

Who's helping the knowledge manager?

A critical literature review: What are the limitations of the knowledge development cycle?

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Summary

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Abstract

The knowledge development cycle is a conceptual model by Bhatt published in the year 2000. The cycle lacks sufficient exploration into the definitions of the knowledge processes involved, the interdependent relationships between the knowledge processes it presents, and the factors which may affect the knowledge processes. This review aims to highlight the limitations of the knowledge development cycle as a whole. By presenting findings that show how definitions have become varied or similar, how interdependent relationships exist, and what may affect the knowledge processes'. The review presents the original literature used by Bhatt in 2000 to create a greater understanding for the reader when the new findings are presented. By conducting a review of 30 articles within the field of knowledge management, a foundation has been made to both criticise and build upon the work of Bhatt. The review was limited to two databases and used search terms from the original cycle as well as some synonyms. The findings explore the concepts of knowledge review and revision, knowledge creation, knowledge adoption and knowledge sharing. As a result, the review presents the answer to three guiding questions. Firstly definitions are presented, followed by an expanded model to illustrate the interdependent relationships between the knowledge processes and finally the affecting factors. As well as this opportunities for further research based on the new findings are mentioned.

Sammendraget

Kunnskapsutviklingssyklusen er en konseptuell modell av Bhatt publisert i året 2000. Syklusen mangler tilstrekkelig utforskning av definisjonene av kunnskapsprosessene involvert, de gjensidig avhengige relasjonene mellom kunnskapsprosessene den presenterer, og faktorene som kan påvirke kunnskapsprosessen. Denne studien tar sikte på å synliggjøre begrensningene i kunnskapsutviklingssyklusen ved å presentere funn som viser hvordan definisjoner har blitt varierte eller lignende, hvordan gjensidig avhengige relasjoner eksisterer, og hva som kan påvirke kunnskapsprosessene. Gjennomgangen presenterer originallitteraturen som ble brukt av Bhatt i 2000 for å skape en større forståelse for leseren når de nye funnene presenteres. Ved å foreta en gjennomgang av 30 artikler innen kunnskapsledelse er det lagt et grunnlag for både å kritisere og bygge videre på arbeidet til Bhatt. Gjennomgangen var begrenset til to databaser og brukte søkeord fra den opprinnelige syklusen samt noen synonymer. Funnene utforsker begrepene kunnskapsgjennomgang og revisjon, kunnskapsskaping, kunnskapsadopsjon og kunnskapsdeling. Som et resultat presenterer studien svaret på tre veiledende spørsmål. Først presenteres definisjoner, etterfulgt av en utvidet modell for å illustrere de gjensidige avhengighetene mellom kunnskapsprosessene og til slutt de påvirkende faktorer. I tillegg nevnes muligheter for videre forskning basert på de nye funnene.

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1. Introduction

Knowledge management is not an ancient term, it is quite new, and it did not start as a term referring to human behaviour. The first and early concepts of knowledge management emerged in the 1980s, in relation to computer systems and in the early 1990s it became what can be considered an established discipline (Girard & Girard, 2015). Its definitions were one and many, with context and other factors having an ever so slight unique differentiator on what it meant to manage knowledge. As these theories began to grow, and the studies also began to gain traction, it became clear to many researchers that knowledge management is a very broad term, and that within it many things can be covered. As an early attempt within knowledge management literature, Bhatt (2000) created the knowledge development cycle to show how knowledge processes are affected by factors such as the nature of knowledge, whether it is explicit or tacit. Or the nature of knowledge work which can be both complex or simple. Bhatt (2000) also mentions knowledge levels, where the individual, group and organisational levels also affect the knowledge process.

Bhatt (2000) created the "Knowledge development cycle" to show that four knowledge processes have an interdependent relationship with each other. The resulting model was a circular model consisting of: knowledge distribution, knowledge adoption, knowledge creation and, knowledge review and revision. A model with no arrows, nothing indicating how the processes are interdependent, simply a circle indicating that everything is connected to everything (Bhatt, 2000). Since the year 2000 many new studies within knowledge management have come to light, and it is time to critically evaluate the model presented by Bhatt (2000) which is why we ask *what are the limitations the knowledge development cycle?*

It can be easy to direct criticism directly towards Bhatt as a researcher for failing to focus on each and every possible relationship that could possibly exist in this cycle, but this is not a fair assessment of the situation. The criticism directed towards the model is mainly motivated by an uncontrollable factor: the passing of time. Therefore, it is more important to look at *who* would benefit from the current model being updated. As an academic, I am not the only one with a cause to be critical. With experience from working with knowledge managers, learning and development specialists and people with similar academic backgrounds, it is clear that the academic syllabus has done us very few favours in the real world. Models are

simply too complicated to bring into the real world, and a model such as Bhatt's (2000) is far too abstract and open for too many interpretations to be used in a real-world setting.

There are two ways one can understand the criticism directed towards the knowledge development cycle as it currently exists: from the perspective of an employer or from the perspective of an academic.

Employers are increasingly concerned with how to maintain and develop individuals. This is an interest shared by individuals who are career focussed. Employers need to invest in their current workers if it is shown that it is cheaper and more sustainable than the alternative of high turnover with knowledge entering and leaving the organisation without the possibility of retention (Harteis & Billett, 2008). One way to achieve this is to have a useful model, such as the knowledge development cycle, on hand to help shape corporate strategy.

An academic view takes a step away from the practical application of the model and asks three key questions, these will be the guiding research questions for this review and shape the structure of this review.

First, *how is the knowledge process defined in the literature?* The answer to this is of importance as in this evolving and new field, there is not always an agreement amongst the scholars as to what the definition of a knowledge process should be. If there are disagreements on defining the knowledge process itself, one can further raise doubts in relation to how valid the interdependent relationships between the processes are.

Second, *how are the knowledge processes interdependent?* In this very vein of questioning, one can come to the third key question posed from the academic viewpoint: *what factors affect the knowledge processes?* By asking this, the review will illustrate what affects a process and its results.

By using these three questions we are able to contribute to the existing knowledge development cycle.

The academic view may take a step back from the practical viewpoint of an employer, but there is an understanding that knowledge management literature and terms such as knowledge development have come to be as a result of how work has changed (Bell, 2014). With individual workers entering the workforce with knowledge as their main asset, often in a specialised field, comparative to their physical body being their asset, workplaces have become more and more reliant on knowledge work (Davenport et al., 1996). As this change

has come about, so has the increased focus on knowledge management. The relationship between knowledge workers and academics studying knowledge work is constantly trying to achieve equilibrium, which is one of the major reasons that Bhatt's (2000) knowledge development cycle can be seen as falling behind and failing to withstand the test of time. To bring the cycle into the future, an expansion to the original model will be proposed. This expansion aims to be more up-to-date, whilst also being more friendly to the knowledge manager by clearly illustrating the interdependent relationships between knowledge processes and ultimately creating ease in understanding the cycle.

To expand on Bhatt's (2000) work requires several elements to come together in this review. Firstly, the original knowledge development cycle must be understood within the context of the literature it was based on. This will provide a foundation for this review to expand upon. By exploring the original literature, definitions, interdependent relationships, and potential affecting factors which can be presented in greater detail. It also illustrates how much of the original theoretical background was removed by Bhatt (2000). For we learn of "self-sufficient teams" (Bhatt, 2000, p. 23) but do not receive a greater understanding of how they work within knowledge review and revision. Consequently, we lack a definition of review and revision which is grounded in theory. Furthermore, we do not gain an understanding of what may affect the process and its interdependent relationship with other processes. Therefore, this review is structured to allow for a definition to be established, followed by how the processes are interrelated, and finally how these may be affected.

Newer theories and new models from across the world within knowledge management have shown that cycles like the one presented by Bhatt (2000) are possibly incomplete or the opposite, that they are too large and inclusive. It is this disparity observed within the knowledge management field that has also drawn a critical viewpoint towards the knowledge development cycle in its current form.

1.1. Existing studies

When searching for "the knowledge development cycle" there are currently no existing studies done using an empirical data collection method, which may attempt to observe the cycle in action. Furthermore, there is also a lack of studies regarding the cycle itself, with a

lack of studies to critique or comment on the knowledge development cycle. These searches were done in the databases *ERIC* and *Web of Science*.

There are, however, several studies which have used terms from the knowledge processes, such as “creation” and “sharing”, and these studies have focused mainly on the singular process. From this we can assume that the processes are well studied and may often be considered too broad a field in themselves to have them combined with the other three processes. This study attempts to fill this gap, by combining all four processes using the knowledge development cycle as the foundation. This allows this study to be a unique contribution to the field of organisational knowledge and learning, whilst also being a product of previous research which have been done on the four different processes.

By using the abundance of literature that exists on knowledge creation, knowledge distribution, knowledge adoption, and knowledge review and revision, and their synonymous terms, it will be possible to critically review Bhatt’s (2000) cycle as well as providing it with a more detailed expansion.

1.2. Parameters and structure

This review will stay within the parameters that are set by Bhatt (2000) in his original article about the knowledge development cycle and it will focus on the terms within that article.

There will be four main areas of focus for which a review will be conducted of each area, these will be the following: *knowledge creation, knowledge adoption, knowledge distribution* and, *knowledge review and revision*.

For each knowledge process the review will present first the definitions which have been found during the literary search process. These will be presented in a simplified form in a table view whilst also being discussed, to give the reader an opportunity to understand where the differences are and why there may be differing views. The definitions will be followed by an expansion of the knowledge development cycle. Finally, the factors which may affect each knowledge process will also be presented and discussed.

This review will attempt to focus purely on the four knowledge processes due to the volume of articles which can comment on these processes. This review will not aim to define terms

such as “learning” as this will distract from the ultimate goal. This review will stay within the four processes and within the original model by Bhatt (2000).

Following this introduction, a chapter will introduce the reader to the knowledge development cycle and allow them to fully understand how it exists in its current state. This is vital to present as it will serve as the comparison for the final product of this review which will be a more comprehensive model of the knowledge development cycle. Following this the methodology chapter which will outline how literature was collected for this study.

Three chapters following the methodology chapter, are dedicated to the research questions, providing an answer for each question and presenting the relevant findings.

The final chapter will provide conclusive remarks as well as an evaluation on the review itself.

The aim of this structure is such that a reader can first understand the original model and then see an organised approach to expanding and building upon the original work done by Bhatt (2000).

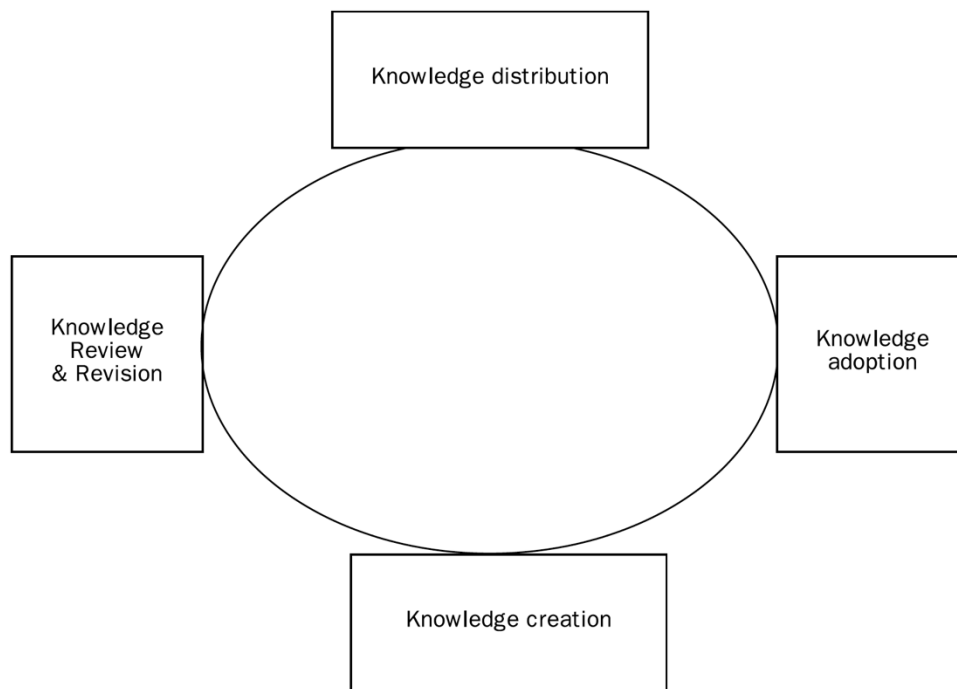
2. The Knowledge Development Cycle by Bhatt

This chapter will first present the knowledge development as presented by Bhatt (2000) and then present the four knowledge processes based on the literature Bhatt (2000) used. This is done to provide a clear comparison between what was presented, and what research was available at the time.

The knowledge development cycle begins in the same place many knowledge management related theories begin, within an organisational context. Starting with the gradual change from manufacturing and production to knowledge work. There was a lack of consensus as to which processes could be used to develop knowledge, as production and manufacturing development methods were deemed too concrete. Knowledge was seen as something abstract and something one cannot physically hold. This abstract nature of knowledge and knowledge work posed a challenge (Bhatt, 2000).

The knowledge development cycle by Bhatt (2000) is cyclical in nature and presents four knowledge processes as being interdependent. The four processes are knowledge creation, knowledge distribution, knowledge adoption and knowledge review and revision. The cycle assumes that all four knowledge processes are interdependent. Despite the lack of arrows, there is one reference to phases by Bhatt (2000) which implies that the cycle's "last two phases [are] knowledge distribution and knowledge review and revision" (p. 17). This gives some hint to a user of which order the knowledge development cycle can be used but it is not a conclusive remark.

Bhatt (2000) argues that the knowledge development cycle will always fit into the context it is placed due to the organisation always focussing on the most relevant knowledge process for them. Bhatt (2000) does not clearly define the knowledge development cycle; it is presented *as is* due to two reasons. Firstly, there is a lack of arrows as Bhatt (2000) argues that there are "several feedback and feedforward loops" (p. 18) occurring simultaneously. Secondly, it is claimed that all the phases (referring to the knowledge processes) are "apparently" interdependent, which is backed up with one example linking knowledge adoption and knowledge creation (Bhatt, 2000). Beyond showing apparent interdependent relationships between knowledge processes, the aim of the original model cannot be clearly defined.



Model 1 The Knowledge Development Cycle by Bhatt (2000)

To be able to critique Bhatt's (2000) work and to expand on it, it is important to understand the research done by Bhatt (2000). This allows for a balance in criticism to be created, as we are focussing on the limitations of the cycle. An assumption that it is Bhatt (2000) who decided there should be limitations would be premature and therefore it is critical to see if the limitations exist in the original literature.

In his paper Bhatt (2000) has shown how the knowledge process theories may have a relevance to each other by drawing a processual connection between them, making them interdependent to one another. He does not however, dive deeper into the context behind each theory and place that context within the knowledge development cycle theory. This is one of the reasons each process is being explored in further detail for this paper. The lack of a clearer explanation as to *how* the processes are interdependent are a limitation from an academic or a practical stand-point. Bhatt (2000), has for reasons unknown to us, omitted much of the theoretical background from his sources. This has consequently led to a less thorough understanding of the theories which the knowledge processes are based on and has left us with practical examples which are not grounded with theory.

At the time of Bhatt (2000), some research had been done on knowledge theories, and this has resulted in what Bhatt (2000) has created with the knowledge development cycle. Whilst there was a lot of research it must be mentioned that the field was still relatively new (Girard & Girard, 2015). Bhatt (2000) has attempted to create a framework by combining the knowledge processes many researchers have worked on and showing that they can be interdependent within the context of an organisation. In this cycle Bhatt (2000) came across many issues such as how to define knowledge, something which he says is akin to organised information. This definition also comes into question once he explored terms such as tacit and explicit knowledge. These types of knowledge became a part of something referred to as the knowledge society (Bell, 2014) which is the arena for a new type of worker, the knowledge worker. It is within this context that Bhatt (2000) manages to create the knowledge development cycle, a non-sequential interdependent framework within which knowledge creation, adoption, distribution, and review and revision are all affecting each other with several feedback and feedforward loops (Bhatt, 2000).

One major flaw in Bhatt's (2000) paper is the removal of context of his original theories, as many of his sources are based on studies done within different organisations. This is redeemed in this paper by going back to the source material to gain a richer insight into these knowledge processes than presented by Bhatt. Bhatt (2000) has a section for organisational strategies, which places some of the processes within an organisational context. This section reveals a flaw which this review will attempt to contribute to. The flaw is not showing the processes working together. By removing *how* the knowledge processes are interdependent is of relevance for both an academic or knowledge manager.

The examples and strategies which Bhatt (2000) provides are fragmented into their individual processes. Whilst the examples portray how the individual process may exist within an organisation, it does not show all four processes. This may be due to no one considering these processes as interdependent in a cycle such as Bhatt has, but still reveals a considerable hole in the literature which was available to him at the time (2000). As this major hole is revealed in this paper it becomes clear that this framework is purely theoretical, and that to test it one would need to have a deeper understanding of all the terms used by Bhatt and further apply this to one single organisation.

In the following sections each knowledge process introduced by Bhatt (2000) in the knowledge development cycle will be explored and presented in greater detail. The sections aim to demonstrate how much context Bhatt (2000) has removed.

2.1. Knowledge Creation in the Knowledge Development Cycle (2000)

The theory of knowledge creation, which Bhatt has based on Nonaka (1994) is interesting as it is a cyclical process itself and, in some ways, resembles the knowledge development cycle. The theory has a similar contextual background as Bhatt (2000), where society has transitioned over into the knowledge society, but the more specific context is of innovation within organisations (Nonaka, 1994). The paper begins with what an organisation is and shows organisations have shifted from being a system of information processing has become a system for solving problems. It takes this further by claiming that what an organisation creates is the way to truly understand it. The goal is to ultimately deliver a theory on knowledge creation.

The knowledge creation theory begins by defining knowledge which Nonaka (1994) claims to be “justified true belief” (p. 15). This definition is quite important as it is further elaborated that knowledge is built by organising the flow of information. This is echoed by Bhatt (2000) in his explanation of knowledge and therefore we begin to see where Bhatt has decided to concretise his definition for knowledge. Nonaka (1994) further emphasises the individual, subjective nature of knowledge for the creation of knowledge theory. In sum, knowledge is justified true belief, if it is anchored in the beliefs of its holder. This understanding of knowledge is highly dependent on individual knowledge perspectives and does not yet include an organisational view. Such a strong individual view of knowledge echoes the views of Polanyi & Sen’s (2009) tacit knowledge. There is however a disagreement here between Nonaka (1994) and Polanyi & Sen (2009). Whilst their definitions of tacit knowledge are similar, there is a key issue with how Nonaka (1994) views it, which is its ability to be shared in an explicit and procedural manner. Polanyi & Sen (2009) do not agree that tacit knowledge can be transformed into explicit knowledge, which goes against the entire theory of knowledge creation and therefore is a point one must consider when using the knowledge creation theory by Nonaka (1994). The counter argument to this is that Nonaka (1994) sees tacit knowledge as someone’s images of reality and therefore this is something which can be explained, and therefore made explicit with the use of metaphors. This detail is important to

note in the knowledge creation theory as it is the foundation of the first step which makes the entire process possible.

Before discussing the knowledge creation theory, it must be shown how such individual knowledge can be understood within an organisational context. As knowledge not only exists within an individual but is created by them, an organisation cannot have knowledge without individuals. And once it has knowledge, it cannot create new knowledge without individuals, meaning that individuals are the starting point for organisations dealing with knowledge work (Nonaka, 1994). There is a deep understanding that individuals are creative in terms of knowledge but that not all knowledge is equal, knowledge created by individuals must be considered legitimate and there must be a commitment behind the knowledge which must be shared by others, which will legitimise the knowledge. This commitment is built up by three elements: intention, autonomy, and fluctuation.

Intention concerns itself with what the meaning of the information has and its intended use. One can consider “nuclear power” as a phrase and what it may mean and what intentions lay behind it. For an environmental activist, nuclear power and information on nuclear power are seen as a solution to a climate crisis as well as an energy crisis (Blum, 2021). However, the word “nuclear power” is also one intended to use for fearmongering and threats in the scope of war. Countries such as Iran and North Korea are made to be dangerous due to having access to this very same nuclear power that the USA and Europe have access to (Dahl, 2011). These examples do well to explain autonomy as well, as this is something akin to having a personality according to Nonaka (1994). If we allow people to act autonomously, they may do anything, including absorb new knowledge. This means that an activist can be exposed to nuclear power as a source for danger or for a source of freedom for energy companies, it simply is unexpected which direction they go in. But the final factor, which is fluctuation between the internal and external contexts, may be the one to determine how one commits to knowledge. A military general is more likely to consider nuclear power as a weapon than a solution, as this is the context within which they work and share their knowledge, and this internal system is built due to the external environment within which they live and work (Nonaka, 1994). The reason this understanding of commitment is important is due to how the knowledge creation theory begins with the individual, and therefore the foundation of the individual must be one that is legitimate.

Up until now the focus has mainly been on an individual perspective, but this changes as we begin to look into how Nonaka explains the modes of knowledge creation, and this is through processes which can be summarised in the SECI model (Nonaka, 1994; Nonaka et al., 2000). The SECI model stands for socialisation, externalisation, combination, and internalisation and follows this sequential order. It is this model which begins to resemble the knowledge development cycle, if we investigate how the knowledge creation theory works.

Through socialisation, individual tacit knowledge is made into tacit knowledge for a group. After this tacit knowledge is made explicit via externalisation, in forms of discussions within a group. This becomes a transfer of explicit to explicit, where one group combines their knowledge with another through a coordinated effort. And finally, after this coordination and learning by doing process, the explicit knowledge is internalised from an explicit to tacit form (Nonaka, 1994). Knowledge creation is when all four modes are occurring in a continuous cycle.

If one is a follower of Polanyi & Sen (2009), then one is left with the lingering question of *how* this is all achieved. The key focus here is that tacit knowledge is shared using a process similar to how communities of practice create new members of their community, but in the opposite direction. Whilst a community accepts the individual, it is the individual that must change the group in this case. This is done by sharing the original experience with the team and relying on this to create a collective shared experience. Once this is achieved, one can transfer the tacit knowledge over to the team in a tacit way (Nonaka, 1994). The remaining processes occur in a simpler fashion, where one conceptualises new knowledge and eventually crystallises it within practice. Once this crystallisation occurs then knowledge has been internalised and the process can begin again.

As mentioned, it is strongly believed by me that the knowledge creation theory has highly influenced the knowledge development cycle. As can be seen, the knowledge creation cycle is highly dependent on sharing knowledge, from an individual level to the collective.

Furthermore, it is arguable that the combination and internalisation processes are a similar process to what occurs during knowledge adoption and knowledge review and revision (Bhatt, 2000; Nonaka, 1994). However, this theory has an end goal of creating new knowledge, and the context of innovation is not the same as the knowledge development cycle which takes the organisation into question.

To collect the theory of knowledge creation together is to be able to show for the first time that Bhatt (2000) has removed too much from the original research. From Nonaka (1994) we can learn that there is some form of knowledge sharing occurring between individuals and groups within the process of creating knowledge. This is explained by Nonaka (1994) but not elaborated on further by Bhatt (2000). The loss of this context also means that the heavy reliance on the SECI model by Bhatt (2000) becomes harder for a user to follow, as the SECI model has specific criteria and processes. To build a more solid foundation, it could have been potentially better to find multiple papers on knowledge creation and to present some generic definition based on the many, whilst also gaining a practical understanding of knowledge creation as a process. Ideas such as autonomy are also removed by Bhatt (2000) leaving users of the cycle with little understanding of what affects knowledge creation.

The next section will similarly tackle the knowledge adoption process as Bhatt (2000) defined it. To define the knowledge adoption process Bhatt (2000) used a car manufacturing plant as the foundation and in this case the research was seen to not be advanced enough for Bhatt (2000) to clearly define and explain knowledge adoption and its interdependence to other processes.

2.2. Knowledge Adoption in the Knowledge Development Cycle (2000)

The second knowledge process in the knowledge development cycle is knowledge adoption which has been inspired mainly by a study of a car manufacturer. There is a practical presentation of an organisation which is making use of this idea and therefore the theory is being presented in a scenario which shows the realities of how things succeeded and failed. It is based on this research that Bhatt (2000) has defined the knowledge adoption process. The desire for being able to adopt new knowledge is argued to be connected to organisational goals such as increasing flexibility and efficiency (Adler et al., 1999; Bhatt, 2000).

As mentioned, knowledge adoption within an organisation, according to Bhatt's (2000) research, can be understood as increasing dimensions such as flexibility and efficiency (Adler et al., 1999). Within this concept the dimensions of flexibility and efficiency are seen as a way to measure knowledge adoption and also *why* knowledge is adopted. In the simplest of terms, if knowledge can increase flexibility and efficiency this knowledge should be adopted, whilst a decrease means the knowledge should not be adopted. Using Adler et al.'s (1999)

practical example the process of knowledge adoption is not easy to define. We can assume one thing which is that knowledge adoption occurs over a period of time. Looking further into Adler et al. (1999) we can observe that there are possible methods in which to encourage and adopt knowledge systematically, but these findings are not present in any form of explanation as to how Bhatt (2000) sees the interdependent relationships between the knowledge processes.

The definition of knowledge adoption by Bhatt (2000) is done based on Adler et al.'s. (1999) research in a car manufacturing plant. The NUUMI plant in which Adler et al. (1999) conduct their research is a car manufacturer and the context is the introduction of a new model of a car which is going to require a different assembly process. The main issue that presents itself is that the parts are new, however the process must be standardised to maximise efficiency. How can they ensure this without a lengthy training process of their employees? Secondly, how can employees remain flexible in the production chain in the case of emergencies and so forth? The answers presented trade off's which management could not accept and therefore NUUMI (shorthand for the company) developed four processes which can collectively be seen as a form of knowledge adoption. They are as follows: metaroutines, job enrichment, switching, and portioning (Adler et al., 1999).

Metaroutines are routines which allowed NUUMI to systemise the creative process which entailed problem solving. This allowed them to always approach a problem with a system in place which encouraged them to constantly improve. This also encouraged a consistent *review process of knowledge*. Job enrichment was the process to help employees become more flexible within their routine tasks as well as being able to innovate within their roles. Employees were the main source of source of suggesting improvements. There was a consistent focus on improvement opportunities on the production line that could come directly from those who are working with it. Switching is a process made for allowing workers to deal with to different kind of tasks. This process allowed the company to bring in active workers to develop new routines for the new model without having them unlearn their present role on the production line. Partitioning is a way to deal with each different role and the resulting specialisation. This allows for the roles to remain separate, and that non-routine tasks can be carried out simultaneously (Adler et al., 1999).

The combination of these processes is what we can call a practical example of knowledge adoption within an organisation. The NUUMI example shows a car production line using these processes to adopt a new way of producing a car which requires an overhaul of certain procedures and roles. By using metaroutines the original plan for the new car line was easily improved. Many members were circulating in and out of the planning team which allowed for greater job enrichment as multiple members were represented, and the switching was done seamlessly. The partitioning was done as a way to allow people to learn the new methods, whilst still being on their regular role, which meant once the new car production line came into play, members were integrated seamlessly and easily (Adler et al., 1999).

Whilst this process of knowledge adoption was taken on by Bhatt (2000), it is not grounded in much theory. Adler et al. (1999) conclude that there are several pre-requisites for being able to implement knowledge adoption in this way. There was a need for deep trust to be able to achieve the goals that were intended, and this trust had to be consistent, had to exist in the competence and the trust had to exist in the goal convergence. Similarly, the quality of what is being considered for adoption is considered important for whether or not knowledge will be adopted.

The resulting understanding of knowledge adoption is one that is fraught with insecurity but one that we can be reassured has worked in a practical solution. Knowledge adoption is a process that is defined as a long-term process, which involves the consideration and implementation of knowledge within a practice, as can be understood by Adler et al. (1999). Furthermore, we can summarise that knowledge adoption requires interactivity, as is shown by Adler et al. (1999). Pre-requisites for knowledge adoption are the main factor which can leave one unsure, as trust is weighed equally and sometimes more than the interaction between groups. This definition is a combination of practice and theory and therefore can be ideally used for observing whether or not knowledge is adopted in an organisation, as it will allow for the observation of concrete actions and can further deepen the understanding of these actions in theoretical pre-requisites. The pre-requisites surrounding interaction and communication are also factors that can be seen as important in knowledge distribution and also makes knowledge adoption and knowledge distribution interdependent processes.

The knowledge adoption process shows very clearly how Bhatt (2000) was being held back by the lack of research at the time of writing. If one compares the nature of Adler et al's

(1999) knowledge adoption theory, compared to the more concrete definitions presented in the definition chapter, it shows how far research has come. However, the knowledge development cycle still lacks a detailed definition of knowledge adoption, which is one of the areas the findings will expand upon.

Bhatt (2000) does not consider the connection between knowledge adoption and knowledge review and revision due to this. As the cycle already lacks concrete explanations as to how its processes are interdependent, this would have aided in supporting this claim. As can be seen in Adler et al. (1999), a quality check is done on the knowledge, and this shows that indirectly, there is an interdependent relationship with a review process. This is not an explanation used by Bhatt (2000).

The following section goes on to explore the knowledge distribution process within the original knowledge development cycle.

2.3. Knowledge Distribution in the Knowledge Development Cycle (2000)

The third knowledge process in the knowledge development cycle is the process known as knowledge distribution, which can be seen as synonymous with knowledge sharing. When reading Bhatt's explanation, he uses both words: distribute and share (2000). The explanation by Nonaka (1994) plants knowledge distribution as an element that is needed for the knowledge creation, requiring knowledge to be shared at the organisational level (Nonaka, 1994). Therefore, knowledge sharing, and distribution are concepts that this paper treats as one.

One of the main understandings surrounding knowledge distribution is that it is motivated mainly in relation to an organisations competitive advantage as knowledge distribution within an organisation, or from one organisation to another via an individual may allow for innovative possibilities (Prahalad & Hamel, 1997). There seems to be several definitions for what people consider to be knowledge sharing and this is in part to do with the nature of knowledge. Unlike knowledge adoption, there does seem to be consensus surrounding these definitions and confidence within them.

As there is with knowledge adoption and knowledge creation, a practical example of how the process occurs is included to provide an example and to show how the process occurs outside

of the theoretical realm. For this, the example of companies like NEC and 3M who used the concept of knowledge sharing by targeting competence as a way to gain the knowledge and therefore letting that targeted competence be shared company wide. In the case of NEC, management became aware of a lack of knowledge regarding a new area they intended to expand into. To combat this NEC decided to hire in “core competencies” which can be understood as individuals with the knowledge needed to make the new product. These core people held the knowledge that would eventually be distributed amongst the company and therefore lead to owning this knowledge. The important note to make is that knowledge was distributed but in a very transactional manner, there was not any form of knowledge development (Prahalad & Hamel, 1997).

Core competencies are not something that can only be bought or hired in, but they present the possibilities for knowledge being shared and resulting in new products, which is the main motivation, as this provides a competitive advantage (Prahalad & Hamel, 1997). In the example regarding 3M, the core competencies regarding communication, involvement, and deep commitment to working across boundaries has allowed them to create many differing products. The main idea is that of an adhesive product, and by sharing the knowledge regarding this adhesive across the boundaries within the organisation, 3M has managed to develop an entire market of products. This ultimately shows that the knowledge shared from one area allowed many other areas to develop something new, but the core competence is pivotal to the organisation (Prahalad & Hamel, 1997).

Knowledge distribution is a way for organisations to internalise certain core competencies. As was the example with 3M, if the knowledge regarding the adhesive was only in the hands of one individual, the knowledge would be at great risk. By distributing it with many groups within 3M the knowledge has been shared and secured within the organisation (Prahalad & Hamel, 1997).

When putting together the input from Nonaka (1994), with the findings of Prahalad & Hamel (1997), it is unclear why Bhatt (2000) did not decide to explicitly state that there is an interdependent relationship between the two. It becomes hard for a user to understand how knowledge creation is so dependent on an individual sharing their knowledge, but that knowledge sharing should not have any real say on what knowledge is created, it is arguably this gap that Bhatt (2000) implies to fill. Whilst the knowledge development cycle shows the

processes together, it does not explain how despite the theoretical background arguing for similarities with knowledge adoption (Nonaka, 1994; Prahalad & Hamel, 1997).

The final section of this chapter will show how knowledge review and revision is presented by Bhatt (2000).

2.4. Knowledge Review and Revision in the Knowledge Development Cycle (2000)

Bhatt's (2000) section on knowledge review and revision is the section that is weakest in terms of explanation. The section is based on research done by J-C. Spender (1996) and does not provide any contextual framework beyond the claim that knowledge clusters can be "reviewed, revised, and reconfigured" (Spender, 1996 in Bhatt, 2000, p. 20).

The background on which knowledge review and revision arises is similar to the other articles used by Bhatt (2000). Industries are changing and to survive the competition the use of knowledge resources must be used, and a short historical glance to the 1980s shows that research is increasing in this direction (Spender, 1996).

Whilst Bhatt (2000) does not mention the lack of explicit focus on knowledge review or revision by Spender (1996), one can see that the idea of a "review" is present in the literature. By placing knowledge in this new context, Spender (1996) illustrates how organisations have become dependent on the knowledge. This knowledge exists in many different ways and strategies surrounding retention are also mentioned.

There is not an explicit reference to how knowledge is reviewed, but there are references made to how cultural factors on a national level can have an effect on decision making. Consequently, knowledge is shaped by the societal context one is in, meaning that the review and revision is possibly occurring subconsciously over time. This is further cemented by the idea that individuals have a sense of identity that is changing and malleable (Spender, 1996).

Bhatt (2000) attempts to cement the idea of review and revision by using the camera manufacturer Canon as an example and how they have changed their knowledge base, but this does little to aid in the understanding of how knowledge review and revision links to the

other three knowledge processes. The severe lack of focus on knowledge review and revision is a motivator to find a definition that can be more easily used by academics and users. Whilst there has been mention in the section regarding knowledge adoption that there is some form of review occurring here, it does not match with what Bhatt (2000) presents.

* * *

Having collected the background of Bhatt's (2000) findings it can be more easily understood why this review aims to show the limitations in the interdependent relationships within the knowledge development cycle. The background literature which has been used is strong in showing possible relationships and this is strengthened by the findings which will come later.

This chapter also lies as the reason behind the first guiding question surrounding definitions, as there is a desperate need for unanimity in the knowledge processes. The lack of concrete definitions for knowledge adoption and knowledge review and revision stand out particularly here. Newer models provide some support to Bhatt's (2000) ideals, with several newer models and theories drawing knowledge processes together in a processual or cyclical way. The findings on this specifically could leave us wondering whether researchers preferred to create their own models, rather than to build upon the one Bhatt (2000) began with?

The next chapter will provide a detailed explanation into how a methodical literature review will be conducted so that findings may contribute to the original knowledge development cycle. This method allows for using new research to expand upon the original knowledge development cycle.

3. Methodology

To be able to answer the research question of this paper, and to be able to use the guiding questions it is important for the methodology for the literature review to be laid out. This literature review was conducted in two stages. The first stage was to focus on the articles Bhatt (2000) had already included within their own paper. This was done to avoid duplicate articles. This process included reverse engineering the knowledge development cycle so that each article could be traced back to which specific knowledge process it was connected to. This can be seen in the table below (Table 1).

Table 1 Articles from Bhatt (2000)

Author(s)	Main theme of article
<i>Adler, P. S., Goldoftas, B., & Levine, D. I. (1999)</i>	Knowledge adoption
<i>Crossan, M. M., Lane, H. W., & White, R. E. (1999).</i>	Knowledge adoption (not discussed in the Knowledge development cycle chapter)
<i>Davenport, T. H., Jarvenpaa, S. L., & Beers, M. C. (1996)</i>	Knowledge distribution (not discussed in the Knowledge development cycle chapter)
<i>Nonaka, I. (1994)</i>	Knowledge creation (as well as all other processes)
<i>Prahalad, C. K., & Hamel, G. (1997).</i>	Knowledge distribution
<i>Spender, J. C. (1996).</i>	Knowledge review and revision

Bhatt (2000) uses many more articles than the ones mentioned above in their article, there is however a small number of core articles which define the foundational understanding of each knowledge process presented by Bhatt (2000) in the knowledge development cycle. The reason for identifying these articles is that they are the foundational layer for this knowledge review. This review will attempt to not only illuminate more on each knowledge process, but also build upon Bhatt's existing model by showing how the interrelatedness within the cycle can be understood. To provide a review which contributes the most it was important to understand what foundational theories or definitions Bhatt has already included within the knowledge development cycle. Furthermore, it is important to note that Nonaka (1994) is mentioned as being an article that covers many themes, this is due to the nature of the SECI model and will be discussed later on.

By having a few articles in a foundation, it allowed the search process for articles to go a little more smoothly, as the literature search stage would not start from zero with the need to collect everything, but rather simply articles which could contribute more than the existing articles already have. The second stage is inspired by the clear guidelines presented by Snyder (2019).

A literature review is first and foremost a research method in which one collects previous research in a manner which can benefit others in furthering their own research. This is done by literature review authors collecting research in a systematic or non-systematic manner and synthesising review articles which can summarise findings related to certain topics (Snyder, 2019). The resulting articles can provide an overview, but this is not to say that literature reviews are perfect or always correct. This is the case with this literature review as well, as the process with which one chooses literature, reviews the literature, and finally synthesises findings about the literature can be affected by subjective biases of an author. This is a problem that Snyder (2019) highlights in her guidelines.

There are three main types of literature reviews, or one can argue that literature review methods can be placed into three categories: systematic, semi-systematic and integrative. This paper will adopt a methodology that can be seen to lie between a semi-systematic and integrative method. The purely systematic method has several flaws or drawbacks for this review. A systematic review is first and foremost meant as a way to compare evidence and is often a method which focuses on quantitative results (Snyder, 2019). Due to the nature of this review, as the goal is to show how certain knowledge processes may be affected by factors or be related, it would not help to have quantitative results over how many articles on certain knowledge processes have been published in a certain year or field, as well as relying on purely quantitative articles may prove to be a hinderance to the aim of this study.

Furthermore, from the approaches summarised by Snyder (2019) it is clear that this review falls under semi-systematic or under integrative as it is contributing a model or theoretical model. As well as the contribution to the model, the research questions are broad, and the analysis will be of a qualitative format rather than a quantitative one. A semi-systematic review allows for qualitative contributions which allows for many articles about knowledge processes to be included. The literature in general is often split between studies which attempt to quantify certain trends versus studies which provide a qualitative analysis and

discussion about their findings. It is important to be able to include all types of studies in this review.

The integrative method can also be considered due to how Snyder (2019) identifies what kind of contribution is often made, which is a new framework or model, as well as perspective. As this review has an aim of contributing to Bhatt's (2000) original model, as well as providing alternative perspectives on the knowledge processes involved, it can be assumed that there is an integrative approach being applied in this review. For the analysis this review will focus on the knowledge process themes as well as the content which falls under the semi-systematic approach. The integrative approach to analysis requires advanced skills and a larger understanding of the theme, this is something that cannot be achieved at the current stage as I am a master's student.

When considering the limitations of this method the status of the author as a master's student is the factor which causes the largest issue. Due to the limited capacity of a student, it would have been extremely difficult to conduct what one considers a "real" literature review where one goes through all the literature that has been written on a topic (Snyder, 2019). To ensure that this review could deliver a high-quality contribution to the field of knowledge development it was important in the methodology stage to set a limit on the number of articles that should be read and analysed for this study. The guiding number was to have 5 articles which can contribute to the review as a whole. This is lower than the number of articles which would be sought out. By limiting to 5 there is a large chance that much of the literature is not covered in this review, however the total review would cover 23 articles out of 30 which were found which would be in addition to the original articles used by Bhatt (2000). The limitations are important to take into consideration as the literature search stage is where these limitations begin to become visible.

The literature search was done within two databases, ERIC (Ovid) and Web of Science, with ERIC being used as the main database and Web of Science as supplementary as often Web of Science would offer the same articles but with a broader range of academic categories. ERIC was chosen as it is the database that specialises with education-based topics. It is under this category we can also find articles related to knowledge processes. ERIC is also a useful database to use as it is historically backdated to 1966 and is updated monthly, with up to 1.5 million records (Wolters Kluwer, 2022). The reason Web of Science is also being used as a

supplementary database is due to it having a larger coverage but furthermore it is a database that goes across academic fields (Nettredaksjon på UB, 2022) . This benefit is also the reason it is not used as the main database as filtering and finding specific articles would be a much larger challenge.

To search for articles within ERIC the following strategy was chosen. The four knowledge processes were searched for within “” and followed by “.ab” to ensure that the database searched for the term within the abstract. This was done to avoid a larger sample of texts to choose from as limiting the search to purely titles could lead to a much lower search result. After the results came up a further narrowing down was done using the “knowledge management” category. This was done to ensure that articles were relevant and within the same context as Bhatt’s knowledge development cycle (2000). To search for articles within Web of Science a similar tactic was used, however in Web of Science the abstract search can be turned on manually rather than needing to add a code. In Web of Science there were categories of “Management” and “Business” which could be used for certain searches as well as “Education Educational Research”, it was found that when filtering with the “Education Educational Research” category turned on, the search results became very similar to those from ERIC.

After each search was conducted and filtered down, the next step was to read through the abstracts. Articles were identified as relevant based on whether or not they could potentially contribute to answering the two guiding research questions. This meant that a few articles were immediately taken from consideration when their abstracts revealed that they were solely focused on school children, this occurred with several studies. Furthermore, some abstracts were identified by the search as relevant but upon a closer read there was a comma between the word “knowledge” and the process in question, often eliminating it. The focus of this review was journal articles which also meant that many books were eliminated, as well as any articles which were not peer reviewed. For an article to be considered relevant for the review it was often based on whether or not the abstract could present the knowledge process as being central to the article and that it could show it being defined or show how it is affected by some factor. Based on these criteria, the literature search produced a list of 30 articles. Of these 30 articles, 23 articles would be included within the review. The tables below (table 2 and 3) summarise the results of the search. Table 2 shows which terms were searched for, the results as well as results after filtering, and how many were taken further to

reading. Table (3) is a list of all 30 articles, including the reasoning for why 7 of 30 articles were discarded from the review.

Table 2 Literature search by term and database

Database	Term searched	Number of results	Articles chosen from search
ERIC	Knowledge creation	591 78 (after “knowledge management” filter applied)	7
ERIC	Creation of knowledge	115 17 (after “knowledge management” filter applied)	2
ERIC	Knowledge distribution	26	4
ERIC	Knowledge sharing	722 212 (after “knowledge management” filter applied)	4
ERIC	Knowledge adoption	6	1
ERIC	Knowledge integration	208 7 (after “knowledge management” filter applied)	1
Web of Science	Knowledge adoption	61 12 (after “management” and “business” categories applied)	2
ERIC	Knowledge review	6	0
ERIC	Knowledge review and revision	0	0
ERIC	Knowledge revision	6	5
ERIC	Knowledge evaluation	32	2
Web of Science	Knowledge evaluation	288 30 (“Education Educational Research” category applied)	0

Web of Science	Knowledge evaluation	288 20 (“highly cited” as well as “management” category applied)	2
Total		2061	30

As can be summarised from Table 2, there is a vast number of articles which cover the topics within the knowledge development cycle. A total of 2061 articles were found to have the knowledge processes within their abstract and due to filtering down a small fraction of these article abstracts have been read and considered for this review. It can be noted from the searched terms that synonymous terms were also used in an attempt to expand the search and to include articles which may have been missed by Bhatt (2000). The term “knowledge sharing” comes directly from an article used by Nonaka (1994) whilst “integration” and “evaluation” were seen as synonymous terms which may be used in similar contexts. It is clear from the abstracts that these terms have been used interchangeably by researchers, eluding evermore to the issue that there is little agreement amongst researchers when it comes to definitions and terms. The complete list of articles chosen can be seen in Table 3.

Table 3 Articles chosen after literature search based on abstract

Author(s)	Knowledge process theme	Reason for discarding article after reading or other comments
<i>Brown, C. (2013)</i>	Knowledge adoption	
<i>Dahiyat, S. E. (2015)</i>	Knowledge adoption	
<i>Huang, K. G., & Li, J. (2019)</i>	Knowledge adoption	Dropped due to focus on patents rather than the knowledge processes or theme of knowledge adoption within the patent process.
<i>Southard, K., Wince, T., Meddleton, S., & Bolger, M. S. (2016)</i>	Knowledge adoption	
<i>Cruthaka, C. (2019)</i>	Knowledge creation	Dropped due to similar definitions as Nonaka as well as a poor explanation of knowledge sharing.
<i>Frias-Navarro, R., & Montoya-Restrepo, L. A. (2020)</i>	Knowledge creation	Dropped due to SECI model focus but also due to a context that is incorrect.
<i>Ingvaldsen, J. A., & Engesbak, V. (2020)</i>	Knowledge creation	

<i>Intem, N., Phuwanatwichit, T., Sarobol, A., & Wannapaisan, C. (2021)</i>	Knowledge creation	
<i>Jaleel, S., & Verghis, A. M. (2015)</i>	Knowledge creation	
<i>Jung, J. (2020)</i>	Knowledge creation	Incorrect context but valid contextual presentation which make it slightly useful to the overall review. Not specifically for knowledge creation theme.
<i>Sankowska, A. (2013)</i>	Knowledge creation	
<i>Silamut, A.-a., & Petsangsri, S. (2020)</i>	Knowledge creation	
<i>Zinzou, E. F., & Doctor, T. R. (2020)</i>	Knowledge creation	
<i>Butterfuss, R., & Kendeou, P. (2020)</i>	Knowledge review and revision	Refutation text theme meant that we had to seek the knowledge evaluation articles
<i>Kendeou, P., Butterfuss, R., Van Boekel, M., & O'Brien, E. J. (2017)</i>	Knowledge review and revision	
<i>Ohlsson, S. (1996)</i>	Knowledge review and revision	Included but considered dropping due to completely incorrect context and model is IT based.
<i>Rich, P. R., Van Loon, M. H., Dunlosky, J., & Zaragoza, M. S. (2017)</i>	Knowledge review and revision	Refutation text theme meant that we had to seek the knowledge evaluation articles
<i>Trevors, G. J., Kendeou, P., & Butterfuss, R. (2017)</i>	Knowledge review and revision	Refutation text theme meant that we had to seek the knowledge evaluation articles
<i>Bravo-Torija, B., & Jiménez-Aleixandre, M.-P. (2018)</i>	Knowledge review and revision (knowledge evaluation)	
<i>Ioi, T., Ono, M., Ishii, K., & Kato, K. (2012)</i>	Knowledge review and revision (knowledge evaluation)	Discarded and not used due to lack of relevance to knowledge evaluation as well as overly focussed on project management skills transfer
<i>Mason, L., Boldrin, A., & Ariasi, N. (2010)</i>	Knowledge review and revision (knowledge evaluation)	

Skok, W., & Kalmanovitch, C. (2005)	Knowledge review and revision (knowledge evaluation)	
Zhao, J., Xi, X., Li, B., Wang, T., & Yin, H. (2020)	Knowledge review and revision (knowledge evaluation)	
Andersen, B. R., Hinrich, J. L., Rasmussen, M. B., Lehmann, S., Ringsted, C., Løkkegaard, E., & Tolsgaard, M. G. (2020)	Knowledge sharing	Discarded due to misleading abstract, focus of the article is patient satisfaction
Jarrah, H. Y., & Alkhazaleh, M. S. (2020)	Knowledge sharing	Dropped due to focus on universities and their relationship with knowledge creation and sharing, context of an organisation is missing and becomes a slightly meta context for knowledge sharing.
Messenger, W. (2013)	Knowledge sharing	
Österberg, P. (2004)	Knowledge sharing	Dropped due to knowledge sharing being addressed within the process of generative learning and not having knowledge sharing in direct focus.
Sonmez Cakir, F., & Adiguzel, Z. (2020)	Knowledge sharing	
Takhsha, M., Barahimi, N., Adelpanah, A., & Salehzadeh, R. (2020)	Knowledge sharing	
Zhang, X., Vogel, D. R., & Zhou, Z. (2012)	Knowledge sharing	

The process described above and illustrated in Table 2 and 3 can be considered to be “Phase 2” in Snyder’s (2019) guidelines for how to conduct a literature review. The next phase will focus on the analysis, which will be conducted as a thematic analysis.

After the thematic analysis of the literature is done, the findings will be used to answer the main research question with the help of the two guiding questions: *How is the knowledge*

process defined in literature and *What factors affect the knowledge process?* These two questions will be asked for each article and will aid in the thematic analysis process as well.

3.1. Thematic Analysis

The choice to conduct a thematic analysis within this review was made for several reasons. First and foremost, it is the ease of the method relative to many others. As a novice researcher it is deemed the easiest method for one to begin with. Furthermore, it is also well researched with well-established frameworks to guide the analysis (Kiger & Varpio, 2020). This relative ease is not without its pitfalls, as thematic analysis is fraught with pitfalls and to avoid them, the analysis will be outlined in detail. The second reason to use thematic analysis is that it is a flexible analytical method which can easily be applied to various types of data, in this case the articles chosen for this literature review. Finally, thematic analysis is considered a good method when searching for “common or shared meanings” (Kiger & Varpio, 2020, p. 847) which is one of the goals of this review. Consequently, this means thematic analysis will also make it easier to find opposing views and conflicts within the same theme.

As this review is focussing on Bhatt’s (2000) “Knowledge Development Cycle” there are certain things that are pre-existing for the thematic analysis. The framework presented has six steps which are as follows (Braun & Clarke, 2006 in Kiger & Varpio, 2020, p. 848-853):

1. Familiarise yourself with the data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the Report/Manuscript

In the following table each step of the thematic analysis in relation to this review will be explained.

Table 4 How the thematic analysis will be done step-by-step

Step of thematic analysis	How it is conducted in this review
Familiarise yourself with the data	The “data” for this thematic analysis is the articles which have been chosen for the review. To familiarise oneself requires re-

	reading of the material several times. A minimum of three times will be necessary, as the first round of reading was dedicated to confirming a relevance for this review. A second round of reading will be dedicated to coding the article (see step 2) and a third round of reading must be done to affirm any claims made based on the article. This will ensure that the material is familiar.
Generating initial codes	As the data in this review comes from articles written by others there is often many pre-existing codes that come with each article. Therefore, codes for this analysis must be made in relation to the guiding questions. Each article can receive initial codes of D and/or E to signify whether or not it gives a definition or an effect on the knowledge process. These codes can then be expanded if other knowledge processes are discussed. For example, if an article shows how knowledge sharing can affect knowledge creation a code of A + KS/KC can be made.
Searching for themes	Due to the deductive nature of this analysis as well as the pre-existing framework (Bhatt, 2000), there is little that is needed in these sections. This review does not aim to expand beyond the existing knowledge processes, as this is already one of the major issues in this field, and therefore the themes can be considered pre-reviewed. As for defining the themes, this step may only be resolved as the analysis is ongoing, as this is one of the questions we are aiming to answer.
Reviewing themes	
Defining and naming themes	
Producing a Report/Manuscript	This will be done in the chapters answering the key research questions these will give a descriptive presentation of what was found as a result of the thematic analysis and relate them back to the knowledge development cycle to attempt to answer the research questions and overall research problem.

The analysis will be deductive as there is an existing assumption that underlies this analysis. Due to the nature of the knowledge development cycle, this analysis is operating on the assumptions that there are four main themes which are the knowledge processes. Furthermore, there is an assumption that all of these knowledge processes are affecting each

other and that there is an interdependent existence between them, therefore the coding will be used to establish these connections rather than new themes. As mentioned in Table 4, there is also an issue in defining themes as this is one of the goals of this review and therefore the themes will not go without a definition, but rather, they must be understood as having multiple possible definitions rather than one set standard.

As steps 3-5 have a less active role on this review, it is pivotal that steps 1 and 2 are conducted thoroughly and therefore the quality of the analysis is dependent on a complete coding that will be able to show the interrelatedness between each knowledge process. To aid with this a visual mapping, similar to that by Kiger and Varpio (2020) will be used but the goal will be to map the codes. As we are dealing with processes that are “active” it is important not only to understand them alone, but within the activity that may be proposed by the articles within which they are presented.

The following chapters are the result of this method. The following chapters are dedicated to the definitions which were found (research question one), the interdependent relationships (research question two), and the affecting factors (research question three). This method has allowed for an abundance of findings and has given many opportunities to expand the original knowledge development cycle. This expansion has been done in three chapters, each related to their respective key research question.

4. Research question 1: Definitions of the knowledge processes

In the following chapter the definitions of the knowledge processes will be presented. This chapter will present the processes which Bhatt (2000) has in the knowledge development cycle but will define them explicitly. These definitions will be followed by a short discussion regarding the similarities or differences. The purpose of this is to answer the first guiding research question, which is: *how is the knowledge process defined in the literature?* By answering this review aims to lessen some of the knowledge gaps left by Bhatt (2000).

4.1. Knowledge sharing defined

Table 5 Definitions of knowledge sharing

Author(s)	Knowledge process theme	Definition in terms of “knowledge sharing as...”
<i>Sonmez Cakir, F., & Adiguzel, Z. (2020)</i>	Knowledge sharing	Knowledge sharing as the transfer of information but knowledge sharing requires the buyer of information to produce new information.
<i>Takhsha, M., Barahimi, N., Adelpannah, A., & Salehzadeh, R. (2020)</i>	Knowledge sharing	Knowledge sharing as communication and the exchange of experiences, methods, or attitudes to increase the value of knowledge which is beneficial to the organisation (From Wang et al., 2016)
<i>Zhang, X., Vogel, D. R., & Zhou, Z. (2012)</i>	Knowledge sharing	Knowledge sharing as the integration process of expert’s knowledge to achieve task completion.

There were three articles which provided definitions of knowledge sharing that were chosen within the knowledge sharing theme. It can be surmised that these definitions are similar but do not qualify as one definition for the moment. The similarities can be seen in value, as two definitions focus on the value of knowledge being important in regard to the organisation or task completion (Sonmez Cakir & Adiguzel, 2020; Takhsha et al., 2020). All three definitions show that knowledge sharing deals with the exchange or transfer of something (Sonmez Cakir & Adiguzel, 2020; Takhsha et al., 2020; Zhang et al., 2012), however the specified element that is transferred varies between the three. This confirms one of the issues

mentioned in the introduction. The knowledge management field lacks cohesion and agreement around certain definitions and therefore cannot create a consensus regarding the definitions for these knowledge processes.

4.2. Knowledge Creation defined

Table 6 Definition of Knowledge Creation

Author(s)	Knowledge process theme	Definition in terms of “knowledge creation as...”
<i>Ingvaldsen, J. A., & Engesbak, V. (2020)</i>	Knowledge creation	Knowledge creation as mark I or mark II: Mark I implies that knowledge creation destroys the old knowledge, a “destructive creation” Mark II implies that knowledge creation builds new knowledge on top of the old, an “accumulative creation”
<i>Intem, N., Phuwanatwichit, T., Sarobol, A., & Wannapaisan, C. (2021)</i>	Knowledge creation	Knowledge creation as creating new knowledge from existing knowledge
<i>Jaleel, S., & Verghis, A. M. (2015)</i>	Knowledge creation	Knowledge creation as something constructed based on dynamic prior knowledge which can be both tacit and explicit.
<i>Jung, J. (2020)</i>	Knowledge creation	Knowledge production (creation) as mode I or II, where universities are the knowledge creators based on research and development.
<i>Sankowska, A. (2013)</i>	Knowledge creation	Knowledge creation as internal knowledge generation, as inspired by the SECI model.
<i>Silamut, A.-a., & Petsangsri, S. (2020)</i>	Knowledge creation	Knowledge creation as the result of previous knowledge or gathering more knowledge, within a knowledge management process.
<i>Zinzou, E. F., & Doctor, T. R. (2020)</i>	Knowledge creation	Knowledge creation as knowledge built on past knowledge, as well as valuing organisational knowledge creation over individual knowledge creation

Unlike the variation within the knowledge sharing process, the field on knowledge creation is in far greater an agreement on what it means to create knowledge. Whilst there is a clear angle that each article in the review takes, there is an overwhelming consensus as to what it means to create knowledge. There is an observable outlier with the mention of Mark I (Ingvaldsen & Engesbak, 2020; Jung, 2020), the status quo for all definitions is that

knowledge creation is based on previous knowledge and new knowledge is built upon this (Ingvaldsen & Engesbak, 2020; Intem et al., 2021; Jaleel & Verghis, 2015; Jung, 2020; Sankowska, 2013; Silamut & Petsangsri, 2020; Zinzou & Doctor, 2020). As this is in agreement with what we can observe within the knowledge development cycle (Bhatt, 2000; Nonaka, 1994) we can argue that whilst there are nuances in context and varying findings in research, the process is understood similarly. Mark I is mentioned and it is viewed in an economic development setting where the theme of innovation is in focus (Schumpeter, 2010 in Ingvaldsen & Engesbak, 2020). Innovation is often mentioned in knowledge creation literature, similarly to knowledge sharing and this is one of the major connections between the processes which will be discussed in the following chapter.

4.3. Knowledge Review and Revision defined

Table 7 Definitions of knowledge review and revision

Author(s)	Knowledge process theme	Definition in terms of “knowledge review and revision as...”
<i>Kendeou, P., Butterfuss, R., Van Boekel, M., & O’Brien, E. J. (2017)</i>	Knowledge review and revision	Knowledge review and revision as understood by the knowledge revision components framework (KReC), as well as revision deemed a change in knowledge rather than an erase and replace concept.
<i>Rich, P. R., Van Loon, M. H., Dunlosky, J., & Zaragoza, M. S. (2017)</i>	Knowledge review and revision	Knowledge review and revision as understood by the (KReC): knowledge revision is when new knowledge dominates old knowledge which may have been a misconception.
<i>Trevors, G. J., Kendeou, P., & Butterfuss, R. (2017)</i>	Knowledge review and revision	Knowledge review and revision as understood by the knowledge revision components framework (KReC): knowledge revision is when new knowledge dominates old knowledge which may have been a misconception.
<i>Bravo-Torija, B., & Jiménez-Aleixandre, M.-P. (2018)</i>	Knowledge review and revision (knowledge evaluation)	Knowledge evaluation (review and revision) as a process used in decision making for whether or not knowledge should be shared and/or adopted by the individual in an argument.
<i>Mason, L., Boldrin, A., & Ariasi, N. (2010)</i>	Knowledge review and revision (knowledge evaluation)	Knowledge evaluation as an individual belief that knowledge can vary in support and objective and subjective views on it must be balanced. Categories of evaluation

		include: relevance, reliability, certainty and complexity.
<i>Skok, W., & Kalmanovitch, C. (2005)</i>	Knowledge review and revision (knowledge evaluation)	Knowledge evaluation as a framework to ensure bias is minimised and that gaps in knowledge are highlighted, however knowledge evaluation cannot occur in a vacuum.
<i>Zhao, J., Xi, X., Li, B., Wang, T., & Yin, H. (2020)</i>	Knowledge review and revision (knowledge evaluation)	Knowledge evaluation as knowledge being judged by the demands as a part of the knowledge reuse process.

Whilst knowledge creation can be argued as the one knowledge process that has the largest visible agreement across the field, knowledge review and revision can be seen as the one lacking any such luck. The use of the term “review and revision” in of itself has proven to be a challenge in conducting the review. Despite a lack of agreement, some consensus can be found within individual terms, such as knowledge review producing multiple studies conducted with the knowledge revision components framework (KReC). Within these articles there are similar types of studies being conducted with varying findings, but the theoretical understanding of knowledge review and revision is agreed upon (Kendeou et al., 2017; Rich et al., 2017; Trevors et al., 2017). When searching for an alternative using knowledge evaluation as the key term there is a larger variation that creates difficulty in finding one true definition. The definitions vary in their understanding of *how* knowledge is evaluated, furthermore *why* it is evaluated and thus provide a difficult situation for the review in creating a definition. Despite providing a challenge in regards to a definition, this variation within the term of knowledge evaluation provides ample theoretical discussion in regards to how knowledge evaluation can be effected by factors within organisations (Bravo-Torija & Jiménez-Aleixandre, 2018; Mason et al., 2010; Skok & Kalmanovitch, 2005; Zhao et al., 2020).

The largest issue found within this field of research is that knowledge review and revision/evaluation in organisations is not a well-studied field. Further research may be needed to settle on one “true” definition.

4.4. Knowledge Adoption defined

Table 8 Definition of knowledge adoption

Author(s)	Knowledge process theme	Definition in terms of “knowledge adoption as...”
<i>Brown, C. (2013)</i>	Knowledge adoption	Knowledge adoption as taking in findings from research and noting how they may be used in the future via a process of digestion and acceptance.
<i>Dahiyat, S. E. (2015)</i>	Knowledge adoption	Knowledge integration as either a) the creation of new combinations and associations in <i>existing</i> knowledge or b) reconfiguring knowledge by combining existing and new knowledge
<i>Southard, K., Wince, T., Meddleton, S., & Bolger, M. S. (2016)</i>	Knowledge adoption	Knowledge adoption as a process of developing mental models which will add in new ideas (knowledge) and will place the new knowledge in the correct space within the mental model

The definitions of knowledge adoption or integration are poorly explained in many articles and mean that finding definitions which can contribute to this review has been a challenge. Whilst the three definitions presented in this review vary slightly, it is positive that there is a singular entity they all have in common: the idea of including something new (Brown, 2013; Dahiyat, 2015; Southard et al., 2016). Be it research findings (Brown, 2013), a new combination of existing knowledge (Dahiyat, 2015), or the inclusion of completely new knowledge which needs to be integrated into an existing model or existing knowledge (Dahiyat, 2015; Southard et al., 2016), there is an agreement that knowledge adoption is when something new comes in.

Despite having a similarity within all definitions there are varying findings in the literature associated with knowledge adoption, as well as the use of the term knowledge integration. There are signs that new knowledge is adopted based on having a goal, and furthermore it can be handled differently within the view of public policy creators or a more academic view.

* * *

By clearly presenting the definitions, as well as drawing attention to the differences in them, this section has aided in answering the research problem by focussing on the first key question. To draw attention to the limitations of the cycle, it is important to understand how

each knowledge process is defined. This chapter has created a foundation of understanding that Bhatt (2000) did not provide to his reader. Having definitions ensures that a user of the cycle can correctly (or with confidence) determine which process they are observing, or which process they desire to achieve.

Furthermore, the presentation of both similarities and differences has illustrated an issue: the difficulty to reach *one* definition. It was a surprise that Bhatt (2000) did not expand his search to multiple articles, but as shown in this chapter, that search may not have aided in coming to one definition for a process. A multiple article foundation may have provided Bhatt (2000) with a clearer definition for knowledge creation and sharing, as is observed in the findings of this review.

This chapter has provided a foundation of understanding for the individual knowledge process. The next chapter will build upon the definitions and present the expanded model. This model can be seen as an expansion of what Bhatt (2000) had already begun. By first presenting the definitions of the knowledge processes, one can now move to the new expanded model with a greater understanding of the knowledge processes involved. The second key research question regards the interdependent relationships and these will be explained in the next chapter.

5. Research question 2: The expanded interdependent relationships in the knowledge development cycle

This chapter aims to answer the second key research question: *how are the knowledge processes interdependent?* This has been asked to highlight another limitation of the original cycle which is the explanation of interdependent relationships between the knowledge processes. As mentioned in the introduction there are limitations to the interdependent relationships within the knowledge development cycle as presented by Bhatt (2000). The specific limitations are in Bhatt's (2000) explanations, which do not tackle the interdependence beyond claiming it is there. To expand upon this, the original knowledge development cycle has been expanded upon. Furthermore, smaller simplified sub-models have been created to help aid and understand the interdependent relationships. The expanded model also tackles the lack of direction by including arrows.

The lack of literal direction, displayed by the lack of arrows within the original model as well as its circular nature mean that an individual observing this model will not know where this model begins. A defence of this can possibly be that the knowledge development cycle should be seen as a circular cycle which is constantly "running", meaning that all the knowledge processes are happening simultaneously. With a lack of direction, users of the cycle may struggle to apply it in corporate situations or strategies. Furthermore, the lack of direction leads to the other major issue, which is the difficulties in understanding relationships between the knowledge processes.

One of the issues that Bhatt (2000) leaves a user of their cycle with is that they must use their own time and creativity to understand how the knowledge processes are related and how they may affect each other. Whilst Bhatt (2000) provides some explanation, in the form of saying that there are multiple feedback loops between the processes, this is not reflected in further explanations and leaves the majority of work up to a user. By not elaborating on the feedback loops the cycle becomes difficult to use, and by discussing the majority of the knowledge processes in their individual selves, isolated from the others, it does not help in a user's understanding of how these processes relate to each other. (Bhatt, 2000).

The aim of expanding the cycle is to address the limitations Bhatt (2000) had in his cycle. As a result of this, there are certain comments about the expanded knowledge development cycle that need to be made. Firstly, the cycle is not meant to be seen as superior to Bhatt's, as admitted in the introduction, there is now 22 more years-worth of research available for this newer cycle to lay its foundations on. Secondly, this cycle is not designed to be visually appealing, but to function as a tool which can be used with ease. And lastly, the abundance of knowledge surrounding the knowledge processes upon which this is based, means that this cycle is an attempt to create order out of chaos, and therefore one may find that visually as a whole, it is chaotic. Therefore, to lessen the load on a user I have decided to go a step further than Bhatt (2000). Bhatt provided a table for the users of his cycle, but this was a rigid table which kept the processes isolated, showing only how to understand one at a time. In this review this has been done by answering the first and third key research questions. The aim of the model is to help a reader in understanding the interdependences which exist within these processes. The model which has been created is also broken down into 4 sub-models to create ease in understanding.

Another difference with which the original design was expanded upon is the idea of triggers and goals and what role they play in the cycle. In Bhatt's (2000) original cycle there was no indication or mention of external or internal factors which were triggering or motivating the start of the knowledge processes, despite the research in knowledge adoption which often showed this is a motivating factor (Adler et al., 1999). This is once again in relation to the limited nature of the interdependent relationships. The expanded cycle is designed with the idea that something triggers the interdependence of the processes. Due to this idea of a start, there is also a concept of a finish or a goal, and this is in keeping with what has been observed in the findings, where a trigger or goal are often found to be a part of the knowledge process (Kendeou et al., 2017; Österberg, 2004; Trevors et al., 2017). This idea of having a trigger as well as a goal also means that the knowledge development cycle, when revised, does not look cyclical anymore.

5.1. The expanded Knowledge Development “Cycle”

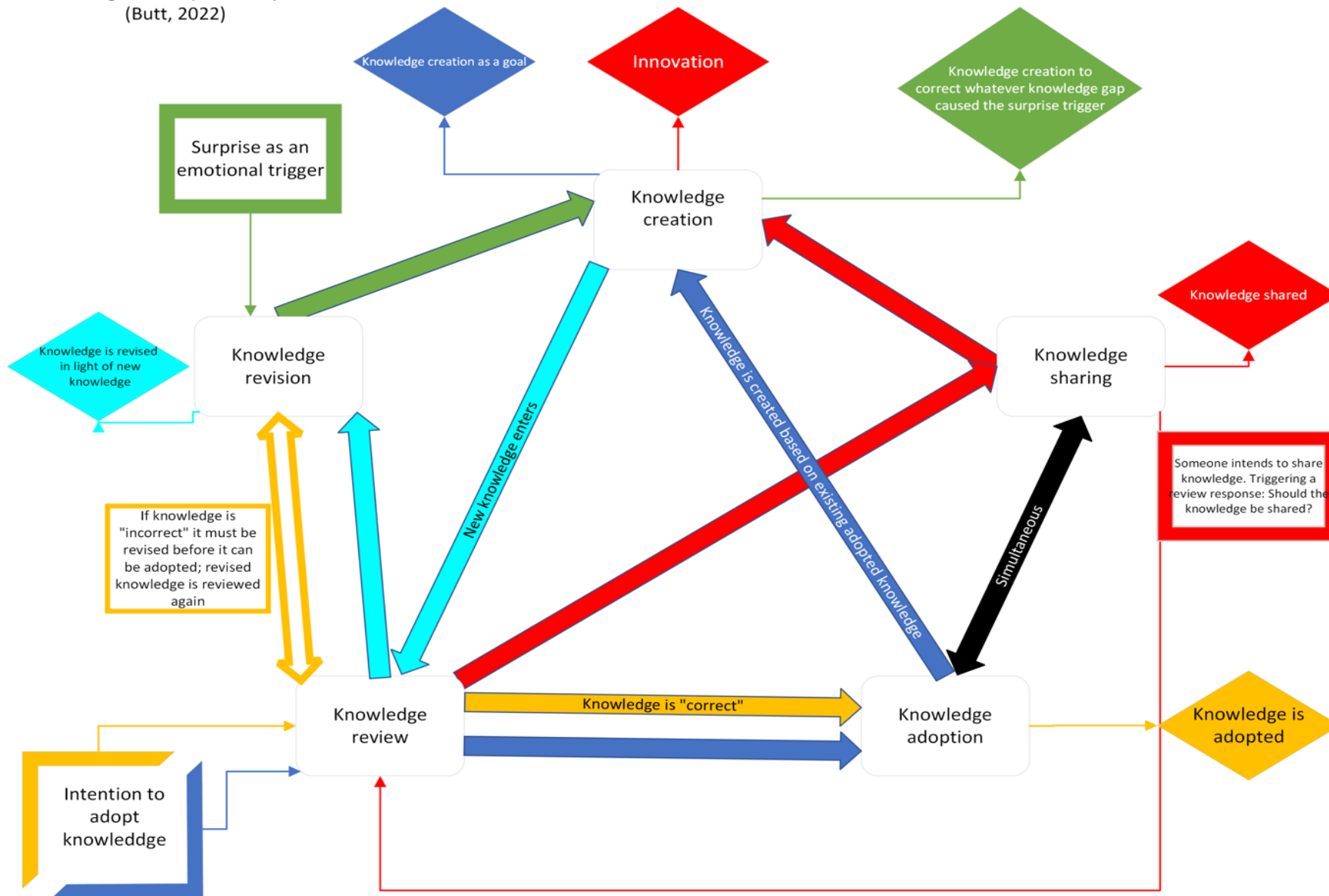
In direct comparison, the newer cycle does not seem cyclical in nature at all, which is why it is being referred to in air quotes. Furthermore, one can immediately notice that there is an abundant use of colour, and this is done intentionally. The use of colour is to allow a reader

to easily distinguish which path they are on. The idea of paths within the model will be explained in more detail later on. The premise of the new knowledge development “cycle” can be understood in 3 steps. There is a trigger which often indicates which path you will be on. This trigger will then link into a knowledge process which will lead to a goal. The trigger can sometimes be the same as the goal, as is the case with knowledge adoption. Therefore, the model is designed with triggers which are represented in the thick-edged boxes and connect to a knowledge process with a thin arrow, and then the path taken to achieve the goal is shown with the thicker arrows; the diamonds represent the goals. A small deviation that has been made from the original is the decision to split knowledge review and knowledge revision. This was done after the findings show that knowledge review is often its own process and knowledge revision is also its own process. It is also a conscious decision to not include more processes, as this would not contribute to answering the research question but is not contributing to solving the usability problem of the original cycle.

The new “cycle” shows that there are 6 possible goals from the 5 possible paths one can take. This should *not* be seen as a final model that is set in stone. It should be treated as a tool that can be adapted to the situations in which it is needed, which is also why the 4 sub-models’ will be presented. This model does not consider the external factors which may be affecting the organisation or individual, nor does it differentiate on whether this is a model to be applied to individuals, groups, or organisations. This is done purposefully and is a way to acknowledge the work done by Bhatt (2000) and the idea that new research will come, new findings will arrive, and there must be room to build upon on this model without completely tearing down the work that has been put down before. Furthermore, this review provides an abundance of affecting factors in the next chapter to aid a user, without causing overcrowding in the model itself.

Model 2 The expanded knowledge development "cycle"

Knowledge Development "Cycle"
(Butt, 2022)

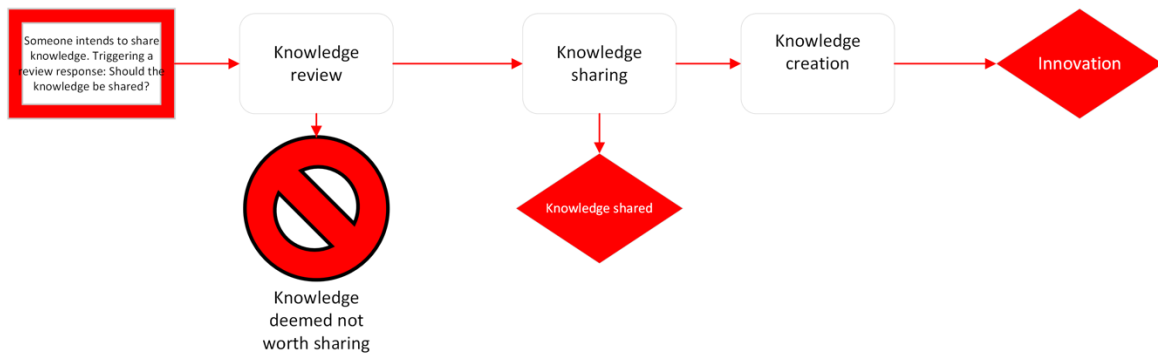


5.2. The Five Paths of the knowledge development cycle

The expanded model presented is not easy to understand in its current state. Paths have therefore been created. These paths are visualised by sub-models and are relatively easier to follow for a user. These sub-models can be used as tools if that is desired, but their current aim is to break down the interdependent relationships within the knowledge development cycle. The relationships which have been presented in the sub-models match those in the larger model in regard to colour and arrows. In some cases, such as sub-model 1, more detail is added in to allow for contextual understanding and concepts of failure.

The paths are attempting to show how the interdependent relationships were limited in the original knowledge development cycle. By showing *how* the processes are related and drawing on the findings to further illustrate how the processes may be affected, the paths present an easier tool to use. Furthermore, by keeping the interdependent relationships limited to the original four knowledge processes (which are now five due to the splitting of knowledge review and revision), none of the paths can be considered “new”, rather they are arguably concrete examples of the knowledge development cycles interdependent relationships. These relationships, however, are supported by the findings of this review. Each path also provides opportunities for further research which can expand upon the knowledge development cycle even further.

5.2.1. The Innovation or Knowledge Sharing path



Sub-model 1 The innovation or knowledge sharing path

The first path that will be discussed is the innovation and knowledge sharing path, named as such after the two goals which can be seen on the path. The first major change made to the original cycle is that in this new cycle, the term knowledge distribution has been changed to knowledge sharing, this was done due to challenged explained in the methodology chapter, where knowledge *distribution* did not provide as many results as knowledge *sharing*, furthermore knowledge sharing is used off and on again by Bhatt (2000), as well as in one of the key articles used by him, when discussing knowledge creation and distribution, as sharing is the term used in the SECI model (Nonaka, 1994).

The path begins with the trigger which is that someone intends to share knowledge. From the findings on knowledge sharing it has been shown that this is often how knowledge sharing processes begin, there is some intention to share knowledge with another individual, with a group or with the organisation (Sonmez Cakir & Adiguzel, 2020; Takhsha et al., 2020; Zhang et al., 2012). This trigger is missing from the original cycle by Bhatt (2000) and the triggers lack means that the model does not sufficiently illustrate *how* or *why* a knowledge process is interdependent with the others, as there is no start point or path to follow. In the new model, it will become clear that the intention of a knowledge process is often the reason a certain path is *chosen*. The intention trigger in this path raises the question: Should the knowledge be shared?

The question “should the knowledge be shared?” arises from multiple areas in the findings and there are two major factors at play here, which are not made clear in the original cycle by Bhatt (2000). The first factor leading to this question is whether or not the knowledge is

being shared by someone who is experienced, as this can raise questions about the validity of the knowledge being shared (Messenger, 2013). Secondly, one may ask themselves whether or not the knowledge being shared is needed to complete the task (Takhsha et al., 2020). The result of these two questions is that knowledge sharing cannot occur before a knowledge review is conducted, where the review specifically intends to deem the worthiness of the knowledge. This process is similar to what research on knowledge evaluation (which is equal to knowledge review) has found, where individuals or governments must use a knowledge review process to determine whether knowledge should be adopted, but instead of adopting knowledge, the issue is sharing knowledge (Bravo-Torija & Jiménez-Aleixandre, 2018).

The parameters on whether or not knowledge should be shared have therefore been set up to be based on the experience of the individual sharing it or the value it contributes to a task. Therefore it can be concluded that *if* the knowledge sharer is deemed to be inexperienced by the receiver, the knowledge is deemed to not be worth sharing. This means that the knowledge sharing process will end after the review and neither the goal of innovation nor knowledge sharing is achieved according to the path (Messenger, 2013). Similarly, if the knowledge is deemed to not contribute to the task being completed, it will not be seen as worth sharing and will produce a stop, where the knowledge is not shared (Takhsha et al., 2020). In the opposing case, where the knowledge sharer is deemed experienced enough and/or the knowledge is seen as relevant to contribute to the task, then the first goal in the path is achieved, which is knowledge being shared. This obvious set up exposes a deep flaw within the original knowledge development cycle, which is the lack of failure. Knowledge, as we can see by the chaotic state of the new model, is not an easy concept to grasp, therefore there must be opportunities to fail, a way to show that sometimes the interdependence of knowledge processes can actually cause a stop in the system, and this links explicitly to an intention which is also lacking from the original cycle. By presenting this opportunity within the sub-model, it is clearly illustrated that the path is not always successful.

The two factors mentioned in this section surrounding *how* knowledge may be reviewed, based on experience or usability, are not visible in the model or the sub-model. This is a deliberate decision made in respect to the reality of the academic field as well as the practical uses of a model such as this. The two factors mentioned are found in this review, but future research may be able to find new links between the knowledge review and knowledge sharing processes, and therefore this model does not attempt to exclude future contributions,

rather the aim is to show that there is a possible link based on the findings and that this may be how one uses the link in a practical setting.

The first section of the path is based on only two knowledge processes, but the entire sub-model consists of three and this is because if the path continues, we can see that knowledge sharing can lead to knowledge creation which can lead to innovation. From the findings it is clear that knowledge creation and innovation have a close relationship. Whilst in modern day terms, innovation has become a “buzzword” which is often used in marketing, in the academic sense it is still understood as presented in the findings: the creation of something novel (Hong et al., 2019; Ingvaldsen & Engesbak, 2020; Zhao et al., 2020). This simple definition allows for an intuitive connection to the concept of knowledge creation, and this is well documented by Ingvaldsen & Engesbak in relation to Mark I and II types of creation. This clear connection is one that is not visible within the original cycle, but it is mentioned by Bhatt (2000). It would be an unfair criticism to claim that Bhatt did not discuss innovation or competitive advantage, as this was a part of the background for the knowledge development cycle, specifically in relation to the section regarding knowledge creation (Nonaka, 1994). The limitation becomes clear in how innovation is presented as a much broader and background element in the original cycle, whilst the findings show that innovation has a much closer relationship to knowledge creation specifically and is often a *goal* (Hong et al., 2019; Ingvaldsen & Engesbak, 2020; Zhao et al., 2020). Therefore, the decision was made to show that innovation can be a goal, despite this not being the intention, it is possible through this path and the explanation is also clear from the findings.

In the findings there are two areas where knowledge creation and knowledge sharing are closely linked in relation to innovation. It is observable in the link between Mark II/Mode 2, as well as in concepts of safety and trust. Within the concept of Mark II and Mode 2 we see that the focus is knowledge creation linking to innovation, with creation being needed to innovate. Mark II is the concept of accumulating knowledge and therefore opens up to the idea that knowledge must come from somewhere. In the new model this is from knowledge adoption and knowledge sharing. The link to knowledge sharing cements the idea that knowledge sharing via the contribution of others is needed for knowledge creation (Ingvaldsen & Engesbak, 2020; Jung, 2020).

As a whole path, it has been shown how there are connection between the intention to share knowledge, knowledge review, sharing, and creation. This path can lead to knowledge being shared as a stand-alone goal, or it can be linked further into the larger goal of innovation. This will be ultimately decided by the user of the model. The limitations of the model made by Bhatt (2000) have also been shown in the inclusion of both an intention that triggers the process, as well as the many possible results one can get from the one trigger. There are also other elements from the findings which are shown to affect this process but may also need further research.

When one observed this path as a whole it becomes clear that there is ample opportunity for further academic research to be done within this path alone. As mentioned earlier there is a need to see what other factors link together the knowledge review and knowledge sharing processes. One possible link already, which can be seen within the new model, is how knowledge revision can play a role in the intention to share knowledge if it is deemed not worth sharing.

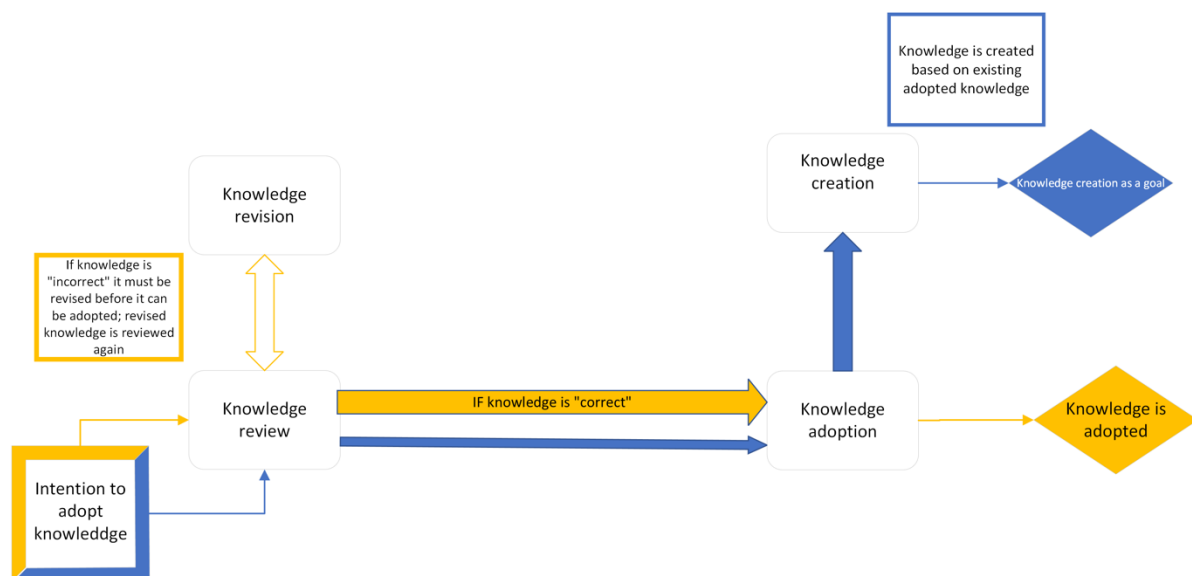
Furthermore, there is a need for further research to be done into the role of knowledge hiding and ostracism, as this is an interesting concept but is limited to knowledge sharing at the moment (Takhsha et al., 2020), with focus on individuals. This idea has great potential to be explored further at an organisational level but also on the level of specific individuals within an organisation. What could be the effects of one employee in a team hiding knowledge in comparison to whole groups or members of leadership? The causes of ostracism are often linked to the organisational culture, but what can be done to avoid this? There is also the question of what consequence such behaviour can have on the larger aims of an organisation and the corporate culture. This further research will indirectly do exactly what today's research has done to Bhatt, which is show that there are limitations to the existing interdependent relationships and that there are many other possibilities. There are many things which could affect the behaviour of individuals and also this innovation and knowledge sharing path, but it is just one part of a much larger puzzle

The second path deals with knowledge adoption or knowledge creation, building upon this path.

5.2.2. The knowledge adoption or knowledge creation path

When starting sub-model 2 it can be easier to follow it backwards if you are using it to understand knowledge creation but if the goal is knowledge adoption it can be a little more difficult. This difference comes from the varying understandings research has presented on the terms. Whilst knowledge creation has been found to be a term many differing researchers agree on, knowledge adoption is still a term that is up for debate. We can see this in the findings as the definitions for knowledge creation are similar whilst the definitions for knowledge adoption are somewhat similar but can also be interpreted as distinct definitions. This is also the reason that sub-model 2 presents two unique paths (represented by the blue and yellow colours) compared to sub-model 1 which is all one path with two goals (and the chance of failure).

Sub-model 2 begins with the intention to adopt knowledge for both possible paths. In the path to knowledge creation this intention triggers a review process which will lead to knowledge being adopted and this adopted knowledge will be used to create new knowledge. In the path for knowledge to be adopted there is also an intention to adopt knowledge, but the knowledge review process can have two possible outcomes: knowledge revision if the knowledge is incorrect or knowledge adoption if the knowledge is correct. If the knowledge is incorrect and revised, it must be reviewed again and deemed correct before it can be adopted.



Sub-model 2 The knowledge adoption or knowledge creation path

Sub-model 2 allows us to discuss some further limitation within the original knowledge development cycle. First and foremost is the splitting of knowledge review and revision into

two independent processes. Furthermore, it is showing that an intention can have two differing outcomes, once again showing the importance of a trigger and goal, as this dictates how one proceeds within the expanded model.

To follow the first path of knowledge adoption, one must begin with the intention to adopt knowledge. All three definitions from the findings present the idea that knowledge which is adopted is *new* knowledge, but none of these claim that knowledge creation is the way to achieve knowledge adoption (Brown, 2013; Dahiyat, 2015; Southard et al., 2016). Whilst Brown (2013) does mention the concept of research, there is not a claim that new knowledge is adopted simply because it is created. Knowledge adoption research is also one that strongly advocates for the idea of having a goal in mind.

The concept of a goal or that knowledge adopted should be useful is the grounds for how the path is set out and why there is a knowledge revision opportunity. When one intends to adopt knowledge it must be reviewed in light of its usefulness or the goal of the organization or individual (Dahiyat, 2015). This idea means that knowledge adoption cannot exist alone and is related to the process of reviewing knowledge. It is first here we see a limitation within the review *and revision* that Bhatt (2000) set up in the original knowledge development cycle. The original cycle had a long-term view on knowledge and considered the idea that knowledge should be reviewed and revised as time goes on. Whilst this is not incorrect, it did not accurately represent the practical way in which researchers treat knowledge. What can be observed is that knowledge is often reviewed first, in light of some criteria (Bravo-Torija & Jiménez-Aleixandre, 2018), and *if* this knowledge is incorrect it may be revised (Butterfuss & Kendeou, 2020; Rich et al., 2017). If the knowledge is reviewed and seen as correct it is simply adopted without further questioning. This process is very similar to the process knowledge sharing goes through, illustrated in sub-model 1, and it is on this basis that there is a black arrow claiming that knowledge sharing, and knowledge adoption are occurring simultaneously in model 2. This idea is strengthened based on the second path knowledge adoption goes through, via knowledge creation, similar to knowledge sharing.

Knowledge creation has a total of 3 goals related to it in model 2, based on the findings in this review. There is of course the possibility of many other goals going through knowledge creation but one goal which will always remain is the goal of creating knowledge. When focusing solely on knowledge creation as an isolated process it is the opinion of this review

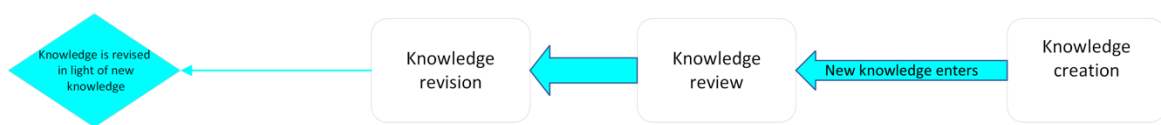
that the definition has not changed much from what Bhatt (2000) originally presented. This is mainly due to the fact that the SECI model (Nonaka, 1994; Nonaka et al., 2000) has cemented itself in research and the idea of knowledge being created based on existing knowledge is now accepted by many researchers, to such an extent that some do not reference the SECI model directly (Ingvaldsen & Engesbak, 2020; Jung, 2020; Silamut & Petsangsri, 2020). The path to knowledge creation can be understood in both directions. For the sake of creating an easier path to follow the sub-model and model only show one direction. When one intends to adopt knowledge and has adopted knowledge there are two end goals; the knowledge is adopted, or it is used. The use of this new knowledge is often in the context of knowledge creation. Existing knowledge is the grounds for knowledge creation and knowledge adoption is often in relation to existing knowledge. Based on this one can argue that whilst there is not a clear link within knowledge adoption literature to show a connection to knowledge creation, knowledge creation literature has made it clear that it relies on knowledge to be adopted into the existing knowledge base (Ingvaldsen & Engesbak, 2020; Intem et al., 2021). From the path relating to knowledge adoption, we also know that knowledge cannot be adopted without a form of review. This idea is strengthened by Brown (2013) who is alone in showing how knowledge creation, adoption and review fit together. Brown shows that public policy creators rely on new research or new knowledge to use in public policy making. This new knowledge must be adopted *but* is only adopted if it is useful to the creation of public policy. Whilst this connection has been made, it requires further research and the paths may potentially merge into one, similar to sub-model 1. Due to their variation in research and the lack of support for linking knowledge adoption and creation from the perspective of knowledge adoption, it is a potential gap that needs filling.

A question that remains to be answered is one that arises due to the relationship discussed between knowledge creation and knowledge adoption and it is not raised by Bhatt (2000) either, which is when is knowledge truly new? The definitions of knowledge creation are hesitant to confirm that new knowledge has truly been created, and this discussion may be a philosophical one, but it has implications for users of the model in practical setting. With sub-model 2 we can also highlight the limitation Bhatt (2000) placed on the knowledge development cycle but not splitting knowledge review and revision into independent processes, as we see them as two separate processes. Furthermore, the sub-model continues to show that Bhatt's concept of constant interdependence is not true, but that rather we must

assume that there is a certain limitation in how each process is involved depending on the intention and goal of the individual and/or group/organisation.

The following path deals with knowledge review and shows how it can exist as a singular knowledge process, separate from knowledge review, but still being interdependently related to knowledge review.

5.2.3. The knowledge revision path



Sub-model 3 The knowledge revision path

The knowledge revision path shows how Bhatt (2000) had the correct idea, but research has shown that the concept of review and revision as one process is no longer popular. In the original knowledge development cycle, knowledge is seen in terms of being something active that needs to be reviewed and revised so that it does not become a passive asset within an organisation. This is not how newer research has presented the concept, and the process is also one that is dependent on something triggering it. In this case, Bhatt (2000) attempts to show companies who may be falling behind their competitors. This concept has changed slightly to now be represented by the creation of new knowledge which is the trigger for the knowledge revision process in sub-model 3.

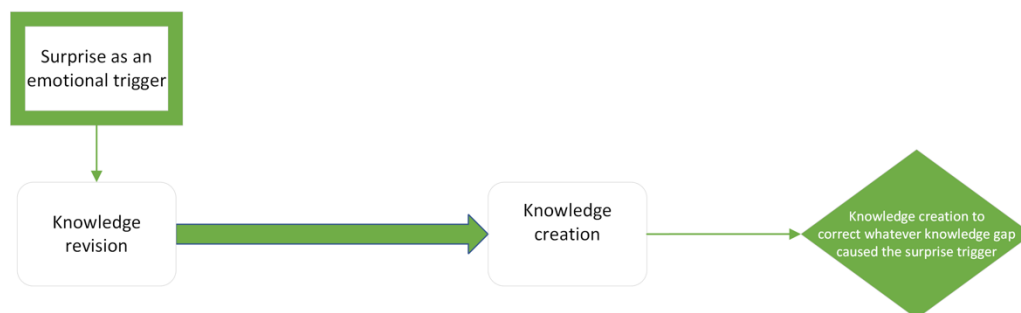
The knowledge review process is based on the KReC (Knowledge revision components) framework (Kendeou et al., 2017; Rich et al., 2017; Trevors et al., 2017). Sub-model 3 places this concept into a visual model that can become a piece of the expanded knowledge development cycle. The creation of new knowledge is the only deviation made from the original framework as the KReC framework states that new knowledge is presented. It can be argued that there are now other ways to review knowledge, as the process has now been split up. The idea of revising is still similar to what the KReC presents, a new concept and old concept being compared side by side and removing the old concept if the new concept deems it false (Kendeou et al., 2017). Knowledge evaluation literature can provide certain new ideas

on how to review knowledge such as looking at the knowledge relevance, reliability, certainty and complexity (Mason et al., 2010).

It has been difficult to draw clear connection from the knowledge revision process to others. The findings have shown an abundance of cases where knowledge reviews were needed in relation to other processes, such as knowledge creation, sharing and adoption, but revision has struggled to go beyond knowledge review. It is therefore necessary that knowledge revision is studied further than the current research done on the KReC. There is also a lack of research on knowledge revision done outside of schooling contexts. Attempting to show the limitations in Bhatt's knowledge development cycle in terms of interdependence is not easily done when there is very little knowledge to support or argue against the existing research done by Bhatt (2000). Splitting knowledge review and revision up into their own processes is the only way the current literature shows that Bhatt's original attempt was incomplete.

The final path is the path to fill a knowledge gap, which presents a possible interdependence between knowledge creation and knowledge revision.

5.2.4. The path to fill a knowledge gap



Sub-model 4 The path to fill a knowledge gap

The final sub-model is showing how the path to filling a knowledge gap begins with an emotional trigger. There are many emotions to be had in relation to knowledge, both positive and negative, but surprise plays the largest role in triggering a process. Surprise is an emotion that triggers individuals to revise their knowledge because the emotion is often seen as a sign that there is a knowledge gap (Trevors et al., 2017). Sub-model 4 therefore begins with surprise as an emotional trigger, which leads on to revise knowledge and the need to revise knowledge requires knowledge to be created. This is in the opposing direction to how the

KReC normally functions, as normally new knowledge which is created triggers the need for a review and then knowledge is revised, as in sub-model 3.

Sub-model 4 can be considered, together with sub-model 3, to be one where Bhatt (2000) was correct in his model design, choosing to not include arrows. But the inclusion of the trigger and the goal is still the main contribution that shows how Bhatt's (2000) design was limited and difficult to put into practical use. With sub-model 4 questions may arise as to why emotional trigger was not placed alone, and why surprise is the specific emotion of choice. Due to surprise having no specific valence, it is deemed as the one emotion which would not have a positive or negative effect on the knowledge that is gained when filling the gap. If a similar process was set in process with a negative emotion, it may limit or cause a biased view of the knowledge created and not fill the knowledge gap, leaving the knowledge review process as failed. This is not a part of the model as this is something that requires more research outside of the KReC framework (Trevors et al., 2017).

5.2.5. The expanded model versus the old

This chapter aimed to answer *how are the knowledge processes interdependent?* In presenting the expanded model and the respective sub-models, this chapter has shown some possible interdependent relationships between the knowledge processes. This contribution has addressed the limitation in Bhatt's (2000) original work by providing clear paths to follow as well as detailed explanations on how the processes are interdependent. A large contribution has been made to the original cycle itself, which can be seen in Model 2 and sub-models 1-4. The contribution of these models has given the knowledge development cycle a more structured format, as well as including goals and triggers for users to identify or use in their work. Furthermore, the use of arrows makes the possible interdependent relationships between processes clearer. The final contribution of the expanded model is the opportunities for further research. As some have already been mentioned, it is possible that some have yet to be explored. The findings regarding knowledge management literature shows that there is potential for new models to be taken into use all the time, and the research from new models may contribute and expand even more upon this one.

The next chapter will build upon the first two questions by answering what factors affect the knowledge processes that have been discussed in this review.

6. Research question 3: The factors affecting the knowledge processes in the knowledge development cycle

There are three types of findings which have been uncovered in this review. The first are the findings which define the knowledge processes in this review. The second findings are ones which have presented how the knowledge processes work together in an interdependent way. The final findings in this chapter aims to answer the third research question of this thesis namely: *What factors affect the knowledge processes?* The factors which have been chosen were selected for two reasons. Firstly, many of the factors were related to explanations of interdependence between the knowledge processes, and this made them important to highlight for a reader, as they will aid in understanding the expanded model. Secondly, the review is limited by the articles which were found and selected, and therefore the findings were picked based on what was presented. As mentioned in the previous chapter, this is a work that is open for further contribution.

Regarding knowledge sharing four factors have been found to affect the process. Firstly, the knowledge sharers experience, the leadership of an organisation, and the use of IT based solutions. The fourth and final factor presents how ostracism of employees may lead to knowledge hiding which hinders knowledge sharing. For knowledge creation three affecting factors were identified. The phenomenon of innovation as highlighted in Mark I and II, the feelings of trust and safety for employees, and the role of research institutions and universities. Findings showing how knowledge review and revision are affected are presented under review and revision as one process. Despite splitting them up in the expanded model, the factors affecting them are closely linked. These factors include emotions, radical innovation, the motivation behind an evaluation, and the use of evidence. A final affecting factor is mentioned, which is the use of an intranet. This shows how knowledge review and revision can occur within a digital space, and what may affect this. Finally, for knowledge adoption the idea of a goal is discussed as well as the effects of an academic context.

After these factors are detailed, a final section dedicated to knowledge management literature will present how differing models can have other processes involved, how other models may have differing goals. Within this review, several articles were found to have their own

models, and they can be seen as both strengthening the idea of the knowledge development cycle, as well as trying to undermine it simultaneously.

6.1. Knowledge sharing is affected by...?

The experience of the knowledge sharer

As a part of a larger study looking at professional cultures and collaborative working within children's centres in England, a study was done to build upon existing work done on knowledge distribution. The article presented a problem of knowledge sharing within a inter-professional setting. This can be understood as the combination of knowledge from different professions being used in collaboration in one fixed setting (the children's centres). The study illustrates how knowledge exists within tacit forms and can be absorbed by others, but this was not a conscious or deliberate method of sharing knowledge. It is made clear in several excerpts that status and experience play a role in who is permitted to share knowledge and whose knowledge sharing effort is considered as valid (Messenger, 2013). The terms status and experience are difficult to separate as increased experience also can manifest in the form of increased status. Furthermore, the experience and status must also be recognised by the other party, and this could be different depending on contexts, as it is shown that in schools people see a lack of experience rather than an educated individual. What Messenger (2013) presents is a role to each party, known as the "bringer", the "giver", and the "imposer" of knowledge (p.147). The knowledge "bringer" and "giver" are both presented positively as fulfilling a need for knowledge to be shared or their knowledge will be used. The goal of these types of knowledge sharers is that they offer and inform others of their knowledge and make it available to be shared. The "imposer" is a less welcoming approach as this individual may have a wide breadth of knowledge but in their enthusiasm to share, they do not share *with* the others but simply *to* them, leading to an ineffective knowledge sharing event. The main effect we can take from this study is that status and experience are often important for both parties in knowledge sharing, where a lack of experience or status could lead to two potential issues: one is either ignored and not heard by others or one shares in a way that does not help within the context. Therefore experience and status are needed for an individual sharer to be both heard and seen, as well as honing their abilities on how to share (Messenger, 2013).

The role of leadership in knowledge sharing

There are specific leadership behaviours that can be noted to have an effect on knowledge sharing. The leading hypothesis is that leadership effectiveness has an effect on knowledge sharing, and this is presented on the following grounds: an effective leader will have a positive effect in their followers and the social system they are operating within. As a consequence of this, commitment and motivation for self-sacrifice and increased performance will be high amongst employees (Sonmez Cakir & Adiguzel, 2020). This assumption means that knowledge sharing, which is seen as a behaviour where one sacrifices for the benefit of the organisation, can also be positively affected by an effective leadership presence. The article claims that effectiveness is the function of various organisational conditions and that a leader can indicate to their employees the importance of certain conditions. In the case of knowledge sharing within the organisation it is vital that a leader can effectively convey the importance of self-sacrificial behaviour and can show themselves also show this behaviour. If a leader can consequently create an organisational environment where employees feel that unity is being created, they have a sense of belonging and that there is heightened cooperation amongst employees, then it is plausible to argue that effective leadership will lead to knowledge sharing behaviours amongst employees (Sonmez Cakir & Adiguzel, 2020). A major point of knowledge sharing in this article is that the reason a leader may be motivated to make knowledge sharing a goal and desirable behaviour is that of competitive advantage. As can be noted in the coding of articles, there are repeated instances of innovation being mentioned. Often knowledge sharing is seen as one of the knowledge processes that leads to possible innovation within an organisation. To maintain an organisational advantage, it is in a leader's interest to have knowledge be shared, and therefore we must also note that an effective leader will not automatically cause knowledge sharing. Rather, this article shows that if knowledge sharing is required for the industry, then the leader will be deemed effective *if* they can manage to create a social structure which includes knowledge sharing, and which can use said knowledge for a competitive advantage (Österberg, 2004; Sonmez Cakir & Adiguzel, 2020)

The use of IT in knowledge sharing

The study is done with the aim of discussing knowledge sharing visibility, which is not the focus of this review. There are however findings presented and discussed that can be of interest for the review and as society is moving towards a fourth industrial revolution, the information technology view is important to consider when doing an evaluation of

knowledge sharing and the knowledge development cycle as a whole (Jung, 2020; Zhang et al., 2012). The case study considers a knowledge management system (KMS) which can store explicit knowledge which makes it available for distribution within the organisation. This knowledge management system is the mediating tool for sharing knowledge, as it creates an intranet for the company, by providing access and furthermore, it informs employees about when new knowledge is uploaded (shared). The findings presented show that a KMS is a technology that can be *both* negative and positive for knowledge sharing. The initial findings show that department size and the nature of work can have a lot of influence over the perceived need or effectiveness of a KMS. A larger department or one with routine tasks will note a benefit in being able to share knowledge which can be used by many, as this is easily made explicit. The issue is when a smaller and/or less routine task-oriented department feels that sharing knowledge that is not re-applicable, then the KMS is deemed a wasteful or even obsolete resource. There is also a matter of motivation linked to a KMS, where knowledge sharing can become quantifiable and measured and therefore one may observe knowledge being shared as a way to curry favour with a leader (Zhang et al., 2012). IT skills are also mentioned, as well as one's place within a company, which both present new research questions which remain without an explicit answer. This review benefits from this article as it shows that knowledge management systems are an alternative for explicit knowledge sharing and can also be useful for employees who are at lower levels within an organisation. The issues that may arise, such as lacking IT skills and non-transferable or tacit knowledge, show that there is still a need for face-to-face knowledge sharing, but this again raises the question: how do we store and share this (Zhang et al., 2012)?

Ostracism in the workplace and knowledge hiding

There are many things that can be done to increase knowledge sharing behaviours, but it is equally important to take note of what can create behaviours which hinder knowledge sharing. It has been shown that ostracism within the organisational culture can lead to two separate things: a lack of knowledge sharing behaviour or a consequent knowledge hiding behaviour (Takhsha et al., 2020).

There are several factors which are presented that may actively aid knowledge sharing, and these are behaviours and cultural aspects within an organisation. A major contributor is seen as the existence of tasks which require knowledge sharing if one is to complete them. This is an external source of motivation to share knowledge, but this motivation must also exist intrinsically (Bao et al., 2015 in Takhsha et al., 2020). This intrinsic motivation deals heavily

with emotions and these emotions can be affected by the workplace culture. It is here we first find the term ostracism to be of importance. Ostracising an individual, which is to exclude individuals or groups from an activity within the social environment, has a negative effect on the motivations for knowledge sharing. If an individual is ostracised, they are unable to enter the arena for sharing and therefore cannot share their knowledge. Furthermore, this ostracism can affect person self-esteem which may lower an individual's belief that they have information or knowledge worth sharing (Takhsha et al., 2020).

Consequently, whilst ostracism may seem to only be a hindrance to knowledge sharing, it may also contribute to the process of active knowledge hiding. Knowledge hiding can be understood as the result of being ostracised, as an individual has lost their self-esteem in their knowledge. The knowledge is not worth sharing and is therefore now kept hidden. As well as this, knowledge hiding can be done for other reasons, which are more to do with individual intrinsic motivation or a lack of external motivation. In these cases, knowledge is not shared based on the negative feelings which may be directed towards the organisation, the task or the ostracism an individual has experienced (Takhsha et al., 2020).

There is a clear understanding in the literature that knowledge sharing is critical for remaining competitive and for an organisation to thrive, and an organisational environment where employees engage in ostracising behaviours could spell catastrophe for an organisation long term. It is therefore important for collaborative behaviours to be encouraged at the level of employees but also leadership. It is shown that knowledge hiding, and ostracism do not only affect the knowledge sharing process but have severe negative effects on individuals in terms of job satisfaction, motivation, performance, and mental health (Sonmez Cakir & Adiguzel, 2020; Takhsha et al., 2020).

6.2. Knowledge creation is affected by...?

Mark I and Mark II in knowledge creation

Mark I and Mark II are not originally knowledge creation terms, but their underlying ideologies are mirror to that of knowledge creation and the concepts include an idea of creativity. Both Mark I & II are originally types of industries within economic development literature that focusses on innovation, and this review understands them to be similar to Mode 1 and Mode 2, as referenced by Jung (2020), as they also have their roots in innovation literature. As previously mentioned, knowledge creation and sharing are both connected by

innovation and the process of innovation, where one creates something novel, is a result of knowledge being created and applied to something (Hong et al., 2019; Ingvaldsen & Engesbak, 2020).

The concept of Mark I is presented by Ingvaldsen & Engesbak (2020) as creative destruction. This is the exception to all the other definitions given for knowledge creation within this review. The idea is to make the old concept useless due to new knowledge and/or technologies emerging. Within this type of development, the relationship to knowledge was also different to how it is in Mark II. According to Jung (2020) Mode I suffered from boundary issues when it came to knowledge production. These two aspects together show that Mode/Mark I was a form of innovation that relied heavily on knowledge being released, and also being ground-breaking or new “enough” to make the old knowledge useless for future use. A changing dynamic between universities, research institutions and organisations changed this and led to the creation of Mode/Mark II.

Mark II is a form of innovation that works as creative accumulation, and this definition is more in line with the common definition all the articles within the knowledge creation theme have provided (Ingvaldsen & Engesbak, 2020). Furthermore, Jung (2020) has presented Mode 2 as being a knowledge production method which also incorporates knowledge sharing but also builds upon the contribution of others; the collective of Mode/Mark II translates to knowledge creation being an individual contribution within a collective effort to build upon what already exists.

When considering Mark II industries, it is important to note how bureaucracy can affect knowledge processes within them. Ingvaldsen & Engesbak (2020) have managed to illustrate within their case study, that the organisational foci are what can affect how bureaucracy is allowed to affect the knowledge creation process. The same things which can be considered a constraint in one view can be seen as an opportunity to create specifically in collaboration with certain actors. They also argue for what can be seen as advocating for Mode 2 presented by Jung (2020), as they conclude with a calling for “stronger multi-level integration” (Ingvaldsen & Engesbak, 2020, p. 412).

What this review gains from the concepts of Mark/Mode I and II is the understanding that knowledge creation is no longer seen as an individual, enclosed effort and that going forward there is a larger reliance on collaboration to create what can be understood as explicit knowledge.

Trust and safety in knowledge creation

There is a conceptual model created by Sankowska (2013) in which organisational trust leads to knowledge transfer, which leads to knowledge creation, which ultimately leads to innovativeness. The aim of the study done by Sankowska (2013) is to show that organisational trust can have an effect on these processes and ultimately the resulting innovativeness.

This article initially confirms once again that there is a relationship to be discussed, between the process of knowledge sharing and knowledge creation and their bond via innovation. However, it provides this review with an important analysis of what trust and the trust within an organisational environment can do for both knowledge sharing and creation.

Trust is an underdeveloped and under-researched phenomenon in relation to knowledge management, despite many scholars claiming it is important for organisational survival and innovation.

Within Sankowska's (2013) study the understanding of knowledge creation is an organisationally internal one, where creative behaviours are encouraged if there is safety and positive expectation. In regard to the creation of new knowledge, it is claimed that a higher level of trust will increase the likelihood of an individual sharing their knowledge in the process of producing new knowledge. As a consequence of this relationship, we begin to see how trust can be seen as a key factor for knowledge creation as it creates knowledge via the mediating act of sharing knowledge. Furthermore, the hypotheses in their sum total argue that trust will lead to innovativeness as trust is a predictor of knowledge creation and knowledge transfer (sharing), which are the two processes required for innovativeness.

Due to the findings of Sankowska (2013) it can be argued that trust is a necessary factor in the creation of knowledge, as it creates a safe environment in which to take risks. However, the further link to innovativeness must be further researched, as claimed by the author themselves. This study is the first and therefore, despite having empirical evidence, it must be considered a theoretical connection for the moment. This is the view of this review but also of the author (Sankowska, 2013).

The role of research and universities in knowledge creation

We know that knowledge can exist in both tacit and explicit forms and often it is easier to understand tacit creation as a new experience which can be connected to a consequence. This creation is linked heavily to the SECI model, where knowledge is internalised (Bhatt, 2000;

Nonaka, 1994). However, there is also the creation of true explicit knowledge from explicit knowledge, which we often refer to as research. This knowledge is often produced by universities or research institutions and it is this knowledge one may associate with the news of discoveries and new technologies (Jung, 2020).

Universities and research institutions are the producers of new knowledge and often do not exist as individual producers. One can use the meta-example of this review, where each author has a connection to some university or institute, within a journal and/or university and/or research institute. This research is peer reviewed and eventually published and taken in by people in charge who may use it to enact change in political policy (Jung, 2020).

This concept of knowledge production is consequently affected by the nation or field within which it is taking place. Jung (2020) provides an insight into the Korean context and how the nation has bounced back after the war. It is shown that governments have a direct influence on how knowledge is created due to the socio-economic control that they have. Government can influence where research should be focused, through the creation of grants which support research. This has in turn meant that universities have hired, and tenured professors based on a contract to produce research. This research however has often been safe and not innovative as to avoid loss of funding. The consequence of this is that knowledge is being produced but very little of it is new or shared beyond the academic field.

The change that Jung (2020) has observed is that knowledge production left the universities and also became a part of the business model for larger organisations, such as technological titans in Korea. Whilst there was an initial barrier between both universities and research institutions and business', there has recently come a collaborative and competitive side which means new knowledge is being produced together. This change came from shifting from a Mode I, to a Mode II knowledge creation approach, which is "application-oriented, trans-disciplinary and involves collaboration with different sectors" (Jung, 2020, p. 138). What can be learned from the specific Korean context of Jung's study (2020) is that local political policy can influence where money goes, but it can also influence how smaller enterprises operate in regard to knowledge creation. The small-medium enterprises in Korea invested conservatively and managed to stay afloat, whilst it fell upon the larger firms to invest heavily in innovation, and thus knowledge production, to ensure competitive advantage and survival. Policy changes can possibly influence the imbalance in favour of SMEs as well as a collaborative effort between larger firms and universities, but these changes take time and due to this, we find that whilst universities and research institutions in Korea *can* be the producers of new knowledge, they are often at a disadvantage due to having less freedoms

than a large and rich organisation which creates knowledge freely and can allow for a riskier more innovative research approach (Jung, 2020).

6.3. Knowledge review and revision is affected by...?

The role of emotions in knowledge review and revision

Knowledge being reviewed can often be associated with negative connotations due to the idea that if knowledge needs to be reviewed and replaced is due to one of the following reasons: it is incorrect, it has become outdated, or it is incomplete (Bravo-Torija & Jiménez-Aleixandre, 2018; Butterfuss & Kendeou, 2020; Kendeou et al., 2017; Mason et al., 2010; Rich et al., 2017; Trevors et al., 2017). Due to these negative connotations, it is important to consider the emotions of the individual when knowledge is going to be revised, to ensure that knowledge revision is done effectively but that an environment exists in which knowledge can be revised and evaluated.

The knowledge revision components framework is the most concrete example of how knowledge can be revised. It follows five principles known as encoding, passive activation, coactivation, integration, and competing activation. The framework makes an individual take their permanent encoded knowledge and change the assumption, that this knowledge can be reactivated via passive activation, reactivation in this sense would be to change the nature of the knowledge. This would require three things to happen: one requires coactivation in the form of *needing* new knowledge, this may be due to the awareness of a misconception. Consequently, new knowledge must then be integrated with the misconception and finally an individual must go through a competing activation where the new knowledge must dominate and become encoded, as it draws attention away from the misconception (Butterfuss & Kendeou, 2020).

This framework has repeatedly been tested with the use of something known as refutation texts, where one provides information to refute previous knowledge, which makes an individual go through this KReC process (Butterfuss & Kendeou, 2020; Kendeou et al., 2017; Trevors et al., 2017). There are several elements which must come together for this method to work, such as the emotional aspect. One cannot simply prove that something is wrong in a vacuum, it must be done alongside a misconception (Butterfuss & Kendeou, 2020).

Emotions can be seen within two aspects, their activation, which is how they present if activated, and their valance, which is if they are positive or negative. There is a clear

difference in how negative and positive emotions affect how an individual treats knowledge revision processes. It is possible for both negative and positive emotions to lead to knowledge revision, there is however a difference in how this knowledge is revised within the individual. Positive emotions associated with the revision can ensure that an individual has an enhanced working memory and can activate the information appropriately. Consequently, positive emotions will mean that an individual has greater chances of high comprehension and integration. Negative emotions may still result in revised knowledge but it may not be activated outside of the scope it was made, meaning it is not a comprehension level that can make it useful or spread the memory of the new knowledge beyond the scope within which it is presented (Trevors et al., 2017).

The emotion of surprise is deemed to be neither positive nor negative. When knowledge is being revised, the emotion of surprise can alert an individual to a fault or missing piece in their knowledge. If an individual feels surprised, their new goal is then to avoid this surprise again, which will lead to a pursuit of knowledge. The emotion of surprise is therefore a trigger for knowledge revision but can also potentially serve as a predictor for learning (Trevors et al., 2017)

The source of knowledge has also undergone changes in the last 20 years, as we have seen how technology has developed, so has access to information. The evaluation of knowledge is no longer only an objective pursuit, but a balance between the objective and the subjective (Mason et al., 2010). The role of relevance judge has shifted from the teachers and professors to the students sitting in their classrooms. Individuals in the modern age have had to become judges of credibility by being able to correctly ascertain the expertise of the author, the plausibility of the information and to look at their own beliefs (Rich et al., 2017). Due to this added role, the source of knowledge is now also a part of an already emotional process that could potentially be affected by the emotional valance of knowledge revision (Mason et al., 2010; Trevors et al., 2017).

Radical innovation and knowledge evaluation

Innovation is a recurring theme in knowledge management literature and in the pursuit of innovation many knowledge processes have been included, such as knowledge creation and sharing. When Zhao et al., (2020) begin to discuss knowledge, they present it as a dynamic flow which consists of knowledge capture and sharing. There is an issue with knowledge flows, in that we do not know their explicit impact, and this is needed because knowledge can be reused in the pursuit of innovation. The main focus is how to reuse knowledge, but this

requires a process of searching, evaluating, and recombining knowledge. In practice this can be observed in the judgement of knowledge in terms of demands. If knowledge flow is the capture from knowledge reuse that is shared after being recombined, then there are two possible ways evaluation can function in this process. If the knowledge in use is evaluated to meet the current demands of the market, then the knowledge flow is restricted or unnecessary as innovation is not needed. The opposite, where the market demands new knowledge, would increase the knowledge flow and attempt to reuse knowledge to meet the demands (Zhao et al., 2020).

Another view of knowledge evaluation can be seen in the academic context and could aid with the process of considering demands. When evaluating knowledge there are 5 academic points one could consider; does its accuracy need to be improved? Does it need to be more easily learnable? Can the knowledge be improved upon? Has its relevance increased? And can the effectiveness of the knowledge be improved? It is upon these terms, as well as the markets demands, that we can see how the academic side and the private organisational side come together to ultimately radically innovate and create and share new knowledge for the benefit of a field (Zhao et al., 2020). All of this is summarised within a larger organisational flow which is presented in Figure 3, (Zhao et al., 2020, p. 14), where we see that this knowledge flow and reuse process is triggered by an encounter of problems and involves other parties in an attempt to solve problems or meet new demands, which could need an innovative solution.

Motivation for knowledge evaluation

Knowledge review and revision/evaluation presents with a large variation of effects as well as definitions. In an attempt to create some cohesion between them some similarities are presented below.

The concept of knowledge refutation texts within the KReC framework experiments can be seen as similar to demanding evidence to make an argument or come to a conclusion correctly. In both cases an individual is presented with new evidence that may refute a misconception or argue for or against their beliefs, motivating them to review or evaluate their knowledge. The concept of taking in new information to evaluate the old is therefore one similarity observed (Bravo-Torija & Jiménez-Aleixandre, 2018; Butterfuss & Kendeou, 2020; Kendeou et al., 2017; Trevors et al., 2017).

Furthermore, individuals are motivated to pursue knowledge evaluation based on their emotions, as we have seen emotions can positively or negatively affect the outcome of an

evaluation process. Furthermore, emotions can affect the belief one has in sources, which can directly affect whether evidence is believed (Mason et al., 2010; Rich et al., 2017; Trevors et al., 2017).

Finally, it is worth noting that evaluation occurs at an individual and organisational level, and that organisations are heavily invested in knowledge evaluation in the pursuit of innovation, as knowledge evaluation is critical in this (Skok & Kalmanovitch, 2005; Zhao et al., 2020)

How knowledge reviews can be conducted using evidence

To evaluate knowledge, to engage in discussion, to make an informed decision, but on what grounds? An individual has two possible ways to go, to base it on their own beliefs or to base it on evidence (Bravo-Torija & Jiménez-Aleixandre, 2018). Sometimes your own beliefs may be shaped by evidence, the question is, how do we as individuals pick out evidence which we will not only use as an argument but also believe?

Within the context of learning progression, there is a need to ask how evidence is used to evaluate knowledge. A process that may seem straightforward can have hidden pitfalls. When evidence is used incorrectly, one may be able to come to the same conclusion but it may not have been the correct way (Bravo-Torija & Jiménez-Aleixandre, 2018).

To present this issue consider the two following questions: What is the sum of $2 + 2$? Who was the first man to step on the moon? The answers are 4 and Neil Armstrong. Neither answer requires a reference as they are directly from my memory. It is here where the weakness lies when considering the use of evidence. The answers are weak in the eyes of the academic as neither solution is backed by some form of evidence, which could have been provided in the form of a working out and a link to Wikipedia or NASA. Whilst this was a relatively simply example, it becomes clearer when considering complex issues which may occur in the workplace.

When making a decision, it should be informed by evidence, which means that individuals can “compare the consequences of different options on the basis of available evidence” as well as being able to “articulate their option by synthesising evidence from multiple sources” (Bravo-Torija & Jiménez-Aleixandre, 2018, p. 628). The weakness of this practical use of evidence is the scholastic context, but this does not dismiss it as a valid way in which evidence can be used in a knowledge development cycle.

Potential issues with this understanding of knowledge evaluation is that it does not account for the gained tacit knowledge which can occur within the workplace, and thus to adjust for a

workplace environment, it may be possible to argue that personal experiences are also a form of evidence.

Knowledge evaluation of an intranet

Knowledge evaluation at the individual level is often the victim to emotions and due to the change in technology, the individual has become increasingly dependant on themselves as a knowledge evaluator. This is not in the interests of an organisation, as knowledge must be evaluated equally and, ultimately, to the benefit of the organisation (Skok & Kalmanovitch, 2005). One way to take the load off the individual is to have an intranet, which allows individuals to upload their explicit knowledge, as well as store communication logs and information which may be relevant for others. In this sense an intranet provides an ease in knowledge organising as well as knowledge sharing (Skok & Kalmanovitch, 2005). When an intranet begins to function as the representation of organisational knowledge it becomes increasingly important for this organisational knowledge to be evaluated in an objective manner. To do this, the Intranet Evaluation Model (IEM) has been presented by Skok & Kalmanovitch (2005), a model that views an intranet as consisting of 3 elements: the knowledge management in an organisation, the knowledge creation and the epistemologies on the individual, group and organisational level. The IEM is not something that can be done in isolation, it is a model that should be used within the strategy of the organisation. In practice, an IEM allows an organisation to evaluate its knowledge in two steps. The first step allows the organisation to observe what is influencing its work; the results of this will give way for step two in which the organisation can observe the current situation, evaluate the human and technological aspects and their roles, and plan for future development *within* the organisations strategic goals (Skok & Kalmanovitch, 2005). The IEM also shows that evaluation of organisational knowledge is also something which can directly affect knowledge creation, as knowledge creation is a part of the intranet structure.

6.4. Knowledge adoption is affected by...?

Knowledge integration/adoption and having an end goal

Innovation is often the goal of an organisation if they wish to be successful and the contribution of knowledge adoption to this is no surprise. Knowledge adoption is not seen as an isolated knowledge process when it comes to knowledge adoption, it is seen as working together with knowledge acquisition, absorption and application (Dahiyat, 2015). According

to Dahiyat (2015), integration (adoption) occurs between acquisition and absorption, which shows how something new is acquired before it can be integrated into the existing knowledge of the organisation and absorbed by individuals.

Having an end goal in the form of innovation shows that there can be a motivating factor in a firm's desire to create something of novel value, which directly places value on the knowledge and therefore drives a need for knowledge to be integrated, as without new knowledge being integrated by an organisation, an organisation will be unable to innovate (Dahiyat, 2015).

Such an understanding of knowledge adoption shows a connection to knowledge evaluation that is not mentioned by Dahiyat (2015), where an organisation places the value on knowledge being adopted directly in relation to the novel value it can create when it is assimilated and understood by the employees that can make use of it.

A key point made by Dahiyat (2015) is that the knowledge must be useful, which once again echoes a perceived use or application that is considered beforehand. In a similar way, we can see that one of the major issues with knowledge adoption processes is what may occur if the knowledge adopted or integrated is incorrect. If the knowledge integration process does not actively include a knowledge evaluation element, it is clear that incorrect knowledge could be integrated and have negative effects. This is shown within a schooling context where the adoption of incorrect knowledge leads to an incorrect answer (Southard et al., 2016).

What we can see from this is that knowledge integration and adoption are not processes which are deemed as isolated, and that their function is dependent on the other knowledge processes. Furthermore, it is a goal-oriented process as knowledge is not seen as worth adoption if it cannot be applied to some innovative process or goal for the individual or organisation.

Knowledge adoption within public policy

Within the term knowledge adoption, Chris Brown is a leading name and dominated the search results. The contributions made by Brown have had a specific focus, which is the adoption of knowledge within the public policy process. Within this field, knowledge adoption is purely focused on research findings (Brown, 2013).

Similarly, to Dahiyat (2015) there is a concept of goals driving the knowledge adoption process for Brown (2013), but this goal is not innovation, rather it is the assistance of current and future policy making. The knowledge that is being considered is taken on with the aim of public policy issues rather than business problems.

Within this very specific context, Brown (2013) provides a list of factors which affect knowledge adoption within his proposed new model of knowledge adoption. There are both internal and external factors. Internal factors which can affect knowledge adoption are the nature of what is communicated, the clarity of the presentation, the efficacy of presentation, and the level of proactivity, contextualisation, and tailoring (Brown, 2013, p. 36-37). The common factor of these internal factors is that they are based on factors that affect how the individual approaches knowledge adoption. The external factors are inherent factors that can compromise the policy-maker's knowledge, the perceived credibility of the source of knowledge by the policy-maker, the perceived quality of the evidence by the policy-maker, the general involvement by policy-makers in research studies, and access to policy-makers (Brown, 2013, p. 37-38).

A further affecting factor which frames these internal and external factors is that of contextualising, which focuses on two contextual issues: the favouring of the research idea by policy-makers and the strength and nature of relationship between the policy-makers and researchers (Brown, 2013, p. 39). These factors come together to create a framework for how to best create a successful knowledge adoption process.

From Brown (2013) this review can assume that knowledge adoption requires a close consideration of the individual who is on the receiving end of the knowledge as well as what kind of organisation they work within. If knowledge is to be successfully adopted, the organisational goal must be the same as the goal of the individual, especially in a democratic context, where individual policy-makers or knowledge receivers may decide to go against the acceptance of the knowledge.

A final comment to make is that Brown (2013) confirms the role of research creators in the knowledge development cycle. As previously discussed, someone must produce knowledge and we can see a clear relationship in this study, between how knowledge created by researchers within universities or research institutions must be adopted by someone else.

Knowledge adoption within an academic context

To conduct a review that focuses completely on how knowledge processes occur within organisational settings would be ideal, but it would leave many holes within the understanding of who an individual is and what individuals go through before joining an organisation. We already see from the section on knowledge evaluation that knowledge work begins before the organisational context, and that learners are now exposed to information that they must constantly evaluate and eventually also adopt (Bravo-Torija & Jiménez-

Alexandre, 2018; Mason et al., 2010). Due to this, it is important to see that knowledge adoption within an academic context can possibly shape how an individual adopts knowledge in the future, when it comes to their work.

The first thing to consider is the idea that students are often exposed to new knowledge that must be integrated into existing mental models, and that this mental model can be victim to misinformation. The goal of a mental model is to be able to provide knowledge and apply it in explanations, however if misinformation is integrated it may provide explanations that are logical but are deemed incorrect by the instructor of a class (Southard et al., 2016). This is seen as a specific issue for students; however, one can assume that similar problems could occur within the workplace learning environment with new employees compared to experienced and senior employees.

The model that is presented for total knowledge integration begins with a view of knowledge as fragmented and integrated. As knowledge becomes more integrated, it becomes less fragmented and vice versa. From this we understand that knowledge integration requires an individual to be able to sort through their ideas and the knowledge being gained, and create a cohesive view, this would be done through sorting, creating connections and integrating them into this network of knowledge within the mental model (Southard et al., 2016). The theme chosen for this research was microbiology.

The study focussed on two different classes and presents us with an issue that requires further research: the concept of integrating knowledge without a foundation. It was observed that students who attempted to integrate upper-level knowledge often struggled if their knowledge networks internally were not able to connect it to other pieces of knowledge. This implies that knowledge adoption is a building process, and that in this sense, the goal of knowledge adoption is to create an understanding, rather than to simply take on board knowledge (Southard et al., 2016).

Despite being an academic setting, this review can gain valuable information from seeing how students begin their knowledge journey, as it will shape an individual's ability to perform within all of the knowledge processes, which is showing to be of great importance due to the multiple instances of inter-dependence presented.

6.5. Knowledge management

There is a large variation in what comes under knowledge management. This echoes the concerns in the introduction, that researchers are still struggling to find overarching

agreements. Furthermore, these knowledge management variations have shown that knowledge management can often give way to varying goals, as well as varying goals of the 4 knowledge processes discussed above. To summarise this section, it is also important to present the varying models which have been presented in the literature, which may compete, contradict, or exist within the knowledge development cycle. In answering the third key question, this section attempts to show that the factors affecting the four processes above, also affect other factors which are not mentioned by Bhatt (2000) but may fall under similar or competing umbrella terms. The presentation of alternative models also contributes to answering the second question, as it can support certain interdependencies.

Knowledge Management's many faces

The knowledge development cycle is a part of knowledge management literature and presents the cycle as a form of knowledge management. The cycle is a constantly active element of the organisation and consists of knowledge adoption, knowledge creation, knowledge distribution and knowledge review and revision, this occurs all at once, in no particular order, with all processes being interdependent on each other (Bhatt, 2000).

This view does not match up with the seven-step learning management process presented by the Office of Public Sector Development Commission, and Thailand Productivity Institute in 2005. In this there are 6 knowledge processes which lead to the final step which is learning: knowledge identification, creation and acquisition, organisation, codification and refinement, access, sharing, and finally learning (Intem et al., 2021). Of the seven processes, only two are directly a match to the knowledge development cycle (Bhatt, 2000).

The problem persists, as there is also a five-step knowledge management process consisting of the following, in this order: knowledge discovery, capture and storage, evaluation, application and distribution, and creation. After the final step it is possible to go back to step one if needed (Silamut & Petsangsri, 2020). Within this variation we can see that capture and storage are seen as one process, as well as application and distribution. This does not match with how Bhatt (2000) presents knowledge distribution, nor Intem et al., (2021), who have sharing as an isolated process. The differences only seem to grow.

When the goal of innovation becomes involved, the knowledge management process becomes even smaller, consisting of knowledge acquisition, integration, absorption and application (Dahiyat, 2015), or simply consisting of knowledge transfer and creation which is aided by organisational trust (Sankowska, 2013). Despite also coming from a Thai context Zinzou and Doctor (2020) provide a view on knowledge management that differs from the

one used by Intem et al., (2021): “knowledge management is [...] the process of creating, sharing, using and managing the knowledge and information of an organisation” (Zinzou & Doctor, 2020, p. 108). This confusion is only acknowledged by Van Krogh & Kleiene (1998) (in Skok & Kalmanovitch, 2005) who argue that sensemaking of such contradictions should be avoided, and rather that one should try and have an epistemology-based understanding. The aim of this review is not to deduce the epistemological background of all its articles, but this is a potential theme for further research, as it could aid in creating cohesion within the field.

What is the goal of a knowledge management process or model?

The goal of knowledge management processes are not always the same. There is a major theme of innovation and competitive advantage that has been presented often in the findings. Often innovation is the goal of knowledge management as a whole or a knowledge process specifically. The goal of innovation is not the only goal one can have, and this can often vary depending on the type of organisation, group or individual which is being focused on.

When the Ban Thung Hong community was being studied as a case in a knowledge management process, the goal was not to innovate. Innovation had in fact created the very situation which was the focus of the study, which was self-reliance and preservation of an old technique (Intem et al., 2021). In this case knowledge needed to be managed to preserve and create an opportunity for learning of a dying technique that was closely related to a culture. This has no benefit to organisations which have innovated and developed beyond the technique, but the community at the group level, have placed a value on this knowledge. With the goal of preserving their old techniques they have implemented knowledge management (Intem et al., 2021).

Knowledge adoption in the view of Brown (2013) is also a knowledge process that is not directly linked to the goal of innovation. The goal of knowledge adoption within public policy is to create policies that benefit the societies within which these policy-makers serve. By basing themselves on research and serving the public, there is a key element of innovation that is missing, which is that of creating value. The study does present ideals of grandeur in which policy-makers are only interested in serving their public, but does show that knowledge adoption is used as a way to serve a personal goal for policy-makers as well as a larger communal one (Brown, 2013).

Within the majority of knowledge revision literature, we can also observe that the goal of innovation may have been involved, but that the main aim of knowledge evaluation (and

sometimes integration), was to ensure that the knowledge is correct and relevant for the end goal. Knowledge revision often deals purely with the aim of correcting misinterpretations of knowledge and to create a cohesive understanding of why knowledge is incorrect (Bravo-Torija & Jiménez-Aleixandre, 2018; Butterfuss & Kendeou, 2020; Kendeou et al., 2017; Mason et al., 2010; Southard et al., 2016; Trevors et al., 2017).

The final goal we can observe is the theme of learning and how often knowledge management processes are a part of what many authors refer to as learning, or where learning is the goal. This can be seen in attempts to have self-directed learning for adults (Silamut & Petsangsri, 2020), the learning progression of students (Bravo-Torija & Jiménez-Aleixandre, 2018), and the way knowledge can be built in a learner-teacher context (Southard et al., 2016).

Alternative Models

Within the literature there are six clear models presented for how to manage knowledge in some form or another (these are not the same as research models which sometimes have overlapped in studies, such as Dahiyat (2015)) and provide a visual understanding of how knowledge processes work together. The exception is Brown's (2013) model which specifically tackles how to adopt knowledge in the context of policy-makers. The models will be briefly explained and are important to the discussion chapter as this review will look at how these models can contribute to the existing knowledge development cycle.

There is the model which aims to manage local wisdom and create a stable inheritance for lifelong learning. It is a circular model consisting of the seven steps for knowledge management as well as four overarching goals of retention, adaptation, survival, and lifelong learning (Intem et al., 2021).

The self-directed learning knowledge management model is a four-step circular model which goes through readiness triggers, setting goals and planning, learning activities, and learning evaluation. Each of these four steps is composed of multiple knowledge processes (Silamut & Petsangsri, 2020).

The model for achieving innovativeness starts as a research model and is finally presented as a sequential model in which organisational trust leads to knowledge transfer, which leads to knowledge creation, which results in innovativeness (Sankowska, 2013).

The knowledge management process in educational institution is a circular model which shows one knowledge process leading into another but with no clear start or finish, implying a continuous process. Knowledge creation to knowledge storage to knowledge sharing to

knowledge application to knowledge review back to knowledge creation (Zinzou & Doctor, 2020).

The mechanism model shows how various factors within a knowledge organisation affects several other areas. The model is visualised with graphics and figures and therefore difficult to make sense of. In the middle the model a sequential path from encountering problems, to knowledge search, to knowledge evaluation, to knowledge recombination and finally knowledge creation is shown, and both above and under are varying elements which can affect these processes (Zhao et al., 2020).

The final chapter will provide conclusive remarks and reflect on some of the limitations of the review.

7. Conclusive Remarks

This review aimed to highlight the limitations which exist in the knowledge development cycle by Bhatt (2000). In the process of doing so, this review has contributed with four concluding remarks.

Firstly, the timing of Bhatt's (2000) original cycle contributed heavily to the lack of quality in the original knowledge development cycle. The knowledge development cycle is presented as a visual model, and it is argued to be a cycle consisting of feedforward and feedback loops. In reality this was not possible and is not what has been presented. The original cycle was based on literature that had not had the opportunity to mature and develop and therefore it left Bhatt (2000) with limited resources with which to truly develop and present the interdependent relationships. By exploring the sources used in the original cycle, there has been a clear lack of definitive research and conclusive findings, as well as research which supports interdependent relationships. Despite the lack of research findings, it would then have been up to Bhatt (2000) to present possible relationships, but instead the original cycle falls short, showing everything as interdependent but *not* exploring the processes as interdependent. The majority of the research focuses on the processes in isolation from one another.

Secondly, in regard to key question one, this review found that defining knowledge processes is still a challenge. Despite the challenge, the review has found some agreement among researchers for defining knowledge creation and knowledge sharing. Further research is needed within the field of knowledge adoption. Knowledge review and revision still requires more research to support the splitting proposed in this review.

Thirdly, in relation to key research question two, there is an expanded knowledge development cycle which is arguably not a cycle at all when it is broken into its four sub-models. The expanded model has taken the findings and places them into a clearer more applicable model, based on showing how triggers and goals can lead to an interdependent relationship between the knowledge processes. The use of goals was mentioned in Bhatt's (2000) background literature but was sadly missing from the original model. This contribution allows people to easily use the model as a start to finish tool, but also allows academics to explore further within the paths that have been presented more clearly in the

sub-models. A smaller but equally important contribution that has been made is the use of directional arrows to aid an individual in the use of the model.

Finally, this review answered the third key research question regarding what affects knowledge processes. Within this chapter, an abundance of research has shown that many factors are related to the individual, but that larger societal changes also come into play. The role of technology has become bigger within knowledge processes. There is also a clear move towards a lifelong learning view, as some factors relating to the knowledge processes did in fact go back to the academic context. More research is needed, but it may simply add more fuel to an already large fire. In answering the third key question this review also highlighted that Bhatt's (2000) cycle is not alone, and that within knowledge management literature there is growing competition. The fear from the introduction, of a lack of agreement, has grown. There is now a disagreement of which knowledge processes should be in such a cycle.

Whilst these contributions are a result of the collective work done in this review, there is also limitation to what this review has contributed and how it should be used further. The most glaring issue any academic should take with this review is the scale of it, focussing on so few articles. This is a limitation of this review as I am a student and lack a full team or the resources to conduct a review of the literal thousands of articles out there. In the methodology this issue is clearly highlighted. The consequences of this are of course that the quality assurance of this review cannot be extremely high. Whilst a standard has been set for the articles chosen, there can be articles which have later in time been deemed invalid, incorrect, criticised heavily and so forth. Furthermore, there is a much larger possibility that articles have been missed in the phase of filtering articles. Consequently, the findings in this review cannot all be put into use, and this is due to their enormous scope. Despite limiting the review, there are findings which open up for much more research than is possible to do in this review.

Due to this limitation, it can be argued that none of the findings are truly conclusive but can rather be used in the future as an inspiration to others. The knowledge development cycle by Bhatt (2000) has served as inspiration for me to explore the broad spectrum of literature in this field, and there is simply far too much for one individual to tackle. Whilst this review has gone to great length to criticise the flaws in the knowledge development cycle, it would not be here without it. Therefore, the work should be applauded as a valiant effort to put together

what can only be described as a chaos of ideas and opposing opinions all trying to be the same thing. Having explored this chaos to expand the knowledge development cycle, I can say with quite certainty, that it is no place for the weak hearted to wander into.

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