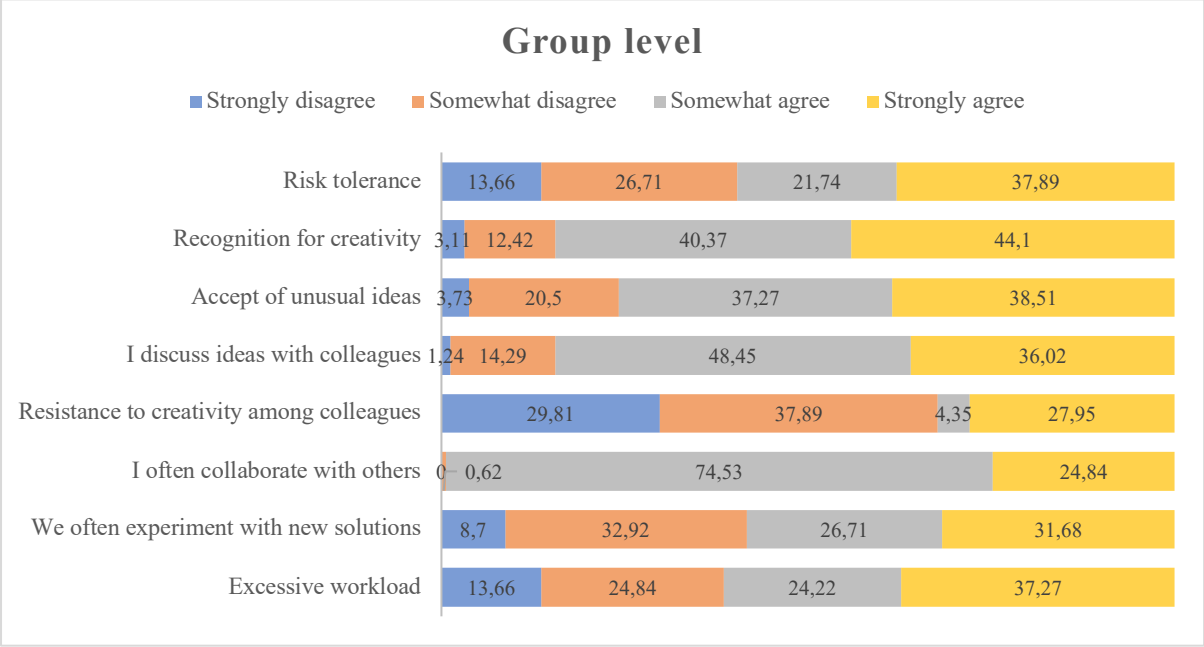

Figure 6 – Distribution of answers on group level variables

[5] Be aware that the questions are abbreviated in this chart to fit the page (see the table in section 3.2.1 for more accurate wordings).

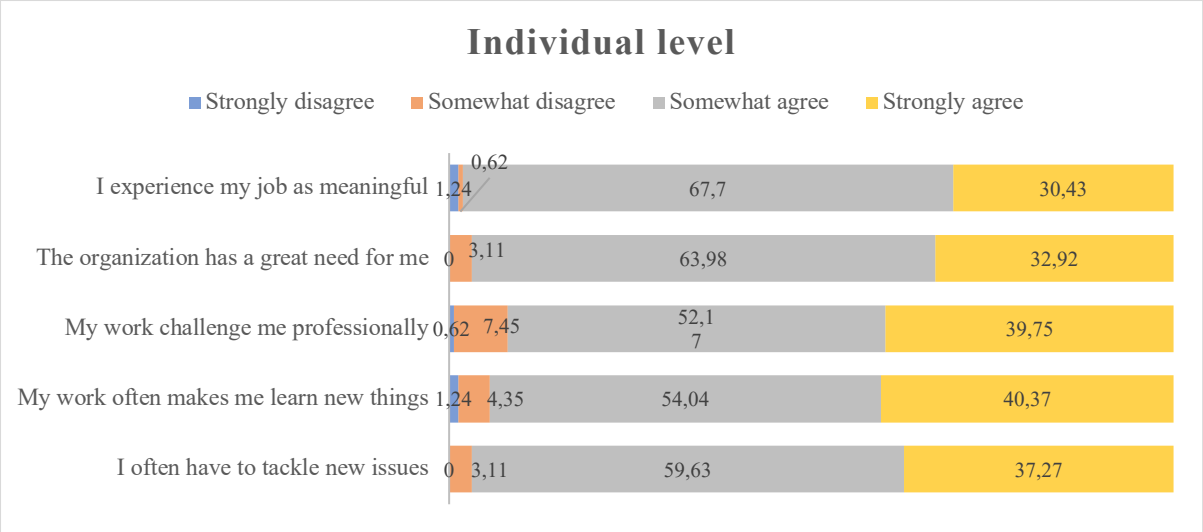

Figure 7 – Distribution of answers on individual level variables

In sum, employees perceive their work as meaningful and, in large, report high scores for creativity stimulants such as collaboration, leadership interest, openness to new ideas, and acceptance of unusual suggestions. The most notable barriers are the perception of available resources, workload pressure, and resistance from colleagues to creative ideas. Also, there are more answers on the low end for questions related to the acceptance of risk, failure, and experimentation relative to other items. As previously mentioned, the hospital does tick several boxes empirically found to promote creativity and innovation in organizations and has actively sought to improve its innovative capabilities. Based on the data we have, there is, however, no telling if the overall high scores can be attributed to the hospital's innovation efforts or whether they are due to selection skewness, inflated ratings, or a cocktail of everything.

The variables aimed at assessing the respondents' creative confidence also received pretty high scores (Figure 8). What is interesting to note in the creativity variables is that even though fantasy and generation of ideas are heavily right-skewed, the question asking respondents whether they are more creative than their co-workers is fairly normally distributed. The respondents are almost perfectly split down the middle, with 51.56% respondents saying they somewhat or strongly agree, while 48.44% disagree.

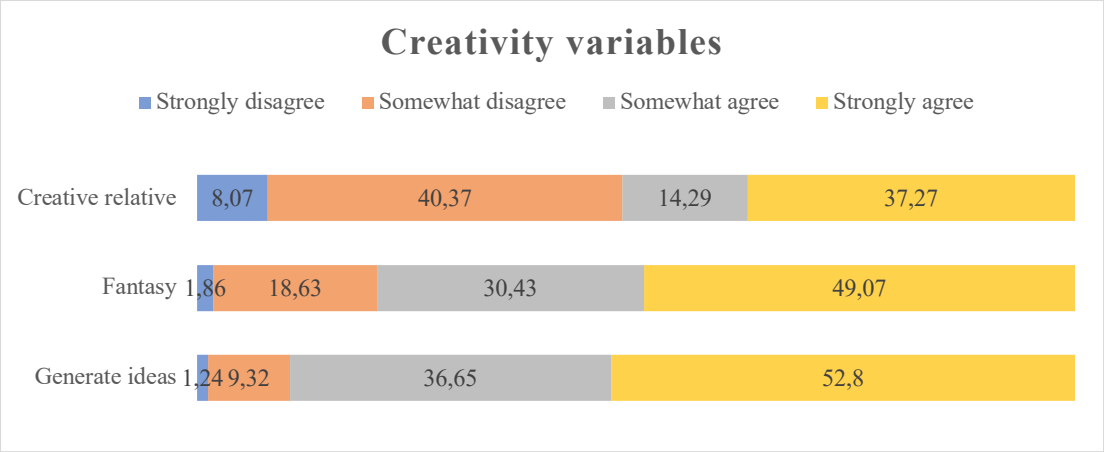

Figure 8 – Creativity variables distribution

4.1.1 Variable structure and factor analysis

To test the empirical model, I ran an exploratory factor analysis on all variables measured on a Likert scale. The factor analysis revealed eight factors, four of which represented the most complete picture. The factor structure of the remaining variables was more diffuse.

Variable	F1	F2	F3	F4	F5	F6	F7	F8	Uniq.
Idea follow-up	**0,83**	0,13	0,02	0,06	0,13	0,02	-0,01	-0,02	0,27
Leadership interest	**0,78**	0,15	0,08	-0,03	0,05	-0,12	-0,06	0,05	0,33
Submit where	**0,76**	0,03	0,01	0,04	-0,12	0,05	0,05	-0,09	0,39
Available resources	**0,68**	0,06	-0,08	-0,01	0,30	0,16	0,23	-0,04	0,35
Innovation importance	**0,66**	0,04	-0,02	-0,28	-0,18	-0,06	0,07	0,25	0,39
Experimentation	0,27	**0,71**	-0,03	0,02	0,31	-0,07	0,03	0,07	0,32
Creative recognition	-0,07	**0,69**	0,23	-0,14	-0,03	-0,02	-0,10	0,13	0,41
Unusual accept	0,09	**0,67**	0,06	-0,15	0,10	0,22	-0,06	0,06	0,45
Risk accept	0,31	**0,67**	-0,02	-0,10	-0,02	-0,08	0,32	0,02	0,34
Learn new	-0,03	0,00	**0,89**	-0,04	-0,07	0,04	-0,04	-0,06	0,20
Professional challenge	0,06	0,12	**0,82**	0,16	0,05	-0,11	0,10	0,01	0,26
I often cooperate	-0,07	-0,24	0,01	**0,77**	0,07	0,08	-0,10	-0,10	0,31
Meaningful work	0,05	-0,11	0,20	**0,69**	0,01	-0,20	0,02	0,08	0,43
Organizational need	0,00	0,31	0,03	**0,55**	-0,39	0,09	0,17	0,08	0,39
Creative resistance (inv.)	0,06	0,19	-0,04	0,03	0,84	-0,07	0,01	-0,03	0,24
Creative relative	0,05	0,08	-0,12	-0,05	-0,05	0,74	-0,07	0,01	0,42
Tackle new	-0,02	-0,06	0,45	0,17	-0,13	0,52	-0,20	0,04	0,43
Workload barrier	0,08	0,06	0,03	-0,01	0,02	-0,08	0,86	0,01	0,25
Discuss with colleagues	0,13	0,18	0,41	0,05	0,01	-0,41	-0,41	0,13	0,43
Generate ideas	-0,03	0,20	-0,07	0,06	-0,13	-0,09	-0,08	0,84	0,22
Fantasy	0,12	-0,15	0,06	-0,18	0,42	0,29	0,23	0,61	0,23

The factor structure largely supports the theoretical concepts from prior research on organizational creativity and innovation. The common denominator for items loading onto factor one is that they belong to the organizational level and are in the hands of top management. Factor one encompasses leadership interest, agenda-setting, and organizational structures and resources – all of which contribute to communicating how important innovation is for the organization. Factor two comprises items typically related to supervisors' leadership skills: creating a work environment accepting of risk, openness to unusual ideas, room for experimentation, and recognition for creative efforts. Factor three consists of the variables learning and professional challenge and can be said to represent a learning orientation. Factor four is made of items related to the perception of doing meaningful work, which is typically found to impact intrinsic motivation (Amabile & Pratt, 2016).

The four factors were tested for internal consistency using Cronbach's Alpha. It should be noted that the reliability of this test has been debated (Dunn et al., 2014). Dunn et al. (2014) promote the use of McDonald's Omega as a superior alternative as it is less restrictive, makes more realistic assumptions, and mitigates some of the internal consistency estimation problems in Cronbach's Alpha (Dunn et al., 2014, s. 406). For comparison, I ran both tests. Results are presented in Table 5.

Table 5 – Cronbach's alpha and Omega scores for innovation capability scales

Factor		Alpha	Omega
1.	Organizational motivation to innovate	0.8097	0.8162
2.	Skills in innovation management	0.7101	0.7136
3.	Personal development/learning orientation	0.7540	N/A
4.	Meaningful work	0.4693	0.5030

Overall, the Omega gave slightly stronger results. Factor 1 ($\alpha = .81$, $\omega = .82$), factor 2 ($\alpha = .71$, $\omega = .71$) and factor 3 ($\alpha = .75$) showed a satisfactory test score. Factor 4 did not report satisfactory internal consistency ($\alpha = .47$, $\omega = .50$).

However, comparing regression models using scales against models using single variables revealed that the scales masked effects of single variables with much explanatory power. This was especially evident in factor 1, organizational motivation to innovate. A bivariate

regression analysis reported a strong statistically significant relationship between the scale organizational motivation to innovate and submitted ideas ($t = 5.10$, $P > t = 0.000$). This is in line with prior literature and findings from other studies (Amabile & Pratt, 2016). However, conducting a multivariate regression analysis with the variables from factor 1 as single items revealed that the performance of the scale was mainly caused by one variable: *submit where* (see Table 6). All other variables in the scale came out insignificant. Moreover, the additional variation explained by the model using the scale versus the one using single items was exceedingly small (.006). In order to be sure no valuable connections were missed, I found it most sound to refrain from using scales in the subsequent analyses despite the results of the factor analysis and consistency tests.

Table 6 – Multivariate regression analysis of single items from factor 1

Submitted Ideas (dummy)	**Coef.**	**t**	**P>t**	**95% conf. interval**
Idea follow-up	.08 (.06)	1.22	.225	-.05, .20
Leadership interest	.00 (.06)	-.05	.961	-.13, .12
Submit where	.12 (.05)	2.56	.011	.03, .21
Available resources	.03 (.05)	.52	.602	-.07, .13
Innovation importance	.05 (.05)	.91	.362	-.06, .16
Const	-.48 (.19)	-2.57	.011	-.85, -.11

N = 161; F(5, 155) = 5.75; P > F = 0.0001; $R^2 = 0.1564$; Adj. $R^2 = 0.1292$

The factor analysis revealed that the creativity items did not load onto the same factor and yielded surprisingly low alpha scores ($\alpha = .24$) compared to what Beghetto (2006, s. 450) reported in his study ($\alpha = .86$). However, Cronbach's alpha is used to measure internal consistency – which assumes that the items are different indicators of the same overlying unidimensional concept. Much of the creativity research, on the other hand, describes creativity as a combination of different traits, which suggests it is a multidimensional construct. Whether creativity is best understood as a unidimensional trait with reflective indicators or a multidimensional construct best observed by formative measurement models is an ongoing debate among researchers in the field (Diamantopoulos & Siguaw, 2006; Edwards, 2011; Hee Kim, 2006; Sullivan & Ford, 2010). It is outside the scope of this thesis to investigate this debate in detail or take a side in the discussion. Nonetheless, to decide on which measure to use going forward, I ran three regression analyses with a dummy of submitted ideas as the outcome variable: the first with individual creative confidence

variables, the second with the creative confidence variables as a scale, and the third with creative confidence as a weighted scale. In the latter, fantasy and idea generation was weighted 25% each, while the adjustment for social comparison was weighted 50%. The model including the weighted creativity scale accounted for slightly more of the variation than the other two models and reported the highest overall significance levels (Table 7). Furthermore, as many statistical calculations assume normally distributed variables (Ghasemi & Zahediasl, 2012), the measures were tested for normality with the Shapiro-Wilk test. The weighted creative confidence scale, although right-skewed, was the only model where the hypothesis of normal distribution was not rejected (P > z = .16). In sum, the weighted creative confidence scale seemed to be the best measure, and I decided to proceed with this scale for subsequent analyses.

Table 7 – Regression results testing different indicators of creative confidence

Model	Variable	Coef.	Std. Err.	t	P > t	P > F	Adj R^2
1	*Model*					*0.0134*	*0.0479*
	Creative relative	.10	.04	2.81	0.006		
	Fantasy	.06	.05	1.21	0.228		
	Generate ideas	.03	.05	0.62	0.537		
2	*Model*					*0.0022*	*0.0516*
	Creative confidence scale	.21	.07	3.12	0.002		
3	*Model*					*0.0011*	*0.0592*
	Creative confidence weighted scale	.20	.06	3.33	0.001		

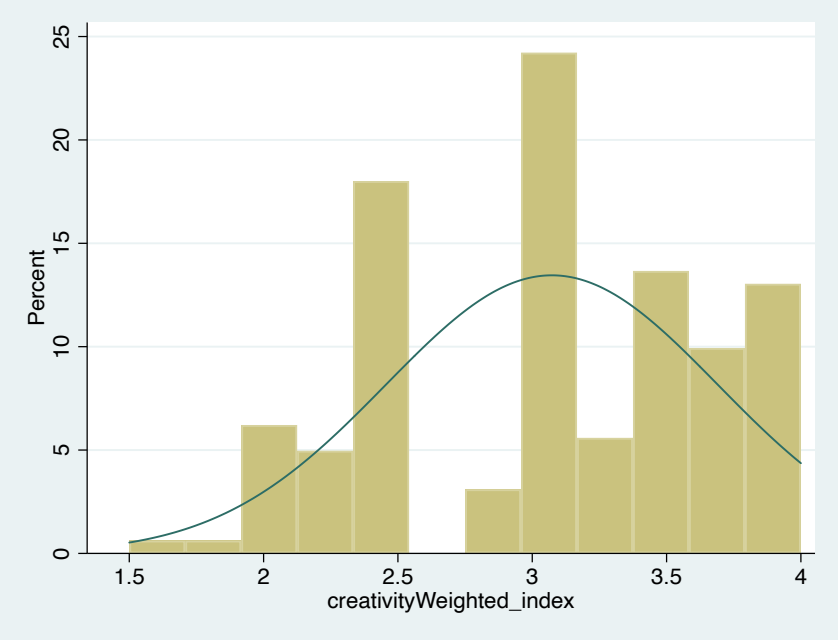

Figure 9 – Histogram of distribution of the weighted creative confidence scale

4.2 Hypothesis 1

Employees with higher levels of creative confidence submit more ideas for innovations.

The hypothesis was examined by conducting a t-test on the weighted creative confidence scale over the submitted idea dummy variable. There was a significant difference in creative confidence between the group that had not submitted ideas (M=2.95; SD=0.63) and the group that had submitted ideas (M=3.28; SD=0.55); t(-3.33)=, p=.0005. The mean difference was relatively small (.33), but in relation to our short four-point scale still worth noting.

Table 8 – T-test of the weighted creativity confidence over submitted idea dummy

Group	**Obs**	**Mean**	**Std, Err,**	**Std, Dev,**	**95% Conf. Intervall**	
Never/don't know	102	2,95	0,06	0,63	2,83	3,08
Once/several	59	3,28	0,07	0,55	3,14	3,42
combined	161	3,07	0,05	0,62	2,98	3,17
diff		-0,33	0,10		-0,52	-0,13
		t = -3.3282		Pr(T < t) = 0.0005		

To investigate whether there were group differences between employees that had submitted one idea versus those that had submitted several, a one-way analysis of variance was conducted. The weighted creative confidence scale was used as the independent variable and the categorical submitted idea variable as the dependent variable. The overall estimation found statistically significant group differences below the 1% level (p = .0031).

Table 9 – One-way analysis of variance of creative confidence over submitted idea (cat.)

Source	SS	df	MS	F	Prob > F
Between groups	4,31	2	2,15	6	0,0031***
Within groups	56,77	158	0,36		
Total	61,08	160	0,38		

Significance: * p<0,1, ** p<0,05, *** p<0,01

Further, a Tukey post hoc test revealed significantly higher creative confidence levels in respondents who had submitted an idea once (p = .006) compared to employees who had not submitted ideas (Table 10). Results were significant below the 1% level. There is also a significant positive difference at the 10% level between respondents who had submitted several ideas and those that had not submitted (p = .089) but somewhat surprisingly less strong. However, there is no significant difference in creative confidence between respondents who had submitted one idea versus those who had submitted several (p = .604).

Table 10 – Tukey post hoc test for creative confidence over submitted ideas with three categories

	Contrast	Std. Err.	Tukey t	Tukey P>t
Submitted Idea (cat.)				
Once vs. never/don't know	.4076797	.1297329	3.14	0.006***
Several times vs never/don't know	.2575061	.1214547	2.12	0.089*
Several times vs. once	-.1501736	.1566413	-0.96	0.604

Significance: * p<0,1, ** p<0,05, *** p<0,01

Lastly, a bivariate linear regression analysis was carried out (Table 11), and the model was tested for homoscedasticity using a residual-versus-fitted plot and the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity. The hypothesis of homoscedasticity could not be rejected (Prob > chi2 = 0.1637). However, the model employing robust standard errors

reported smaller standard errors and stronger significance levels, improving the overall estimation. Results are therefore reported with the use of robust standard errors.

Table 11 – Bivariate regression analyses of creative confidence for submitted ideas

	Submitted idea dummy	**Submitted idea cat.**
Creative confidence Weighted	.20 (.06) ***	.27 (.09) ***
Const.	-.25 (.17)	-.27 (.27)
N	161	161
R^2	0.07	0.04
F	12.23	8.98
Prob > F	0.00	0.00

Notes: Robust standard errors in parenthesis. Significance: * p<0.1, ** p<0.05, *** p<0.01

The regression model finds creative confidence to explain a statistically significant amount of the variation in submitted ideas, (F (1, 159) = 8.89, p .0032, R^2 = .0436. The coefficient (B = .27) indicates that a one-point increase in creative confidence is associated with a 27-percentage point increase in the probability of employees submitting an idea.

Conclusion:

The analyses revealed a significant positive relationship between creative confidence and submitted ideas – confirming my first hypothesis.

4.3 Hypothesis 2

Employees with R&D as a job requirement submit more ideas for innovations.

Two binary variables are used to explore the relationship between having R&D as part of your work tasks and submitting ideas. A cross table analysis and a Chi-square significance test were conducted. Results are presented in Table 12.

Table 12 – Distribution of submitted ideas over R&D as a work requirement

	Submitted idea dummy		
R&D as part of work	**Never/don't know**	**Once or several**	**Total**
No	58	15	73
%	*79,45*	*20,55*	*100*
Yes	44	44	88
%	*50*	*50*	*100*
Total	102	59	161
%	*63,35*	*36,65*	*100*

Pearson chi2(1) = 14.9077 Pr = 0.000

Our data finds a statistically significant relationship between R&D as a work requirement and the contribution of ideas, $X^2(1, N = 161) = 14.91$, $p < 0.01$.

Further, a binominal logistic regression was conducted to estimate the odds ratio between the two groups (Table 13). Results supported a significant association between R&D as part of work and the likelihood of submitting ideas, $X^2\,(1, N = 161) = 15.42$, $p < .01$. Based on our sample, employees having R&D as a work requirement are 3.87 times more likely to have submitted an idea than those without such a requirement. The findings are in line with prior research suggesting that making creativity a job requirement will lead to higher levels of creative engagement (Unsworth et al., 2005).

Table 13 – Logistic regression estimation for the effect of R&D as part of work on submitted ideas

	Coeff.	**Odds ratio**	**z**	**P-value**	**95% conf. interval**
Research					
No (ref)	-	-	-	-	-
Yes	1.35	3.87 (1.39)	3.76	0.000	(1.91, 7.83)
Const		.26 (.07)	-4.67	0.000	(.15, .46)

Model: $X^2\,(1, N = 161) = 15.42$, $p = 0.0001$, Pseudo $R^2 = 0.0729$

Conclusion:

I found support for hypothesis two. Employees with R&D as a job requirement are more likely to submit ideas for innovations.

4.4 Hypothesis 3

Employees with R&D as a job requirement perceive themselves as more creative.

To investigate the relationship between having R&D as a work requirement and employees' creative confidence, a t-test of the weighted creative confidence scale over the binary R&D variable was carried out (Table 14).

Table 14 – T-test of the weighted creative confidence scale over R&D requirement.

Group	Obs	Mean	Std, Err,	Std, Dev,	95% Conf. Intervall	
No	73	3.01	.07	.61	2.87	3.16
Yes	88	3.12	.07	.62	2.99	3.25
combined	161	3.07	.05	.62	2.98	3.17
diff		-.11	.10		-.30	.08
		t = -1.11		Pr(T < t) = 0.1344		

The null hypothesis could not be rejected, and thus, results suggest that creative confidence is not clustered among employees with R&D as a job requirement, t (159) = -1.11, p = 0.13. The analysis indicates only a slight difference (.11) between the average creative confidence score among respondents having an R&D component versus those without such a component.

Failing to find support for higher creative confidence scores among employees having R&D as a work requirement raises the question of whether creative confidence is clustered elsewhere in the organization. Arguably, certain positions may naturally demand or attract employees exhibiting higher levels of creative confidence. Moreover, gender differences in creativity have been the focus of several prior studies (J. Baer & Kaufman, 2008). There is also possible to make an empirical argument that more work experience could positively affect creative confidence due to positive reinforcement from prior endeavors and increased levels of absorptive capacity (Cohen & Levinthal, 1990). As a continuation of hypothesis three, I carried out a one-way analysis of variance between creative confidence and position, gender, and education (Table 15). Furthermore, I conducted a bivariate linear regression

analysis to test for a relationship between creative confidence (dependent variable) and years of relevant work experience (independent variable) (Table 16).

Table 15 – One-way analysis of variance in creative confidence by position, education, and gender.

	SS	df	MS	F	Prob > F
Position					
Between groups	2.79	8	.35	0.91	0.5100
Within groups	58.29	152	.38		
Total	61.08	160	.38		
Education					
Between groups	1.24	5	.25	0.64	0.6693
Within groups	59.84	155	.39		
Total	61.08	160	.39		
Gender					
Between groups	1.24	2	.62	1.64	0.1979
Within groups	59.84	158	.38		
Total	61.08	160	.38		

Table 16 – Bivariate linear regression analysis of correlation between work experience and creative confidence

Creative Confidence	Coef.	t	P>t	95% conf. interval
workYears	.00 (.00)	.65	.519	-.00, .01
Const	3.03 (.09)	35.41	.000	2.86, 3.20

N = 161; F(1, 159) = 0.42; P > F = 0.52; R^2 = 0.0026

Based on the conducted analyses, creative confidence does not seem to cluster in the organization by either position (p = 0.51), education (p = 0.67) or gender (p = 0.20). Further, results from the regression analysis suggest there is no significant correlation between work experience and creative confidence ($P>t$ = .519).

Conclusion:

Hypothesis three was rejected. Employees in positions requiring R&D did not report higher levels of creative confidence. Moreover, creative confidence did not cluster by position, education, gender, or work experience. As such, creative confidence seems to have individual explanatory power. Our results support the findings from the recent study by Slåtten et al. (2020).

4.5 Regression model

Finally, the variables were compiled to a multiple regression model to investigate the relationship between employee level creative confidence and organizational innovation beyond the stated hypotheses. In all models, the control variables position, research, and gender were included. In total, 20 models were estimated. Results are reported in table Table 17 and Table 18. For the sake of clarity, I excluded the control variables from these tables.

Table 17 – Regression results from the forward selection process (table 1/2)

Model	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Submit where	.14*** (.04)	.12*** (.04)	.13*** (.04)	.12*** (.04)	.12*** (.04)	.12*** (.04)	.13*** (.04)	.11*** (.04)	.13*** (.04)	.13*** (.04)
Idea follow-up		.03 (.05)								
Creative confidence			.15*** (.05)	.14*** (.05)	.15*** (.05)	.14*** (.05)	.16*** (.05)	.15*** (.05)	.16*** (.05)	.16*** (.05)
Available resources				.03 (.04)						
Leadership interest					.02 (.05)					
Innovation importance						.04 (.05)				
Tackle New							-.17*** (.06)	-.17*** (.06)	-.17*** (.06)	-.17*** (.06)
Work years								.00 (.00)		
Experiment									-.01 (.03)	
Risk accept										-.00 (.03)
Control variables: position, research, gender (hidden in table)										
Const.	-.85*** (.25)	-.90*** (.26)	-1.26*** (.29)	-1.30*** (.29)	-1.31*** (.31)	-1.33*** (.30)	-.71** (.34)	-.73** (.34)	-.69* (.35)	-.70** (.35)
Adj. R^2	.27	.27	.30	.30	.30	.30	.33	.34	.33	.33

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 18 –Regression results from the forward selection process (table 2/2)

Model	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Submit where	.13*** (.04)	.13*** (.04)	.13*** (.04)	.13*** (.04)	.12*** (.04)	.13*** (.04)	.13*** (.04)	.13*** (.04)	.13*** (.04)	.13*** (.04)
Creative confidence	.15*** (.05)	.16*** (.05)	.15*** (.05)	.15*** (.05)	.15*** (.05)	.15*** (.05)	.15*** (.05)	.15*** (.05)	.15*** (.05)	.16*** (.05)
Tackle New	-.17*** (.06)	-.17*** (.06)	-.17*** (.06)	-.17*** (.06)	-.17*** (.06)	-.17*** (.06)	-.17*** (.06)	-.16*** (.06)	-.17*** (.06)	-.17*** (.06)
Cooperation	-.03 (.08)									
Workload barrier		.01 (.03)								
Organizational need			-.00 (.06)							
Learn new				-.00 (.06)						
Unusual accept					.00 (.04)					
Meaningful work						-.03 (.06)				
Creative recognition							.01 (.04)			
Professional challenge								-.04 (.05)		
Discuss w./colleagues									-.00 (.04)	
Creative resistance										-.02 (.03)
Control variables: position, research, gender (hidden in table)										
Const.	-.63 (.40)	-.72** (.35)	-.70* (.40)	-.70* (.36)	-.72** (.35)	-.61 (.39)	-.76** (.37)	-.61* (.37)	-.71* (.37)	-.70** (.34)
Adj. R^2	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The procedure suggested the final model should include variables measuring the following: the perception that ideas are followed up, knowing where to turn if one has an idea, often having to tackle new situations at work, employee's creative confidence, and having R&D as part of work. In addition comes the control variables for position, research, and gender. To confirm the variable selection, a best subset model (excluding categorical variables) was calculated for comparison, using the leaps-and-bounds algorithm (Lindsey & Sheather,

2010). The best subset calculation suggested the same model as the manual forward selection method.

The variables available resources, leadership interest, innovation importance, and idea follow-up all came out significant in the preliminary bivariate regression analyses. Interestingly, during the forward selection process, they all turned out insignificant. This points towards that there are mediation effects in play. Running a structural equation model investigating mediation between the variables in the dataset could be an interesting suggestion for future research.

Based on the suggested model, a multiple linear regression model was calculated to predict the effect of submitWhere, tackleNew, CC, position, research, and sex on submission of ideas (Table 19). The model was tested for heteroskedasticity by the Breusch-Pagan / Cook-Weisberg test, which revealed heteroskedasticity in the data (Prob > chi2 = 0.0008). The model was re-estimated with robust standard errors. A side-by-side comparison of the results is presented in Table 19. The following result descriptions will be based on the model with robust standard errors.

Table 19 – Multiple regression model on submitted ideas dummy

	Coef. (Std. Err.)	**Coef. (Robust Std. Err.)**
I know where to go if I get an idea for an innovation (submitWhere)	.13 (.04)***	.13 (.03)***
In my job, I often have to deal with new problems and situations (tackleNew)	-.17 (.06)***	-.17 (.06)***
Creative confidence (CC)	.16 (.05)***	.16 (.05)***
Position (ref. cat.: health professional[6]) (position)		
Management	.38 (.18)**	.38 (.12)***
Administration / support	.34 (.18)*	.34 (.10)***
Nurse	.34 (.18)*	.34 (.12)***
Doctor	.60 (.21)***	.60 (.11)***
Occupational therapist	.54 (.21)***	.54 (.16)***
Physical therapist	.63 (.20)***	.63 (.16)***
Psychologist	.46 (.25)*	.46 (.21)**
Other	.10 (.18)	.10 (.09)
Research (ref. cat.: no) (research)		

[6] Since the surveyed health workers had submitted zero ideas, I used that as the reference category for position in the regression model.

Yes	.16 (.07) **	.16 (.07) **
Gender (ref. cat.: don't want to answer) (sex)		
Male	.42 (.16) **	.42 (.11) ***
Female	.36 (.15) **	.36 (.08) ***
Constant	-.71 (.34) **	-.71 (.29) **
N	161	161
R^2	0.3916	.3916
Adj. R^2	0.3332	-
F	6.71	13.83
P > F	0.000	0.000

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The overall model was significant below the 1% level (F(14, 146) = 13.83, $p < .000$) and explained approximately 39% of the variance in submitted ideas.

The variables submitWhere (t = 4.20, p = 0.000), tackleNew (t = -2.81, p = 0.006) and creative confidence (t = 2.89, p = 0.004) were significant below the 1% level. A one-point increase on knowing where to turn if you have an idea (submitWhere) is associated with a 13-percentage point increase in the probability of having submitted an idea. Likewise, a one-point increase in creative confidence (CC) is associated with a 16-percentage point increase. However, regularly having to handle new tasks and situations (tackleNew) was associated with a 17-percentage point decrease in the probability of having submitted ideas.

Employees having R&D as part of work are significantly more likely to have submitted ideas (t = 2.18, p = 0.031).

All positions except "other" and psychologists were positive and significant at the 1% level compared to the baseline group—psychologists at the 5% level. However, keep in mind that the observed effects and significance levels are relative to the baseline group, which was a tiny sample of health professionals where none had submitted ideas. Doctors, occupational therapists, and physical therapists seem to account for a larger share of submitted ideas. The finding diverges from a prior study of employees at public hospitals across six European countries (García-Goñi et al., 2007). Contrary to our study, they found managers to be more involved in innovation processes than frontline personnel. The reason for our diverging results is unclear, but a theoretical argument can be made that it could be attributed to the

heterogeneity of healthcare institutions (Thune & Gulbrandsen, 2016). Hospitals have different functions and specializations, and a lot of the prior literature in the field is concerned with general hospitals. Arguably, the work tasks among frontline staff in general hospitals may be more routinized than at specialist hospitals, such as the one we surveyed. It is unclear what types of healthcare institutions were included in the study by García-Goñi et al. (2007). To get a rough estimate of the explanatory power of each variable without conducting a SEM analysis, I calculated the difference in variance explained between the full model compared to models where one variable is removed in turn. The variable SubmitWhere adds 4,8% of explanatory power to the model and accounts for the second highest increase. Creative confidence comes in third, adding 3,6% explanatory power. Position adds, by a good margin, the most explanatory power (12,3%).

Both men and women in the gender variable came out as significant at the 1% level compared to the baseline category "I don't want to answer." As with position, the baseline is a tiny group that did not submit any ideas, so the significance levels should not be given too much weight. The coefficient difference between men and women is minimal (.06), indicating that both genders are approximately as likely to submit ideas.

Conclusion:

Creative confidence is found to have a statistically significant effect on submitted ideas below the 1% level – confirming my first hypothesis also when control variables are present. Further, creative confidence had one of the largest positive coefficients (.16), suggesting that creative confidence is one of the most effective measures towards increasing the probability of employees submitting ideas. Knowing where to turn if an idea occurs, having R&D as a work requirement, and position also seems to be important predictors.

5 Discussion

5.1 Three main implications

Finding preliminary evidence that creative confidence is related to innovation activity has several implications for our understanding of healthcare innovation. In this chapter, I will highlight three topics in particular, presented in sections 5.1.1, 5.1.2, and 5.1.3

5.1.1 The case for creativity

First and foremost, finding that a previously omitted predictor has a significant impact on innovation activity proves that there is a lot we still do not know about the healthcare innovation process. A large body of the prior literature has focused on how to facilitate for creativity and innovation in hospitals. However, usually not including an assessment of the individual prerequisites (Slåtten et al., 2020). My findings suggest that individual-level differences may have a more significant impact than prior research implies and that a more considerable emphasis on the individuals that make up the organization is necessary to uncover the true nature of hospital innovation.

In my multivariate analysis, only three variables ended up being significantly and positively related to innovation activity: creative confidence, knowing where to turn if an idea occurs, and having R&D as a job requirement. Interestingly, the items “the organization has resources available to follow up on good ideas”, “I experience that working with innovation is an important task in this organization”, “the management of this hospital is interested in innovation”, and “ideas for innovations are followed up in this organization” all came out statistically significant in bivariate regression analyses but became insignificant in the multivariate model. The items are well-established stimulants of creativity and innovative activity in organizations (Amabile & Coon, 1996). This indicates that previously established measures of organizational creativity and innovation may be partially, or even entirely, mediated by aspects that have not been included in prior studies. The finding may potentially challenge the validity of prior studies and our current understanding of how to promote innovation in organizations. Specifically, it calls into question whether existing knowledge on organizational innovation transfers to different settings such as hospitals or healthcare environments.

The findings are substantiated by being largely in line with the findings of Slåtten et al. (2020). They investigated the relationship between innovative behavior, leadership autonomy support, psychological capital, and individual creativity. Similar to my results, their study revealed innovative behavior of hospital employees to be directly and positively associated with individual creativity (Slåtten et al., 2020, s. 1). Moreover, they found leadership autonomy support, another hitherto widely accepted stimulant of organizational creativity, almost entirely mediated by individual creativity and psychological capital. Our survey has a broader scope than that of Slåtten et al. (2020). They homed in on the autonomy dimension by means of structural equation modeling. Our survey tests the relationship between individual creativity and a more comprehensive range of organizational stimulants and capabilities. Although we deliberately decided to omit a measure of autonomy in our survey, the finding of Slåtten et al. is interesting because it corroborates the assumption that several conventional organizational stimulants may be subject to mediation.

With reference to the two separate studies reporting individual creativity to strongly influence innovation activity in hospitals, and in light of the fact that the two studies seem contradictory to conventional knowledge in the field, more research on how individual creativity affects innovation activity in hospitals seems necessary. I propose that a measure of employee-level creativity ought to be included in future studies of hospital innovation. Based on my findings, it is especially pertinent when the aim is to assess organizational or cultural factors affecting innovation activity. Going forward, there is a need to investigate further the interplay between individual creativity and the previously established measures of organizational capabilities and the hospital work environment. Moreover, the effects of individual creativity should be tested across a broader range of contexts and conditions: There are large variances in the type of work carried out in, for example, a general hospital compared to a specialist hospital. Equally, hospitals are complex organizations encompassing a heterogeneous group of employees across a wide range of specializations and positions. As such, there is reason to believe that the role of individual creativity may play out differently both across departments within a specific hospital and across different types of hospitals. My thesis provides preliminary evidence from the perspective of a specialist hospital. However, results may turn out differently in other healthcare institutions.

5.1.2 Including the entire organization

A second implication of my findings is that there is a seemingly large untapped potential for innovation in hospitals. Several other researchers have pointed out that it is important to engage the entire organization in innovation activities (Djellal & Gallouj, 2005; García-Goñi et al., 2007; Gulbrandsen et al., 2015; Slåtten et al., 2020; Thune, 2015). My analysis provides empirical evidence for this claim. Firstly, I found ideas to be contributed by employees in (almost) every position. The pilot study from 2015 (Thune, 2015) was conducted on four different hospitals and reported similar findings. Secondly, creative confidence, which was positively related to submitting ideas, was pretty evenly distributed across the organization. However, employees having R&D as a requirement were more likely to submit ideas – indicating that there are many capable creative minds in positions not directly involved with R&D that are not used to their full potential. More precisely, my analysis shows that 51.47% of employees reporting above average scores on creative confidence had never submitted an idea. This clearly demonstrates a considerable untapped potential for innovation activity that is yet to be harnessed.

The question then is, what is hindering creative employees from submitting ideas? My analysis provides a relatively banal explanation as to why this might be: They do not know where to turn if they have an idea. Knowing what to do if an idea occurs seems to be a predictor carrying much weight. In fact, it was the only variable measuring factors of the work environment and organizational capabilities that stayed significant and positive in my multivariate regression model. 31% of respondents in our survey that had not submitted ideas did somewhat or strongly disagree with the statement “I know where to turn if I get an idea”. In fact, even 5% of employees who *had* submitted ideas disagreed with this statement. A closer examination of the data reveals that 80% of respondents not knowing where to turn if they have an idea are employees without an R&D requirement. The hospital investigated has done a great job facilitating for innovation activities. However, they seem to have failed in diffusing knowledge about its initiatives beyond the employees actively engaged with R&D.

Further research is needed to test whether the relatively simple explanation of lacking internal communication is a barrier to innovation activity also beyond this particular hospital. The pilot study from 2015 surveyed employees from four different hospitals and similarly found that researchers and scientists were more often engaged with generating ideas (Thune, 2015). Moreover, they found that employees at Sunnaas were more actively engaged with generating

and reporting ideas than employees from the other three hospitals in the study, indicating that my findings could be generalizable beyond this case study.

5.1.3 Creativity as a requirement

The third and last implication I wish to highlight is concerned with the concept of creative requirement (Unsworth et al., 2005). As mentioned in the above paragraph, employees with R&D as part of their work did not report higher levels of creative confidence. Nonetheless, they were more likely to have submitted ideas. This was true even when other organizational factors were controlled for. Although pointed, Unsworth's comment that researchers may have been blindsided by investigating work factors and could have overlooked more straightforward explanations for workplace creativity seems to be of some substance (Unsworth et al., 2005). Unsworth et al. studied over a thousand health service employees and found creative requirement to account for most of the variance in innovation activity by fully mediating the effects of supportive leadership and partially mediating the effects of empowerment and time demands. Take note that this is the third independent study finding conventional creativity stimulants to be mediated by factors omitted in previous studies. My findings support those of Unsworth et al. (2005), suggesting that making R&D a requirement may prove to be a more effective way to increase innovation activity in hospitals than changes in job design or implementing new organizational routines. I would like to point out in this regard that creativity requirements need not be limited to research positions. Incorporating a requirement for submitting ideas is theoretically possible in almost any position. Exploring how this can be done in a meaningful way could be a fruitful endeavor for hospitals seeking to increase their innovation activity.

Lastly, my analysis suggests that investing in getting employees over the hurdle of submitting their first idea may lead to an exponential return for the organization's innovation activity. 54% of employees in our survey who had submitted ideas had submitted several, suggesting that going through the process once is a trigger for subsequent involvement in innovation activity. There does not seem to be a lack of ideas once the gates are open.

I conclude that there are mainly three aspects affecting employees' engagement with innovation activity according to this case study: individual creative confidence, clearly communicated routines for submitting ideas across all levels of the organization and having

innovation activity as a work requirement. My findings shed light on the previously neglected influence of individual prerequisites and its relation to organizational capabilities, work culture, and hospital innovation activity. Going forward, I urge researchers to include a measure of individual-level creativity when investigating hospital innovation. This will corroborate studies of organizational factors by controlling for important individual differences, as well as advance our understanding of how individual creativity influences hospital innovation. The psychology literature on individual creativity holds valuable insights and tools that can help in this regard. As demonstrated in this thesis, bridging the gap between creativity and innovation research can provide valuable new knowledge. There is also a need to investigate the more immediate explanations to innovation activity, such as creative requirement and lack of internal communication, in more detail. According to my findings, Unsworth (2005) may have rightly accused researchers of being blindsided by investigating work factors and overlooking more straightforward explanations.

5.2 Implications for practice

The seemingly significant effect of individual creativity for innovation activity in hospitals suggests that changes in current practice are needed to maximize the innovation potential.

My main recommendation revolves around human resources and hiring practices. Specifically, I propose that changes in hiring procedures are necessary to unlock the full potential for innovation in hospitals. Focusing exclusively on improving the environmental stimulants for creativity and innovation does not seem sufficient in light of the recent findings. Today's selection criteria in healthcare institutions rarely account for the individual's potential for creativity and innovation (Patterson & Zibarras, 2017). Given the seemingly widespread consensus on the importance of innovation for the future of healthcare, this seems rather paradoxical. According to Patterson and Zibarras (2017), the current selection processes aim to match a person's current skillset to the role, whilst it might be more beneficial to emphasize the candidate's learning potential given today's pace of change.

An informal inquiry into the selection processes at Sunnaas revealed a picture largely in line with what Patterson & Zibarras (2017) described. Hiring is generally a local undertaking led by the closest responsible manager, aided by human resources and sometimes external resources. In short, I was told that the selection process consisted of structured interviews

around the competency required for the position in question. In recent years they have started to conduct ability tests for management positions. However, whether creativity was tested for was largely dependent on whether creativity was defined as a desired competence, which admittedly, was rarely the case. The latter is a rather interesting confession. When not even a specialist hospital positioned at the forefront of healthcare innovation defines creativity as a desired competence, it gives reason to believe that this is symptomatic for the larger part of healthcare institutions.

Several prior studies have identified a gap between the current state of knowledge and what is operationalized in practice (McGinnis et al., 2002; McGlynn et al., 2003). This also seems to be the case for hiring and selection processes. Although deemed important, innovation and creativity are treated as an add-on activity of secondary importance in the selection process. This is at odds with the notion that "innovation has become a critical capability of all healthcare organizations" (Länsisalmi et al., 2006, s. 66). Including creative potential in healthcare selection processes seems necessary to realize the full innovation potential. For this to happen, creativity needs to be *articulated* as a desired skill and considered on equal terms as other attributes.

Of course, not all organizations are at liberty to hire new staff. Further, in countries with strong worker rights such as Norway, making changes in the workforce is not easily achieved. There are, however, some indications that the addition of just a few new people to a team has the potential to create a ripple effect. The presence of creative coworkers has been found to increase the overall level of creativity in a group (Zhou, 2003). Specifically, the presence of creative role models enabled employees to pick up on skills and strategies relevant for creativity. Hence, shifting the focus towards selecting for creativity in healthcare may both yield short-term effects by increasing creativity among existing employees and increasing the organization's capacity for innovation in the long term.

It should be noted that the proposed changes to hospital practice are based on a notion of creativity and innovation as beneficial. However, this need not always be the case. Several studies have explored what is termed "the dark side of creativity" (Cropley et al., 2010). Even well-intentioned creativity may yield unintended negative consequences (Cropley et al., 2013). Especially within the field of healthcare, there are many scenarios where experimental solutions are not warranted and, in the most severe cases, can have fatal consequences. To

my knowledge, not many studies have investigated the potential pitfalls of hospital creativity and innovation. As the demand for innovation in healthcare increases, further research is needed to uncover the potential recoil and how it may be managed. There is a delicate balance to be stricken between the pursuit of novelty and the concern for patient safety. As Sternberg (2003) argues, wisdom is needed to balance creativity. Prior studies have, however, found a significant and positive relationship between innovation and clinical performance (Dias & Escoval, 2013; Salge & Vera, 2009).

A shift towards selecting for creativity in healthcare institutions in Norway and beyond seems to be an overdue, but highly necessary, change to increase hospital innovation. Several recent studies support my findings and report that individual creative abilities may be equally important, if not more, than environmental and organizational factors. Furthermore, if selecting for creativity is to become feasible, work needs to be done in developing suitable assessment instruments and selection procedures tailored to healthcare organizations.

6 Limitations

Several limitations should be mention in relation to this thesis and the underlying study. First and foremost, all the analyses are conducted on a highly skewed dataset with an overall positive bias on most measures. This is less than ideal because many statistical tests assume normal distribution in order to provide the most accurate predictions. However, I did my best to account for this challenge by way of statistical procedures within my knowledge. If nothing else, I have strived to be transparent about test results and possible pitfalls along the way. Further, as the data was gathered anonymously, we do not know whether the skewed results are caused by selection bias or if they represent an accurate reflection of the organization.

The survey conducted was based on employee self-reports. As such, there are no objective measures to validate the findings. A common issue with self-report studies is the possibility of inflated ratings. Especially in regard to the creativity items, it would have been interesting to conduct a validation by, for instance, an expert assessment alongside the self-assessments. Nonetheless, prior research should have provided enough empirical background to support the assumption that self-assessments have predictive value on actual performance.

Along the same lines, the primary dependent variable in my analyses was a self-report item asking respondents if they had submitted ideas for innovations or not. As such, we are not capturing actual innovation output. Turning an idea into an innovation is a complex process that requires a wide range of organizational capabilities not included in our survey. Moreover, our dependent variable is in large a true/false statement which does not provide any insight into the quality or type of ideas submitted. As reports from Sunnaas innovation management system revealed, most employee-submitted ideas were categorized as improvements rather than innovations. In this regard, I would like to add that one of the key takeaways from this thesis is that the quality of the submitted ideas is not the most pressing issue. The real challenge for innovation managers and organizations seeking to improve their innovative capabilities is to engage all levels of the organization in order to unleash the full innovative potential of the organization's resources. As such, the focus should first be to get employees over the hurdle of submitting an idea before too many resources are spent on improving the quality of the submitted ideas.

It is also important to remind you that the way the weighted creative confidence scale was created is not uncontroversial. The underlying items reported very low Chronbach's alpha scores – which I knowingly ignored based on an argument that I consider creativity to be a multidimensional formative construct. As mentioned earlier in this thesis, this is an ongoing (and very interesting) debate among creativity scholars. I sided with what seems most logical to me, but there are solid arguments for either side (Diamantopoulos & Siguaw, 2006; Edwards, 2011; Sullivan & Ford, 2010).

As a final note, I would like to point out that I draw a relatively direct parallel between creativity and innovation in my reasoning. This is, of course, a simplification of reality. High levels of creativity or innovation activity do not automatically yield innovation. Turning an idea into an innovation requires many capabilities beyond idea generation – a process that may very well discriminate between high-performing and low-performing organizations.

7 Conclusion

In this thesis, I set out to explore how employee creative confidence influences innovation activities in a healthcare environment. Innovation is deemed an indispensable key to solving the challenges facing our healthcare system in the years to come. Moreover, research on healthcare innovation has grown exponentially in the last decade, but there has been a tendency to largely favor an organizational perspective. As contended in this thesis, the role of individual creativity is a vastly under-researched topic insofar but paramount to further our understanding of hospital innovation.

I have proposed a novel approach to how our understanding of healthcare innovation can be broadened by combining the conventional measures of organizational innovation capabilities and work environment inducive of creativity with a measure of individual creative confidence.

By a cross-sectional quantitative survey carried out at the Norwegian rehabilitation hospital Sunnaas, I found support for the hypothesis that employees who exhibit higher levels of creative confidence are more likely to engage in innovation activity. The relationship proved significant also when controlling for other factors of the organizational environment. Creative confidence was relatively evenly distributed across the entire organization and did not cluster by position, education, work experience, gender, or employees tasked with R&D. Moreover, creative confidence was among the strongest predictors of innovation activity in our study.

Further, I found a significant positive relationship between having R&D as a work requirement and innovation activity. Findings are in line with a previous study on the effect of creative requirement on employee creativity (Unsworth et al., 2005) and suggests a simple but powerful way to increase innovation activity in hospitals.

There were indications that the effect of resources, organizational motivation to innovate, and organizational encouragement were mediated by a combination of knowing where to submit ideas and creative confidence. As a result, almost no conventional variables measuring aspects of the work environment came out statistically significant in the multivariate regression analysis. There was one notable exception: Knowledge of where to turn if one has an idea was significant and seems to be an important predictor of innovation activity. To my

knowledge, this is a largely overlooked explanation in previous research, which could benefit from further investigation going forward.

In conclusion, finding support for creative confidence to significantly impact innovation activity in employees underscores the importance of accounting for individual creative prerequisites in future studies of hospital innovation. More importantly, it suggests that changes in the hiring and selection process may be necessary to realize the full potential for innovation in hospitals. Key takeaways for hospital managers seeking to increase innovation activity are to incorporate creative potential as an employment criterion, make creativity an integral and expected part of everyday work, and make sure that information about how to submit ideas are diffused throughout all levels of the organization – particularly outside the R&D departments. Suggestions for future research include further exploration of the relationship between individual creativity and innovation activity. Current research has merely scratched the surface of this important topic. Investigating how measures of individual creativity affect and mediate established measures of the work environment, test the effect of creative confidence across different types of healthcare institutions and explore how innovation activity ultimately manifests in hospital innovation are all interesting avenues for future research.

Last but not least, researchers need to help hospital managers by developing suitable tools with practical application for healthcare institutions. Most of the current tools are developed with research purposes in mind and are unsuited to incorporate in an organization's daily operations because of the daunting number of items and large scope. Specifically, there is a need to develop shorter, but reliable, instruments for assessing the organizational capabilities and work climate. Also, a short, validated measure of creative potential that can be used as part of more extensive workplace surveys and as a stand-alone tool for employment processes is needed.

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