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The complex puzzle of collective knowledge

A case study of the interplay between collective intelligence and knowledge creation in an organizational context

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Abstract: The interdependence of individual knowledge and intelligence intensify along with an increasingly specialized economy. The purpose of this thesis is to increase the understanding for how collective intelligence interplays with knowledge creation. A case study consisting of 11 semi structured interviews are conducted in order to explore how individuals integrate knowledge in an organizational context. The analysis presents a complex interplay between abilities for collective intelligence and processes for knowledge creation that can unfold in four different interplays. The results imply that only one interplay allows collective intelligence to increase and knowledge creation to occur simultaneously. This interplay is achieved when combining; relation ability with a socialization process, integration ability with an externalization process, reflection with a combination process, and representation ability with an internalization process. Furthermore, other phenomenon; such as responsibility, freedom, engagement, commitment and a collective idea seems to contribute to knowledge integration that relates to both collective intelligence and knowledge integration, as well as to the interplay between the two concepts. The findings contribute to an increased understanding of the complex interplay between abilities for collective intelligence and processes for knowledge creation - an understanding that we believe can have practical and academic relevance.

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Key words: Collective intelligence, knowledge integration, knowledge creation, knowledge management

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Table of content

Acknowledgements **1**

Table of content **2**

List of tables **4**

List of figures **4**

Key concepts **5**

1. Introduction **6**

1.1 Background 6

1.2 Purpose and research question 6

1.3 Expected contribution 7

1.4 Delimitations 8

2. Theoretical framework **9**

2. 1 Previous research 9

2.1.1 Collective intelligence 9

2.1.2 Knowledge integration 10

2.1.3 Knowledge creation 11

2.2 Research gap 11

2.3 Choice of theoretical models 13

2.3.1 Four abilities of collective intelligence 13

2.3.2 Four processes for knowledge creation 14

2.3.3 Problematization with chosen theoretical models 15

3. Method **16**

3.1 Choice of method 16

3.1.1 Research method 16

3.1.2 Research approach 16

3.2 Sample 17

3.2.1 Choice of theory 17

3.2.2. Choice of company 17

3.2.3. Choice of interview subjects 18

3.3 Data Collection 19

3.3.1 Pilot study 19

3.3.2 Interview Design 19

3.3.3 Coding of findings 20

3.4 Discussion of method 20

3.4.1 Reliability and validity of the thesis 20
3.4.2 Ethical considerations 22

4. Empirical Data 23
4.1 Knowledge creation at Influence 23
4.1.1 A focus on creating a collective intelligence mindset 23
4.2 Four abilities for collective intelligence 24
4.2.1 Relation ability in practice 24
4.2.2 Integration ability in practice 25
4.2.3 Reflection ability in practice 26
4.2.4 Representation ability in practice 27
4.2.5 Abilities in disharmony 27
4.3 Phenomenon encouraging knowledge integration 29
4.3.1 A sense of responsibility & freedom 30
4.3.2 A workplace characterized by engagement & commitment 31
4.3.3 A matter of believing in the collective idea 31

5. Analysis 33
5.1 Interplay Matrix 33
5.1.1 Relation ability in different knowledge creation processes 34
5.1.2 Integration ability in different knowledge creation processes 35
5.1.3 Reflection ability in different knowledge creation processes 36
5.1.4 Representation ability in different knowledge creation processes 37
5.1.5 A puzzle combining collective intelligence and knowledge creation 38
5.2 Putting the pieces together with assembling phenomenon 38

6. Conclusion and discussion 40
6.1 Answer to the research question 40
6.2 Contribution from findings 41
6.3 Further research and discussion about delimitations 41

7. References 44
7.1 Academical references 44
7.2 Internet sources 48

8. Appendix 49
8.1 Appendix 1: Interview subjects 49
8.2 Appendix 2: Interview guide 49

List of tables

Table 1: Key concepts……...….5
Table 2: Interplay between abilities for collective intelligence and processes for knowledge creation…….40

List of figures

Figure 1: Research gap……....11
Figure 2: Interplay Matrix……...33
Figure 3: A puzzle for Interplay 1……...38

Key concepts

Table 1: Key concepts

Concept	**Definition**
Collective intelligence	A group's ability to successfully integrate knowledge of all members. Groups can increase their collective intelligence by integrating knowledge through the practice of four abilities for collective intelligence: *reflection, representation, relation and integration* (Runsten & Werr, 2016).
Knowledge integration	The activity of sharing and transferring knowledge to make it available (Mitchell, 2006, Willem, Scarbrough & Buelens, 2008). It can be described as an element of achieving collective intelligence (Runsten & Werr, 2016), as well as the first step in creating knowledge (Cook & Brown, 1999).
Knowledge creation	A process that describes how knowledge is reconstructed and transformed in tacit and explicit forms. For knowledge to be created, at least one sender and one receiver. Knowledge can be reconstructed within four processes: *socialization, externalization, combination and internalization* (Nonaka & Takeuchi, 1995).

1. Introduction

This section introduces the background of our study that aims to research how collective intelligence interplay with knowledge creation. Further, an explanation will follow about the expected contribution as well as the delimitations of the thesis.

1.1 Background

Adam Smith coined the concept "*division of labor" back* in the 18th century, highlighting the relationship between specialization of labor and prosperity (Smith, 2015). Today, the global economy has moved from a manufacturing, industrial economy to one based on knowledge and services (Walczak, 2005). A high level of specialization may drive prosperity, but it also intensifies interdependence of individual knowledge and intelligence, as complex tasks require diverse input (Van der Vegt & Van de Vliert, 2001). To the benefit of today's organizations that are operating in a highly specialized, knowledge-based economy, intelligence may not exclusively arise inside individuals' brains, but also in groups consisting of many individuals (Woolley et al, 2010). When trying to define the concept of *collective intelligence*, the focus shifts from individual abilities towards human interpersonal abilities such as effective collaboration (Woolley, Aggarwal & Malone, 2015). The concept of collective intelligence is furthermore connected to the academic field of knowledge management, as researchers argue that the level of collective intelligence depends on the ability to integrate knowledge within an organization (Runsten & Werr, 2016). Knowledge integration is in turn argued to be a prerequisite for *knowledge creation* (Cook & Brown, 1999), which foster innovation (Parent et al, 2000) and organizational competitive advantage (Nonaka & Takeuchi, 1995).

1.2 Purpose and research question

The purpose of this thesis is to increase the understanding of how collective intelligence interplays with knowledge creation. The two concepts has previously and separately been argued to foster competitive advantage (Crick et al, 2013, Nonaka & Takeuchi, 1995), which

is highly desirable for organizations (Barney, 1991). Previous research on collective intelligence and knowledge creation highlights knowledge integration as a common denominator of the two concepts (Runsten & Werr, 2016, Cook & Brown, 1999). We therefore make a conscious choice of studying knowledge integration at an individual level. By analyzing which abilities and which processes are used in connection to individual knowledge integration, we aim to explore in what different ways collective intelligence and knowledge creation interplay. We hope to find valuable insights that will contribute to answering our research question:

How does collective intelligence interplay with knowledge creation?

1.3 Expected contribution

So far, studies have been made to explore behaviors of high performing groups to find evidence for collectively intelligent abilities (Woolley et al, 2010). Moreover, several researchers have studied processes for which knowledge creation occur (Nonaka & Takeuchi, 1995). Some researchers explore abilities for achieving collective intelligence through effective knowledge integration (Runsten & Werr, 2016), as the same time as there are theories covering knowledge creation, processes for reconstructing knowledge, and how this knowledge can be transferred to others (Nonaka & Takeuchi, 1995). There is arguable room for combining and exploring synergies between these two concepts, as collective intelligence covers abilities and knowledge creation cover processes, which these abilities theoretically could be practiced within. We expect to contribute to this field by researching how the abilities for collective intelligence interplay with the processes for knowledge creation. We aim to conduct a single case study with the purpose to clarify the connection between processes for knowledge creation and individual-based behaviors related to a conscious daily focus collective intelligence through the practice of the four abilities for collective intelligence. Although a single case-study cannot directly be transferred to other cases, we aim to contribute to understanding the interplay between collective intelligence and knowledge creation by linking existing theory to empirics. Finally, we aim to contribute to

the understanding of the interaction through empirically addressing how collective intelligence and knowledge creation interplay in practice.

1.4 Delimitations

The study is limited to exploring how the four abilities for collective intelligence interplays with the processes for knowledge creation in an organization with outspoken knowledge about collective intelligence. Hence, the result has a probability of being affected by the respondent's knowledge about the subject. Moreover, the case study is limited to a setting characterized by frequent changes in group constellations, as the nature of consulting, which could affect the abilities for collective intelligence and processes for knowledge creation. The study will be on an individual level, where we limit ourselves to study individual's behavior in groups. Furthermore, the geographical limitation is Sweden, Stockholm, and the researchers make a disclaimer about the possibility that this geographical area could affect the result, with the culture and social climate that follows with it.

2. Theoretical framework

The purpose of this section is to describe the concepts collective intelligence, knowledge integration and knowledge creation. Further, two models used for analyzing our data will be presented, including four abilities to achieve collective intelligence and four processes within knowledge creation.

2. 1 Previous research

2.1.1 Collective intelligence

"As with many important--but evocative--terms, there have been almost as many definitions of collective intelligence as there have been writers who described it" (Malone & Bernstein, 2015, p.2).

Collective intelligence is an expression for how well a constellation of several individuals manages to collaborate and perform together. The word intelligence indicates that the term is not exhaustive but rather a measurement contributing to the fact that groups can achieve different degrees of intelligence (Runsten & Werr, 2016). The term collective intelligence first appeared in an academic article year 1971 written by psychologist David Wechsler (Wechsler, 1971). Wechsler described collective intelligence as a phenomenon of cross-fertilization of knowledge resulting in an outcome that could not have been achieved by an individual (Wechsler, 1971). Other researchers agree on the outcome aspect, referring to collective intelligence as the capability of making decisions that are better than any single person in a group (Hiltz, Johnson & Turoff, 1991). John. B Smith on the other hand, takes the concept as far as referring to collective intelligence as an *"intelligent organism working with one mind, rather than a collection of interdependent agents."* (Smith, 1994, p.1). Levy further defines collective intelligence as *"a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills"* (Levy, 1994, p.13). Critical research has pointed out complications related to collective intelligence, such as loss of control when allowing the collective to make

decisions. The downsides with collective intelligence include that there will be no one to blame if a poor decision is made by a group acting as a collective. Hence, the organization faces the risk of losing its power of coercion and reward to specific individuals (Boimabeau, 2009).

Although the researchers mentioned so far have indicated knowledge to be a fundamental part of collective intelligence, more contemporary research links the phenomenon of *knowledge integration* as an underlying element for achieving collective intelligence (Runsten & Werr, 2016). Some argue that collective intelligence can be understood as the quality of the interaction in which people integrate their own and others available knowledge and that organizations can increase their collective intelligence by ensuring that already available knowledge comes into use. *"Every person who is involved in a process brings a given amount of knowledge into the process. Collective intelligence is an expression of to what degree that knowledge come to use through the process of knowledge integration"* (Runsten & Werr, 2016, p.11).

2.1.2 Knowledge integration

Several researchers have used the term knowledge integration, going back to 1945 when Hayek described it as the coordination of specialized and distributed knowledge (Hayek, 1945). The concept has further been argued to have a direct effect on group performance (Mesmer-Magnus & DeChurch, 2009), and others have described it as the outcome of a situation where individuals share their knowledge in a group context (Okhuysen & Eisenhardt, 2002). Furthermore, knowledge integration is often used as a synonym for transferring knowledge (Mitchell, 2006) and has also been defined as the activity of sharing knowledge (Willem, Scarbrough & Buelens, 2008). Knowledge integration can hence be interpreted as the activity of one single person sharing knowledge and making it available to others. The term has been interpreted in slightly different ways, although many agree upon the importance of the outcome, to make individual knowledge available to others (Runsten & Werr, 2016). As mentioned above, knowledge integration can also be described as an element for achieving collective intelligence (Runsten & Werr, 2016). At the same time researchers

have made a connection between knowledge integration and knowledge creation by arguing that an integration is required for a creation of new knowledge (Cook & Brown, 1999). Accordingly, knowledge integration is closely related and studied within the research area of knowledge management, which includes several research approaches to the field such as knowledge creation (Nonaka & Takeuchi, 1995).

2.1.3 Knowledge creation

Knowledge creation can be perceived as the process of generating new ideas from a foundation of a collective problem formulation (Styhre, Roth & Ingelgard 2002). The output of a knowledge creating process is viewed as the expansion of available knowledge that promotes innovation and new ideas (Parent et al, 2000). The creation of new knowledge is argued to be essential for companies as it provides a source associated with innovations and better performance (Tsai, 2001), as well as a competitive advantage (Nonaka & Takeuchi, 1995). Cook and Brown (1999) claim that new knowledge is created through an enhancement of existing knowledge and that the creation occurs within interactive contexts. Nonaka and Takeuchi argue that organizations create new knowledge through processes that continuously reconstructs existing, available knowledge through tacit and explicit knowledge (Nonaka & Takeuchi, 1995). Polanyi also refer to knowledge as either tacit or explicit and underlines the fact that "*...we know more than we can tell*" (Polanyi, 1983, p.4). The processes for knowledge creation occur in what Nonaka and Takeuchi (1995) describe as the epistemological dimension, where tacit and explicit knowledge is combined. The knowledge created is further spread through higher ontological levels, which starts at the individual level and is spread through a knowledge spiral from groups to the organization as a whole (Nonaka & Takeuchi, 1995).

2.2 Research gap

The different theories of collective intelligence and knowledge creation have been elaborated upon by researchers from mid-1900 to today, which shows that the scope has been, and still is, highly relevant in organizational settings. However, we have found a gap in this field of research of how behaviors connected to collective intelligence interplays directly with

processes for knowledge creation. Earlier research suggests an interplay between collective intelligence and knowledge creation by emphasizing knowledge integration to be a common denominator of the two concepts. Collective intelligence is connected to knowledge integration, as researchers suggest that it is dependent on the group's ability to integrate knowledge (Runsten & Werr, 2016). Knowledge integration is furthermore connected to knowledge creation, as an integration of knowledge need to occur before new knowledge can be created (Cook & Brown, 1999). Researchers define knowledge integration as a process of making knowledge available (Willem, Scarbrough & Buelens, 2008), while knowledge creation is argued to require both a sender and a receiver of the knowledge (Nonaka & Takeuchi, 1995). Conceptually, one can argue that knowledge integration is the first step in the process of knowledge creation. Some researchers have indeed made a direct connection between collective intelligence and knowledge creation. For example Lykourentzou et al (2010) who suggest sharing knowledge through an online tool to achieve collective intelligence. However, there has been little research covering the interplay between processes for knowledge creation and abilities for collective intelligence.

Figure 1: Research gap

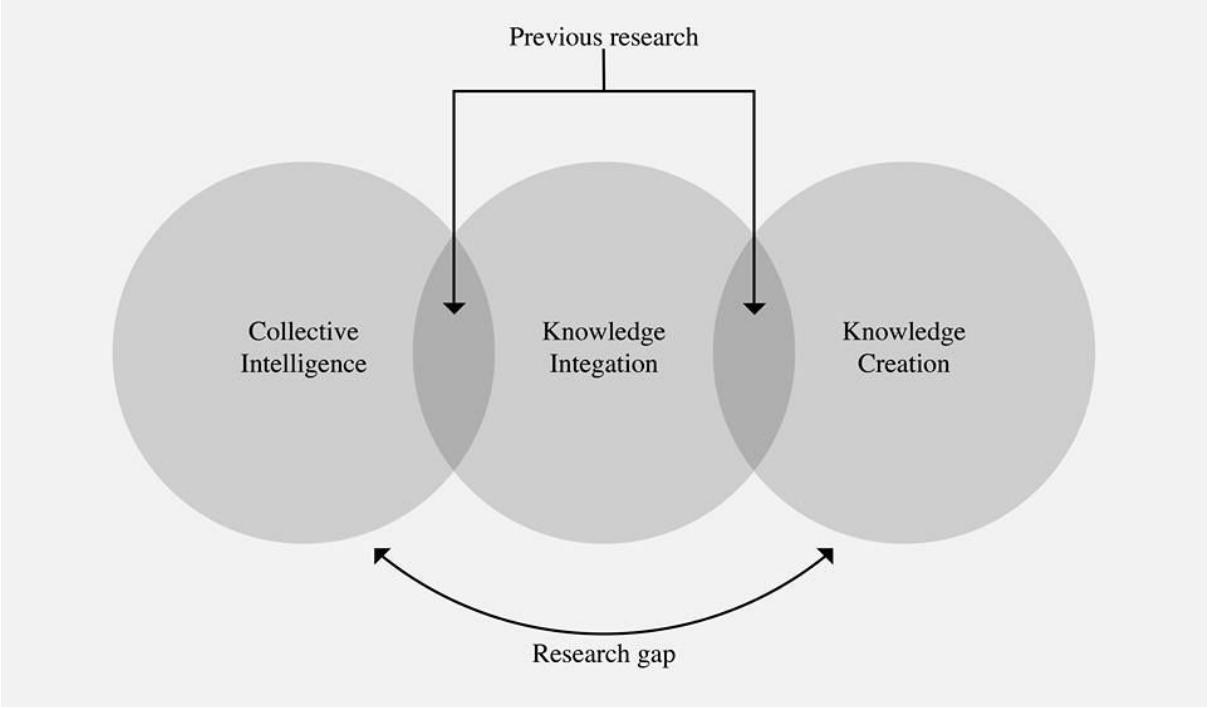


Figure 1 illustrates that previous research has highlighted knowledge integration to be a common denominator of collective intelligence and knowledge creation. We suggest a research gap on how abilities for collective intelligence interplays with processes for knowledge creation.

2.3 Choice of theoretical models

To answer our research question of how collective intelligence interplay with knowledge creation, we decided to mainly use two models. The first model is Runsten and Werr's (2016) model that describe four abilities for achieving collective intelligent groups. The second model is Nonaka and Takeuchi's (1995) model that describe four processes of knowledge creation on an epistemological dimension. Since one model comprises abilities and the other one processes, we see a reason to use them as our core models. Furthermore, one can objectively speaking, exercise an ability within a process, which motivate the value of combining the two models. Other explanatory theories have been added to these models in order to get broad and depth in our framework.

2.3.1 Four abilities of collective intelligence

The model by Runsten and Werr (2016), covering the four abilities for collective intelligence in organizations, serves as a primary source of theory and knowledge in this thesis. The two authors mean that people always bring knowledge into meetings with other people, and that collective intelligence is the amount of knowledge that is used during these different collaborations between people (Runsten & Werr 2016). Further, the authors suggest four dynamic abilities for successfully pursuing collective intelligence;

The first ability, *relation*, is defined as the group's ability to build relationships that enable the participants to contribute with their own available knowledge, in an open knowledge sharing environment (Runsten & Werr, 2016). The goal with the relation ability is to create a climate characterized by Model II behaviour, with the purpose to increase the employees' feeling of safety and creativity (Argyris & Schön, 1996). The second ability is *integration*, which can be described as the group participants' ability to coordinate their knowledge resources dynamically and coherently (Runsten & Werr, 2016). Integration also include the management of different interdependencies within an organization (Thompson, 1967). The third ability, *reflection* is defined as the group's ability to interact in problem solving and

problem definition, and reflect upon performance (Runsten & Werr, 2016). Reflection is developed when group participants interact and share their problems with each other (Klimoski & Mohammed, 1994), and the goal with the ability of reflection is to utilize all knowledge within a group (Runsten & Werr, 2015). Furthermore, knowledge has been argued to be the outcome of observation and reflection (Choo, 2005). The last ability, *representation*, covers how participants in a group create and maintain a complex description of their task (Runsten & Werr, 2016). This has been argued to be important by several researchers, describing representation as an output of collaboration in complex settings (Malone et al, 2009).

2.3.2 Four processes for knowledge creation

Nonaka and Takeuchi's model for creating organizational knowledge takes its point of departure from the assumption that *"An organization cannot create knowledge by itself"* (Nonaka & Takeuchi, 1995, p.72). The model consists of two dimensions, the epistemological and the ontological. The implication of the dimensions is hidden in the names, where epistemology (Steup, 2005) is the study of knowledge and ontology is the study of being (Gruber, 1995). In the epistemological dimension, knowledge is created in four different processes through the interaction between tacit and explicit knowledge. Explicit knowledge can be formulated in words and is relatively easy to transfer from one person to another. Tacit knowledge, however, is harder to transfer since it consists of practical experiences that cannot as easily be formulated (Cook & Brown, 1999). The first process involves tacit to tacit knowledge sharing, defined as *socialization*. It takes form as shared experiences and do not have to involve the usage of language. This is the based of the model, since it evolves around individual's experiences which have not yet been shared nor expressed in words (Nonaka & Takeuchi, 1995). The second process is described as *externalization* and covers how tacit knowledge is articulated into explicit knowledge by creating concepts, models and text (Nonaka & Takeuchi, 1995). This process allows employees to express individual knowledge in words, or other forms of presentation. *Combination* is the third process, which involves how different types of explicit knowledge can lead to new knowledge by combining, adding new explicit knowledge and categorizing

it. It can be combined through meetings between people with the purpose to share and examine explicit knowledge (Nonaka & Takeuchi, 1995). The last process mentioned in Nonaka and Takeuchi's model is the conversion from explicit to tacit knowledge, described as *internalization*. For the knowledge to become tacit, it helps to put it into words before the individual can internalize it. Setting up these kinds of processes for knowledge creation is argued to be beneficial since it can result in financial pay-backs (Lee, Lee & Kang, 2005).

2.3.3 Problematization with chosen theoretical models

The terms collective intelligence and knowledge creation have in the field of research been described in several different ways, in many different settings which makes them open for interpretation. We elaborated on these and made a choice, based on our empirical findings, to narrow our definition of the terms to two different models that describe four abilities for collective intelligence and four processes for knowledge creation. Moreover, we will further define the concepts as they are described in the section "Key Concepts", and Figure 1 will be used to describe the relationship between them. However, we will take a critical stand to if the four abilities for collective intelligence solely can describe what is needed for successfully integrating knowledge and reach a state of collective intelligence within a group. Moreover, are also critical to the simplified explanation that knowledge is created in solely four different processes. Formal processes can never be a complete solution for creating prerequisites for success, as they fail to cover everything a complex organization needs to handle (Runsten & Werr, 2016). Humans one the other hand, need some conversational structures as they are not able to solve all problems through supportive behavior, especially in collective settings where people tend to have different courses of action (Runsten & Werr, 2016).

3. Method

In this section the configuration of the study will be presented. The choice of Influence as an organization and employees interviewed will be motivated and thereafter the reliability and validity of the study will be discussed, as well as the ethical considerations.

3.1 Choice of method

3.1.1 Research method

In order to answer the research question regarding collective intelligence and its interplay with knowledge creation, a single case study was conducted. Employees from Influence were asked broad questions that could be derived to both collective intelligence and knowledge creation. The analysis was hence on an individual level. Semi structured deep interviews have been used to give the interview subjects the opportunity to explain their reasoning (Bryman & Bell, 2015). The decision to conduct qualitative interviews made it possible to research how different individuals perceive the function of integrating knowledge, which is dependent on four abilities of collective intelligence. Further, how knowledge is created within the organization could be understood by letting the employees explain different work processes. Most of the interviews were conducted face to face, which made it possible for the interviewers to register body-language, which could be interpreted for understanding how the interview subjects felt and experienced the interview session (Styhre, 2013). The questions were adopted to fit the current situation for the comfort among the interview subjects.

3.1.2 Research approach

The study was conducted using an abductive approach where the authors of the thesis remained open to the possibility to be surprised by the data collected (Bryman & Bell, 2015). This allowed us to simultaneously conducting interviews and testing hypotheses, turning surprises into new courses of action and adding new theories along the data collection. The reason behind using an abductive approach was the advantages aforementioned, and to avoid

bias that could occur when not questioning earlier assumptions about the research subject. Further, an iterative strategy was used by collecting new theoretical and empirical insights along the development of the thesis (Bryman & Bell, 2015).

Constructionism was assumed the ontological position because of the reasoning that both the organization and culture are in a constant state of revision and can be developed with social interaction (Bryman & Bell, 2015). This approach is aligned with the purpose of the thesis, to explore how collective intelligence interplay with knowledge creation, as both the abilities for collective intelligence and the processes for knowledge creation are dynamic and can be changed over time.

3.2 Sample

3.2.1 Choice of theory

Earlier research suggests that the theoretical interplay between collective intelligence and knowledge creation is knowledge integration. However, we have found a gap in this field of research of how collective intelligence interplay directly with knowledge creation. Alongside the abductive approach of the thesis, we found this gap while collecting data. With a starting point in collective intelligence, we found research covering abilities to achieve collective intelligent groups through effective knowledge integration, as well as theories covering processes for knowledge creation. We wanted to look at the practical interplay between collective intelligence and knowledge creation by collecting data covering how individuals integrate knowledge. We further analyzed it by using Runsten and Werr's (2016) model covering abilities for collective intelligence and Nonaka and Takeuchi's (1995) model for knowledge creation processes.

3.2.2. Choice of company

The company chosen for research was Influence, a management consultancy firm that specialize in collective intelligence and knowledge integration. They have been operating

since 2007 and have during the 12 years employed approximately 100 consultants. Some of these consultants have joined the company with a background in consulting, some with other professional backgrounds and some newly graduated. However, regardless of their background all employees get an introduction to collective intelligence when joining the company. This is essential for new employees, both because the organization aim to improve their customers abilities for collective intelligence and because collective intelligence is a great part of the culture and social climate at the company. The reason for choosing this company was since they profess and are powered by collective intelligence and have a strong ability to share and integrate knowledge (Influence AB, 2019). Furthermore, their work methods and collective idea is based on Runsten and Werr's research within collective intelligence and their model including the four abilities, mentioned in the theory section. This provided us with a unique opportunity to study their model and its implications when used in practice.

Given that Influence is an organization that is powered by research on collective intelligence, we find them to be an adequate study object when trying to explore how collective intelligence and knowledge creation interplay. According to Stake, a case study should be chosen based on where the expected learning is the greatest (Stake, 1995). By conducting a case study within an organization that has outspoken expertise in the study area collective intelligence, one can hope to discover exciting findings that can help answer the research question and add to previous research. The aim with this thesis is not to criticize or praise, but to explore how collective intelligence interplay with knowledge creation and hopefully give a pragmatic conceptualization that can have both academic and practical relevance and substance.

3.2.3. Choice of interview subjects

A total of 11 interviews were conducted with 11 employees at Influence and the interviews lasted for approximately 60 minutes each (see interview list in Appendix 1). Nine interviews were conducted face to face, where the interview subjects got to decide the location to ensure their comfort. The other two interviews were conducted over the phone and were agreed upon

after suggestions from the two interview subjects. The individuals chosen for interviews were selected based on their different experiences within the company, different professional backgrounds, age and sex. We aimed for maximum sample differentiation with the reason to get a broad understanding about how the interview subject perceive collective intelligence and knowledge integration at Influence, regardless of their consulting background and how long they have been working with collective intelligence. The first interview subjects were contacted after recommendations from Philip Runsten, one of the founders of Influence. Some of the later interviews were selected based on snowball sampling, where respondents supplied contact information about colleagues, they believed would be beneficial for continued research (Bryman & Bell, 2015).

3.3 Data Collection

3.3.1 Pilot study

A pilot study was conducted with Philip Runsten, who wrote his PhD examining the subject collective ability and knowledge integration. He is also one of the creators of the model covering the four abilities for collective intelligence, which was discussed in the theory section. The pilot study took form in a meeting, which was unstructured with the purpose to get a broad understanding about knowledge integration, collective intelligence and the company Influence.

3.3.2 Interview Design

Semi structured interviews with open ended questions were conducted for the respondents to be able to answer using their own words (see list of interview questions in Appendix 2). The disadvantages with open questions was discussed, with one disadvantage being that the answers had to be coded and could lead to variability in coding of the answers, which in turn would affect the validity (Bryman & Bell, 2015). However, a conclusion was drawn that the advantages with open ended questions was greater than the disadvantages in this case since

the study topic touch the respondent's perceptions rather than rational answers, and open-ended questions would let them develop their experiences.

In the beginning of each session the interview subjects were informed about the theme of the thesis and about their anonymity. The reason was to make the respondent comfortable and avoid confusion about irrelevant questions (Bryman & Bell, 2015). Since the interviews were semi structured, the respondents were given the opportunity to elaborate on the questions they found the most intriguing, resulting in some of the interviews taking different directions than others. Because all of the respondent's native language is Swedish, a decision was made to conduct the interviews in Swedish to reduce the probability of misinterpretations and facilitate their will to express what they truly mean. After 11 interviews were conducted the authors of the thesis concluded that enough evidence had been gathered for analysis. The reason being, patterns related to theories had been found during all interviews and because of the sample differentiation, we made an assumption that similar data would be found if further interviews were to be conducted.

3.3.3 Coding of findings

The interviews were transcribed continuously as they were conducted. Citations and important findings were highlighted in a shared Google Document to enhance the process of analyzing the data later in the process. Furthermore, it allowed the authors of the thesis to make connections between interview subjects and theory in an early stage and to be able to iterate and collect new theories and interview subjects in the process. The interviews were conducted in Swedish but translated into English in a literal way as possible.

3.4 Discussion of method

3.4.1 Reliability and validity of the thesis

There are three criteria used for evaluation of qualitative management research that are the most prominent. These include reliability, validity and generalizability and will be discussed

in the section below (Bryman & Bell, 2015). Both reliability and validity can be divided into two sub-categories, internal and external, with generalizability being a great part of the external validity.

Since the conducted interviews were semi-structured, the respondents got an opportunity to elaborate on different topics. However, to create a higher level of external reliability, the authors of the thesis created an interview guide to ensure the same set of conversation topics and questions was repeatable during all interviews. This eased coding of answers and made it possible to group the data into different categories for later analysis. However, replication could not be ensured since it is impossible to freeze a social setting, which is the nature of the semi structured interviews (Bryman & Bell, 2015). Furthermore, the case study was conducted at Influence, a consulting firm that specializes on collective intelligence and is therefore affected by their special setting and prerequisites. Firstly, the nature of consulting is characterized by frequent changes in group constellation, which affects the interview subjects' possibility to develop the collective intelligence in permanent groups. Secondly, an outspoken knowledge about collective intelligence may furthermore affect their way of interacting in groups.

To ensure internal reliability, both interviewers were present during all interviews, except for one. After each interview, the findings were discussed between the two interviewers to ensure inter-observer consistency, that the findings were interpreted the same way (Bryman & Bell, 2015). After the interview where only one of the interviewers were present, the other listen to the recording of the interview. It thereafter was discussed between the interviewers to agree upon interpretations. This method resulted in a high degree of agreement. Further, the findings was coded and interpreted several times through discussions and transcripts which increased the probability of data being interpreted the right way.

Mason explain validity as the ratio between what you say you are observing and identifying, and what you actually are observing and identifying (Mason, 2016). Internal validity could be described as to what extent the result is representing reality and external validity, as the degree to which the result could be generalized (Merriam, 1994). To increase the internal

validity of this thesis, we aimed to create an impartial understanding and reduce anchoring bias by transcribing all interviews and analyze them with an assumption that everyone is entitled to its own experience. Although the interviewers have been devoted to this attitude, there is still a risk for subjectivity since we are aware that humans rarely act rational and tend to be colored by values and assumptions (Brunsson, 1989). Regarding the external validity, generalization is problematic because of the qualitative nature of the method as well as the small sample (Bryman & Bell, 2015). In addition to internal and external validity, respondent validation was ensured as the interviewers provided the interview subjects with codlings of what would be used for analysis from each interview session (Bryman & Bell, 2015).

3.4.2 Ethical considerations

All interview subjects have voluntarily taken part in the study after being in contact with the authors of the thesis. To ensure the interview subjects comfortability, they got the opportunity to decide when and where the interviews would take place. Further, the interviews were recorded after full consent and all interview subjects were ensured full anonymity. The primarily goal was to respect the respondents by making them as anonymous as possible. However, to be able to separate the individuals in the analysis, and to increase the credibility of the analysis, their level of seniority and position are mentioned together with their fictional names. Moreover, to further increase the respondent's anonymity the gender of the fictional names is anonymized, as the names are randomized not taking the gender of the respondents into account.

4. Empirical Data

In the following section, data from the conducted interviews is introduced. Firstly, a description of the company's focus on collective intelligence is presented. After that a description follows of how Influence work with the four abilities for collective intelligence. The chapter is summarized by phenomenon that could not be explained by any of the four abilities.

4.1 Knowledge creation at Influence

4.1.1 A focus on creating a collective intelligence mindset

The management team base several of the processes within the organizations on the four abilities for collective intelligence. One manager expressed that his role includes creating a common language and understanding for everyone: *"What makes my role at Influence fun is trying to create great conditions for everyone who works here, such as establishing a common language and a common concept for how we should deliver and organize ourselves". - Carl.*

In order to create a common understanding for the abilities, every new employee who starts working at Influence enroll and go through an *introduction course* to learn about the company and the concept of collective intelligence. Some consultants who start directly after graduating university join a pioneer *program* of one and half year, where they gradually integrate their way into the company by participating in different lectures, workshops and exercises related to the abilities for collective intelligence, or as Gabriel described the abilities: *"the core of Influence"*.

*S*ome of the managers expressed a difficult balance and tradeoff between introducing formal every day processes for practicing and developing the four abilities of collective intelligence, and at the same time retain employee initiative and freedom within the organization. They

mean that too many formal processes tend to restrict creativity among employees and that an insufficient amount of structure and top down guiding may cause organizational confusion. One manager argued that an exaggerated structural control could result in *"system overconfidence"*, which in turn has a negative effect on individual responsibility. *"You can blame external circumstances or claim that your manager has given you too little information. But it is very difficult to blame the system. I think that is good. I personally hate when people blame the system."* - Adam.

One of the senior consultants who has been at the company since it was founded stated that: *"We constantly strive to have as few routines and processes as possible. But considering that we are almost 100 employees today, it is not possible to get away from it."* - Ellen. Our empirical data suggest that managers do not delimit the practice of the four abilities for collective intelligence into predetermined processes.

4.2 Four abilities for collective intelligence

The following part of this section consists of a compilation of data collected on the employee's experience of the processes for which the four abilities for collective intelligence are exercised.

4.2.1 Relation ability in practice

The identified processes that allow for knowledge creation include supportive behavior that occur tacit to tacit without formal instructions. Observed events within this categorization are *informal lunches* and *coffee breaks* where employees integrate knowledge with each other in social contexts. Many interviewees expressed that their relationship was strengthened within these informal processes:

"We are all interested in investing our time and effort to build great relationships at work. By just hanging out during coffee breaks and lunches, talking about things that concern both work and personal life, I feel like we strengthen our relationships." - Kim.

Many of the respondents further expressed that they have a profound focus on relationships at Influence. Hanna described that it is not only a focus area, the result of the ability is also good; "*I would say that we have a great focus on relationship at Influence and we are good at it"*. Doris, Isak, Hanna and Gabriel further described the social climate at Influence, which is characterized by a great focus on the people within the organization; *"We care about each other, so it is very safe in general. Many have a high interest in getting to know each other and we learn a lot from each other by just interacting"* - Doris, "*If I compare with other consulting firms I have worked at, I find that it is a lot better atmosphere here, much warmer as everyone think that relationships are important"* - Isak, *"Influence for me is colleagues who care about each other, enjoy socializing with each other but solve very difficult problems in a smart way, rather than applying a one solution fits all model"* - Hanna, *"Many are friends even outside the workplace"* - Gabriel. Ellen and Felix further describe why good relationships are essential for them; *"For me it is energy-draining not to have good collaboration"* - Ellen, *"You must have a good relationship in order to achieve effective knowledge integration"* - Felix. Furthermore, these relations tend to affect the amount of informal processes of integration at the company; *"Those who have worked here for a long time, who know each other and have developed relationships, that trust each other and who work together, share knowledge by interacting"* - Carl.

4.2.2 Integration ability in practice

The ability of integration covers how individuals coordinate knowledge resources (Runsten & Werr, 2016). The employees showed behaviors that include a spontaneous sharing of content through different internal channels, mainly *yammer and teams,* without being instructed to do so; *"We share things on our channels, Teams and Yammer to make our personal knowledge available to everyone at the company"* - Johanna. The employees hence showed behaviors were they voluntarily go outside their work description to help each other by integrating knowledge. Johanna also explained that she has been on a project with a client for two years but still take the time to integrate internally; *"I have Teams, Yammer and my Influence mail available during the day. So, I do internal stuff at the same time if something pops up"*. Many

mentioned that they value informal integration high and that it is a big part of their learning *"It is a habit now to check out Teams and what has happened there"* - Ellen.

Also, the employees can choose to join different *Tribes* that are created based on the employee's interests. Within those Tribes, knowledge about different specific specialization and subject areas related to industry are shared and discussed. Many of the respondents mentioned Tribes as a place to integrate and gather around common interests; *"I would say that the Tribes are a large part of integration. Those who work, want to work or have an interest in a particular area in which they gather and share knowledge"* - Hanna. "*The Tribes is a way in which one collects a certain type of competence and share it with others"* - Isak. The continuous meetings within different teams were also discussed during many of the interviews; "*At our monthly meetings we have 'project of the month' where they describe how they work with collective intelligence at the customer"*- Johanna.

4.2.3 Reflection ability in practice

Another formal process found was *Cics Clinics*, which could be described as a meeting where consultants within a project gather to discuss goals, obstacles and help each other forward in delivering value to customers. The process was mentioned in several interviews as a useful tool for reflecting and asking constructive questions for developing and improving their work. The tool is further a way for the employees to gather and combine various knowledge; *"Okay, where are we? Are we aware of the situation? What feels difficult and what do we think is hard? What do we need smarter around?"* - Carl. Hanna agreed with the usefulness of the tool for reflection: "*If you work in a team, I think this is a good way to talk about what is good and what can be done better"* - Hanna. The process was described as useful for both problem solving and problem formulation: "*Both the road and the goal are changing."* - *Gabriel.*

Feedback sessions was also a process for reflection discussed by several interview subjects. They described the process as a way of sharing and compiling knowledge. Isak said: *"I think it's very important. Absolutely. Both that one reflects on one's common achievement but also*

that one gives feedback to each other" - Isak. Doris expressed: *"I have never received so much feedback since I started working here. I still have such documented feedback from the years and that is fun"* - Doris. Furthermore, many of the respondents saw feedback and asking questions as an obvious part of their job: *"I am of appreciative nature so if a person does something I really appreciate, I tell them."*- Beatrice. *"I think it is important to reflect, so we take the time to do it. It is almost strange if we do not take the time to ask questions"* - Carl.

4.2.4 Representation ability in practice

Other than reflection, Cics Clinics was mentioned as a source for creating representation. *"That's kind of 'Where should I go? What roles do we have? What is my role? What are my expectations of myself, who are yours and mine on you?' We try to create representation around the mission"* - Gabriel. Our data suggest that this process is a common way to integrate explicit knowledge to job descriptions that are useful both for employees and managers. Carl mentioned that he as a manager could use these meetings to clarify roles: *"That everyone works according to some common rules of the game. Everyone knows what the goals are and how one's different roles interact, and that we have the same picture of what we should do"* - Carl, while Kim explained it as a great process for clarifying and incorporating collective intelligence in his role: "*How to incorporate collective intelligence and develop your role in your project"* - Kim. Adam also mentioned that he appreciated defined roles because it eased progressing it their different projects: *"I like when we agree on something so we can hand out roles and go out and fight in the field"* - Adam.

4.2.5 Abilities in disharmony

Although many positively described how they work with the four abilities for collective intelligence, some of the interview subjects described the negative effects that could be derived from too much focus on being a collective intelligent group. *"If there are too many collective intelligence advocates in a room, there may be a tendency to turn in the other direction and it becomes inefficient"* - Hanna. Both Johanna and Doris described similar

scenarios and a tendency of higher expectations on themselves because of their expertise in collective; *"It can be strained, that one think you have to be so incredibly good because we are experts on this, but that it can sometimes feel like 'Why do we not succeed? Why doesn't it feel like we are collective intelligent right now?'"* - Johanna, *"We can do more, but we have higher performance requirements on ourselves and then you can get locked"* - Doris. Several of the respondents mentioned the concept of *"The Cobbler's children",* showing that even though they know a lot about collective intelligence, they do not always apply it on themselves and the groups they are working in. Doris further explained what she thinks is the reason behind it *"In the end, we are only human"* - Doris.

Looking at the relation ability alone, many of the interviewees described a discomfort and pressure when activities for practicing the relation ability was forced into formalized meetings. "*I get stressed, especially when half a meeting is about finding out how everyone is feeling"* - Adam. Adam expressed that these meetings should instead include solving problems they are facing. Kim further described that an extensive focus on relationships during meetings sometimes resulted in a diminished focus on the task: "*Sometimes we focus more on a good cooperation and relations than the task itself"* - Kim.

Moving over to integration ability, some of the interviewees expressed difficulties in making valuable tacit knowledge explicit to those who could receive help from it.

"There is a lot of valuable information that cannot be found anywhere. It is knowledge that is in the head of an individual, or information that is shared at a meeting around the coffee machine. It is a challenge and it is related to the fact that we are not a person to paper company. We do not write everything down on a PowerPoint and upload." - Carl.

Furthermore, some respondents describe scenarios where tacit knowledge is integrated, but there is uncertainty about if anyone receives the knowledge. Ellen often collect integrated knowledge through a digital knowledge sharing tool called *SharePoint*, "*I am not sure if employees generally use this channel to receive knowledge"*. Kim further said he is aware of

the channel, but do not have a habit of using it: *"I know about SharePoint, but I usually turn to other channels if I feel the need for more knowledge"*.

Regarding reflection ability, a significant number of interviewees described a lack of explicit communication as a source of misinterpretations and conflicts. *"Sometimes we are not communicating clearly enough with each other and are not taking the time to give each other feedback and reflect together*" - Johanna, *"I would say that the conflicts that arise are about communication shortage and misunderstandings"* - Ellen. Moreover, the interview subjects expressed a desire for reflecting explicit together to reduce the probability of conflicts. Kim expressed that a lack of direct communication sometimes resulted in discomfort as they tried to communicate feedback through indirect gestures.

"Sometimes one can feel that there is some unspoken air or misunderstanding through people's body language. Then one should really just ask the person what is wrong and solve the problem through clear communication" - Kim

Looking at the representation ability, we found that some interviewees expressed frustration over the feeling of non-explicit representation around what should be done by whom. *"It may be that one thinks that everyone 'get the thing' and that we may take representation too lightly by not clarify things as one think that everyone knows what you mean"* - Johanna. The knowledge was hence not put into words before it was included in their job assignments. Isak and Gabriel, who are both junior consultants, expressed their lack of explicit representation around their work; *"Sometimes I would like to have more clear explicit information about the expectations of me"* - Isak. Gabriel further described his first months at Influence as confusing: *"I had to find information about the project myself since I did not have enough communication with the others, which caused confusion and frustration in the team"*.

4.3 Phenomenon encouraging knowledge integration

Other than the four abilities, we also found tendencies of other phenomenon that the employees described as fundamental for an eminent knowledge integration. Our findings

suggest that the employees at Influence connects this phenomenon to their willingness of integrating their knowledge when practicing the four abilities.

4.3.1 A sense of responsibility & freedom

A high degree of discretionary behavior was found among the interview subjects, which means that they go beyond what is specified in the task on their own to contribute to a better understanding by integrating their knowledge. Adam and Doris describe their sense of responsibility as obvious; *"There is never a reason not to deliver. Emotionally, I am always responsible* - Adam, *"I feel a lot of responsibility for my duties. It feels like I need a strong personal engine for doing what it takes to get a broad understanding"* - Doris. Johanna gave a concrete example and explained that many of her colleagues writes summaries of what they are working with at Influence's website to share their knowledge and increase transparency. She further explained that she in turn, always reads what is written, even though it is not a requirement; *"I think this is part of my responsibility to read through what my colleagues have written and contact them if I have questions, in this way I also get to know more."* - Johanna. This sense of responsibility take shape in different ways. Felix, who is a senior consultant, described that he is more than happy to help junior consultant at the company. *"With young people, it is always fun to be able to guide and help by integrating my knowledge"* - Felix. This sense of responsibility could also be found among the managers as their expectations of the employees are unspoken: *"We are an organization that does not have many demands. We work more with unspoken expectations"* - Carl. Further, Adam mentioned how he perceive the connection between freedom, responsibility and goals.

" If you just work exactly as it says in the book, you can be unintelligent and still carry out the task. But working on complex problems, there are no give answers or instructions. People need to be free to solve the tasks in an intelligent way. Freedom means a lot of responsibility, as freedom of action imply a promise of reaching the goal" - Adam

4.3.2 A workplace characterized by engagement & commitment

The employees also described a high degree of commitment and engagement. Hanna described it as the core of what they do: "*Much of the internal work and knowledge integration at Influence is based on voluntary engagement."*. Other than *what* they said, the employees' commitment could also be derived to *how* they said it. There was a strong agreement between the two interviewers that a significant part of the interview subjects sounded more engaged when explaining Influence compared to other companies they had worked at. *"In general, Influence is a very committed organization. I cannot imagine that there is any person who just tags along, everyone is involved in the company's development*" - Beatrice. One of the respondents said "*I think that an important part is that everybody wants to help if you have a question. They will drop everything if you have a question*", which indicates that individuals indeed go beyond their own task to contribute to knowledge integration. Johanna said, as it was self-evident, that *"When someone has a lot in their project, other jumps in to help"*.

4.3.3 A matter of believing in the collective idea

Other than a strong sense of responsibility and commitment, we also found that there was an agreement on the collective idea that constitutes the core of Influence. We asked one of the managers about their strategy, and we got the answer that they are an idea driven organization, using collective intelligence as a *"lever to maximize business value"* - Doris. The collective idea is among our interview subjects described as attractive, since it involves complex projects at the same time as the human is kept in the center: *"Almost everyone who is drawn to Influence does it because they perceive that Influence has an idea to begin with, and that idea is attractive and something they want to embrace"* - Beatrice. The patterns we could identify include a human centered organization where the collective is argued to be more important than a single person. *"The human is in the center, and it is important that we all get along, cooperate and integrate our knowledge so we can learn from each other"* - Kim. When asked about why they chose Influence as an employer, many interview subjects described the collective idea of keeping humans in the center: *"Finally! An organization that*

thinks about the people" - Isak, "*People, group dynamics and content, more soft factors and values"* - Felix, *"We have a high level of performance, but it is noticeable that it is the people who are important"* - Gabriel.

5. Analysis

In the following section we present how the four abilities for collective intelligence (i.e. relations, integration, reflection and representation), could from the data collected be connected to the theory of Organizational Knowledge Creation.

5.1 Interplay Matrix

To answer our research question "*How does collective intelligence interplay with knowledge creation?*" we analyzed the interviewees' explanations of how they integrate knowledge in order to increase the collective intelligence. We identified several examples of knowledge creation processes where knowledge was integrated in both tacit and explicit forms. Moreover, our data suggest a complex interplay between collective intelligence and knowledge creation, which we found can unfold in four different ways, described in a matrix below:

Figure 2: Interplay Matrix

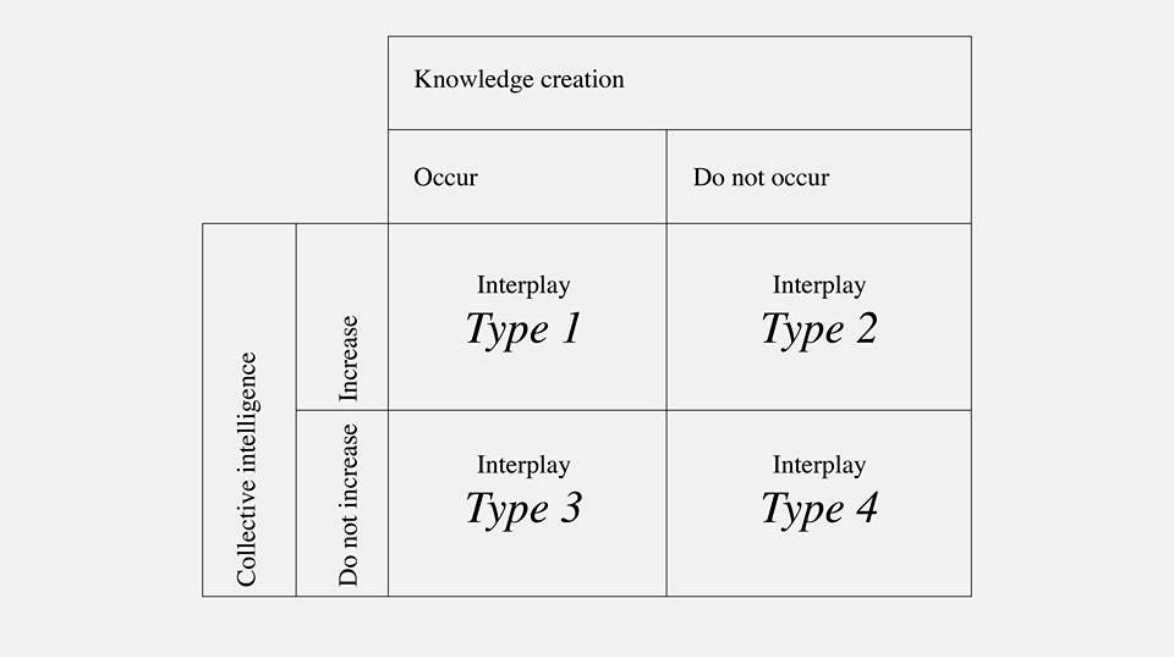


Figure 2 displays four different interplays between collective intelligence and knowledge creation, based on theories by Nonaka and Takeuchi (1995) and Runsten and Werr (2016).

- Interplay *Type 1: Collective intelligence increases through the exercise of one of the four abilities and knowledge creation occurs.*
- Interplay *Type 2: Collective intelligence increases through the exercise of one of the four abilities but knowledge creation does not occur.*
- Interplay *Type 3: Collective intelligence does not increase through the exercise of one of the four abilities, but knowledge creation occurs.*
- Interplay *Type 4: Collective intelligence does not increase through the exercise of one of the four abilities and knowledge creation do not occur.*

Since collective intelligence and knowledge creation has been argued to be essential for organization progression (ex. Hiltz, Johnson & Turoff, 1991, Tsai, 2001), we decided to go deeper into which abilities for collective intelligence and processes for knowledge creation that generates an Interplay *Type 1* (Figure 2), as it allows collective intelligence to increase and knowledge creation to occur, in tandem. We found specific relationships between processes for knowledge creation and the practical work with the four abilities for collective intelligence, to achieve Interplay *Type 1* (Figure 2). The four abilities are described in the section below, together with specific knowledge creation processes that creates an Interplay *Type 1* (Figure 2). We also present examples of other interplays such as Interplay *Type 2, 3, 4* (Figure 2), in connection to the abilities. In these examples we instead find disharmony as an increase in collective intelligence and an occurrence of knowledge creation are not achieved simultaneously.

5.1.1 Relation ability in different knowledge creation processes

By analyzing our data, we found that the interviewees most often mentioned that they integrated knowledge tacit when working with the relation ability. We also found several events of tacit to tacit knowledge creation, in connection with the practice of the ability. The interviewees furthermore expressed that the relation ability contributed to an increase in their collective intelligence when knowledge creation occurred tacit to tacit, as they "*learn a lot from each other by just interacting."*. We can thereby identify an Interplay *Type 1* (Figure 2) when the relation ability is combined with a socialization process.

However, when the relation ability was exercised in deviant processes, we saw that the attempt to increase the collective intelligence though the practice of the relation ability generated an Interplay *Type 3* (Figure 2). One of the respondents described a situation where he found himself in a meeting where people were talking about each other's feelings, which made him "*stressed*" and "*frustrated*". He further expressed that these meetings should instead focus on solving work related problems. This resistance so indicates that when, relation ability is exercised in a combination process, knowledge creation occurs, but at the expense of an increment of collective intelligence.

5.1.2 Integration ability in different knowledge creation processes

Our data suggest that the interviewees most often mentioned that they integrated knowledge tacit when working with the integration ability. We also found several events of tacit to explicit knowledge creation, in connection with the practice of the ability. The interviewees furthermore expressed that the integration ability contributed to an increase in their collective intelligence when knowledge creation occurred tacit to explicit. We can thereby identify Interplay *Type 1* (Figure 2) when the integration ability is combined with an externalization process, as the employees share knowledge on Teams and Yammer to make it "*available to everyone at the company"*.

On the contrary, when the integration ability was exercised in deviant processes, we saw that the attempt knowledge creation and an increase in collective intelligence could not occur simultaneously. One of the interview subjects expressed that some important knowledge remains tacit "*in the head of an individual"*, even though the organization could benefit from converting it to explicit knowledge through practicing the integration ability. If knowledge integration does not occur in the first place, knowledge will remain in the head of an individual which will result in Interplay *Type 4* (Figure 2), since collective intelligence is dependent on knowledge integration. Similarly, knowledge integration must occur before an event of knowledge creation (Figure 1).

However, if valuable knowledge that could benefit the whole organization is *"shared by the coffee machine"* there will be an event of Interplay *Type 3* (Figure 2). The knowledge creation that occurred, when the integration ability was practiced, did not increase the collective intelligence as the knowledge that would benefit the whole organization took place in a socialization process.

From our empirics we could identify the activity of integrating knowledge through digital share points as an activity of integration ability. However, we identified cases where no one received the knowledge and hence no knowledge creation occurred. According to our definition, the process of knowledge creation must include a sender and a receiver of knowledge. Furthermore, knowledge creation should expand the available knowledge (Parent et al, 2000). Hence, the ability of integration was practiced through knowledge integration that increases collective intelligence, but since no one received the information, knowledge creation did not occur. This is hence an example of an Interplay *Type 2* (Figure 2).

5.1.3 Reflection ability in different knowledge creation processes

The interviewees most frequently mentioned that they integrated knowledge explicit when working with the reflection ability. We also found several events of explicit to explicit knowledge creation, in connection with the practice of the ability. The interviewees furthermore expressed that the reflection ability contributed to an increase in their collective intelligence when knowledge creation occurred explicit to explicit. We can thereby identify Interplay *Type 1* (Figure 2) when the reflection ability is combined with a combination process, where different bodies of externalized knowledge is combined (Nonaka & Takeuchi, 1995). The formal process Cics Clinics was mentioned in many interviews as a tool for reflection and utilizing explicit knowledge. The interview subjects even expressed it would be strange if they did not take time to reflect and ask questions.

Furthermore, we also found that reflection ability was practiced in other processes, which resulted in misinterpretations and conflicts. Some interviews expressed discomfort when the reflection ability was practiced tacit to tacit in a socialization process. One example of this is

when employees try to communicate dissatisfaction tacit to tacit through an exchange of indirect gestures with the purpose to get the other part to change their behavior. The discomfort indicates that they lacked a combination process where knowledge is converted from explicit to explicit forms. As the practice of reflection ability did not force a knowledge integration nor, knowledge creation as the indirect gestures could not be interpreted by the receiver, we can identify an Interplay *Type 4* (Figure 2).

5.1.4 Representation ability in different knowledge creation processes

By analyzing our data, we found that the interviewees most frequently mentioned that they integrated knowledge explicit when working with the representation ability. We also found several events of explicit to tacit knowledge creation, in connection with the practice of the ability. The interviewees furthermore expressed that the representation ability contributed to an increase in their collective intelligence when knowledge creation occurred explicit to tacit. A symbiosis was found when practicing representation ability in an internalization process where explicit knowledge was incorporated into individuals' roles and work descriptions. Cics Clinics was once again mentioned as a useful formal tool for processing explicit knowledge, but other than for reflecting it as argued to "*develop your role"*. Hence, by using the internalization process for representation, explicit knowledge was incorporated to the employees' roles. We can thereby identify an Interplay *Type 1* (Figure 2) because both the collective intelligence increased as well as knowledge was created.

However, one of the respondents expressed uncertainty regarding representation when the knowledge created was not departed from explicit knowledge. One example includes when members of a group took representation too lightly by not clarifying roles. The representation ability was not practiced within an internalization process in this case, where knowledge is put into words before included in their work description (Nonaka & Takeuchi, 1995). This in hence considered a mismatch between ability and process, since the collective intelligence did not increase due to not practicing the representation ability efficiently. Moreover, no knowledge was created, which resulted in Interplay *Type 4* (Figure 2).

5.1.5 A puzzle combining collective intelligence and knowledge creation

Figure 3 presents a summary of the four abilities of collective intelligence and the four processes for knowledge creation, which allows for Interplay *Type 1*, as both collective intelligence increase and knowledge creation occurs. When the pieces are put together, collective intelligence increased through the practice of the abilities and the processes for knowledge creation are successfully fulfilling the purpose of creating knowledge that promotes innovation and new ideas (Parent et al, 2000).

Figure 3: A puzzle for Interplay *Type 1*

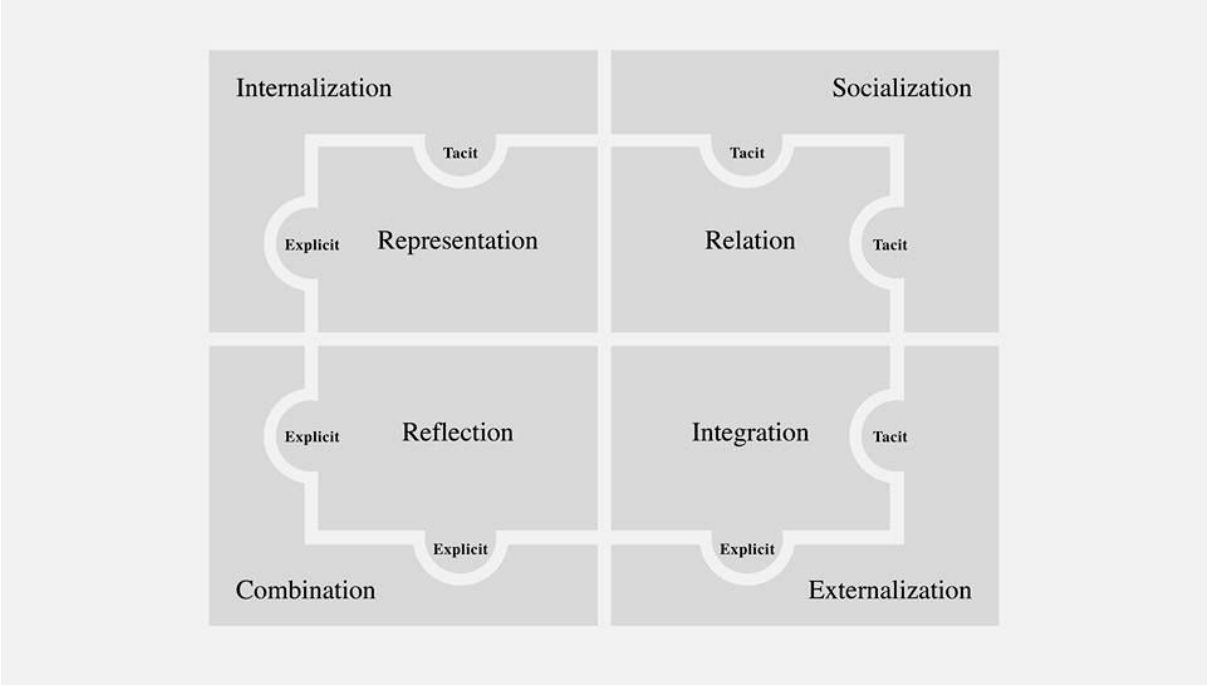


Figure 3 displays a combination between four abilities for collective intelligence (Runsten & Werr, 2016) and four processes for knowledge creation (Nonaka & Takeuchi, 1995).

5.2 Putting the pieces together with assembling phenomenon

After identifying four ways in which collective intelligence can interplay with knowledge creation (Figure 2), we critically ask ourselves if solely combining the right ability with the right process is the complete answer to achieving Interplay *Type 1* (Figure 3). Our empirical data reveal that many of the processes containing a conversion from and or to explicit

knowledge are initiated by managers who have created routines and formal channels for knowledge integration to occur. At the same time, several of the processes where knowledge creation takes its point of departure from tacit knowledge are initiated by employees' voluntary behaviors of integrating knowledge. In addition, the formal tools for integration of tacit knowledge are not coercive. The managers express a work with "*unspoken expectations"* and do not force the employees to use the tools. Since our data nevertheless showed that knowledge integration can take place without coercion, we believe that the phenomenon of responsibility & freedom, engagement & commitment and a collective idea, can be of importance for achieving Interplay *Type 1* (Table 2). From our data we found that the collective idea seems to enforce the employees' awareness of the importance of knowledge integration for achieving collective intelligence, while responsibility and engagement seems to have a direct link to the frequency of the employees' practice of knowledge integration. Furthermore, the assembling phenomenon seem to be of particular importance in cases where knowledge integration must departure from tacit a form, such as in socialization and externalization processes.

6. Conclusion and discussion

In this section we will present the answer to our research question, followed by a discussion about the practical and theoretical contributions, as well as suggestions to previous research.

6.1 Answer to the research question

We have studied and analyzed knowledge integration on an individual level to answer the research question:

How does collective intelligence interplay with knowledge creation?

The question can be answered in three steps; firstly, we suggest that there is a complex interplay between collective intelligence and knowledge creation, that can unfold in four ways (Figure 2). One of the interplays (Interplay *Type 1*) stands out, as it is the only interplay that allows collective intelligence to increase and knowledge creation to occur simultaneously. Secondly, our analysis suggests that this interplay can be achieved by combining the four abilities for collective intelligence and the four processes for knowledge creation in the following way:

Table 2: Interplay between abilities for collective intelligence and processes for knowledge creation

Ability	**Process**
Relation	Socialization
Integration	Externalization
Reflection	Combination
Representation	Internalization

In situations where abilities were practiced in processes deviating from the combinations illustrated above (Table 2), we could observe disharmony as at least one of the concepts of collective intelligence or knowledge creation was adversely affected.

Thirdly, we found that the phenomenon; such as responsibility & freedom, engagement & commitment and a collective idea seems to contribute to an Interplay *Type 1*. Mainly since the phoneomenon foster knowledge integration, which is a prerequisite for achieving Interplay *Type 1*. We noticed these phenomenon to be especially important when practising the relation and integration ability, since they depart from tacit knowledge and are dependent on the employees' willingness to integrate knowledge.

6.2 Contribution from findings

By conducting a single case study at an organization with a pronounced focus on collective intelligence, we contributed to the understanding of the interaction between collective intelligence and knowledge creation through empirical addressing how they interplay in practice. The result indicates that some abilities are most commonly and efficiently practiced within specific processes for knowledge creation, either departed from tacit or explicit knowledge. This knowledge can be used to initiate discussions regarding which processes should be formalized, and why. These implications can further be valuable for both organizations that wish to enhance their competitive advantage, and for employees to reduce stress and conflicts in their day to day work. Our findings can hopefully contribute to organizations aiming to increase their collective intelligence and knowledge creation by helping them answer questions such as: "*Why do we not succeed? Why doesn't it feel like we are collective intelligent right now?",* which interview subjects expressed during conducted interviews.

6.3 Further research and discussion about delimitations

To increase the reliability and validity of the study, further research could be applied to other geographical areas as well as other professions. Since consulting is characterized by frequent changes in group constellations, a study on individuals in permanent groups could be of interest. Furthermore, this study was conducted by interviewing individuals with an outspoken knowledge about collective intelligence, which likely affected the result. Hence,

further research could include examining how collective intelligence interplay with knowledge creation in a setting without individuals possessing knowledge about the subject. Moreover, due to the scope of this thesis, we found it necessary to simplify the complex relation between abilities and processes. However, we are aware of the complex relationships and links between these and advise further research to take this complexity into consideration, as well as the complexity regarding individuals' relation to collective intelligence and knowledge creation.

Although we have identified an interplay where both the collective intelligence increase and knowledge creation occurs, that expresses itself through Interplay *Type 1* (Figure 2), we refrain from taking a stand whether organizations can, or should, strive for this "optimal" state in all situations. Nonaka and Takeuchi (1995) encourage *"breakdowns*" to rub the balance of processes, with the purpose to initiate questioning of assumptions. They argue fluctuation and creative chaos as conditions for spreading knowledge to higher ontological levels (i.e. higher organizational levels), which would not be realized within Interplay *Type 1* since processes are in harmony with practising an adequate ability. As we have limited this thesis to individual's perceptions, we suggest further research to develop this possible complex relationship by researching how, when and why to develop Interplay *Type 1* in an ontological dimension .

Furthermore, it seems like the assembling phenomenon found during conducted interviews have a significance interplay for fostering knowledge integration, which is a prerequisite for Interplay *Type 1* (Figure 3). We do not intend to take a position regarding how the assembling phenomenon might relate to one another, as that would require additional data and research. However, we think that the assembling phenomenon may prevent the presence and frequency of Interplay *Type 4* (Figure 2) as we saw that this interplay occured when knowledge integration did not occur in the first place. In events of Interplay *Type 2* and *3*, we saw that these interplays arose due to a mismatch between what we argue to be an adequate process for with an ability that was practiced in the specific event. We do not have enough data to argue the assembling phenomenon counteract the presence of Interplay *Type 2* and *3*, as we identified these interplays to occur even though the employees practiced knowledge

integration. Moreover, we believe that the human factor and the simplification of the complex reality that our model of interplay 1 implies makes it hard to exclusively achieve Interplay *Type 1* (Figure 2, Figure 3). We suggest that it is difficult to delimit the exercise of certain abilities to certain processes and especially in complex situations that require that you work with several abilities simultaneously or in close connection with each other. when working with people, it will always be difficult to reach perfection. Because after all, *"In the end, we are only human"*.

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8. Appendix

8.1 Appendix 1: Interview subjects

Table 2: Interview subjects

Fictional Name	**Experience**	**Position**
Alex	Senior consultant	Consultant and manager
Beatrice	Senior consultant	Consultant and manager
Carl	Senior consultant	Consultant and manager
Doris	Senior consultant	Consultant
Ellen	Senior consultant	Consultant
Felix	Senior consultant	Consultant
Gabriel	Junior consultant	Consultant
Hanna	Junior consultant	Consultant
Isak	Junior consultant	Consultant
Johanna	Junior consultant	Consultant
Kim	Junior consultant	Consultant

8.2 Appendix 2: Interview guide

All interviews were conducted in Swedish. This is a translation of the questions asked:

Table 3: Interview guide

Could you tell us about your role at Influence?
For how long have you worked at Influence?
How come you have the position you have today?

How specific are your tasks?
What degree of responsibility do you feel for your tasks?
How much autonomy do you have?
Are you comfortable with that level of autonomy?
In what way do you feel commitment for your work?
To what extent do you feel that you get appreciated for your work?
Are you comfortable with the appreciation you get?
Can you describe what makes you engaged in your work?
Can you describe the social climate at Influence?
How much did you know about collective intelligence before you started working at Influence?
What have you learned about collective intelligence since you started, and how?
If a problem arises in your day to day work, how do you tackle it?
What does these problems usually depend on?
How often do you take help from others when problem arises?
Do you have processes to follow for solving problems?
How much do you collaborate with your colleagues at Influence when out on a project?
How do you integrate knowledge to the organization when you have been out on a project?
What processes do you use for integrating knowledge?
How do you work with the four abilities for collective intelligence?
What positive advantages to you find with an organization with a commitment to collective intelligence?
What negative effects do you think it has?
Is there something you think we missed, and you want to add?