A Soft Systems Approach Towards a Theory of Knowledge Worker Productivity

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A SSM Approach Towards a Theory of KWP
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Abstract

The main purpose of this research is to contribute towards a theory of knowledge worker productivity (KWP). When it comes to KWP there is no single integrated body of knowledge which can be used for analytical and empirical testing and applied to real world problems. Knowledge and research relevant to KWP is distributed through multiple fields of study and at a high level of detail. This research attempts to explore KWP holistically from an industrial engineering standpoint, by looking at the systems involved. It utilizes the first three activities in the soft systems methodology (SSM) to explore the problem situation, formulate a purposeful activity model for the individual knowledge worker (KW) and debate the situation using the results of multiple literature reviews. The findings are then used to propose a draft of a holistic framework of KWP relevant to individual KWs and their work. It consists of three papers: (I) A Soft Systems Approach to KWP - Analysis of the Problem Situation, (II) A Soft Systems Approach to KWP:a Purposeful Activity Model for the Individual and (III) Towards a Holistic KWP framework. To develop a holistic framework of KWP, the interpretations and inferences made cumulatively throughout the journey from the literature reviews and the results of the SSM activities were abstracted into main components and their influencing factors. The main components of the conceptual framework are the state of the individual KW, work done and outcome. Outcome of relevant work can be value for the individual KW, others in the social system and the organization. It is human nature to gravitate towards creating value for oneself, therefore, the organization needs to align their needs with what creates value for the individual KW to maximize value contribution towards their organizational goals and objectives. This can be done by influencing the state of the individual KW, through external factors such as reward systems, culture, support, and relationships, to guide the KW towards engaging in preferred behaviors such as organizational citizenship behavior. There are also internal factors that affect the state of the KW, which are influenced by the KW's actions, traits, worldview, and interpretation of his environment and experiences. The state of the individual KW affects the KW's intuition when evaluating work and making decisions in his process of getting things done. This study adds to the literature by giving an overview of the many elements that affect the productivity of the individual KW, abstracting them into key insights and drawing up a simplified and concise conceptual framework. This study also uses a new approach to SSM by adapting it to use inferences made from literature reviews rather than using interviews and discussions with stakeholders.

Útdráttur

Tilgangur þessarar rannsóknar er að byggja upp kenningu um framleiðni þekkingarstarfsmanna. Þegar það kemur að framleiðni þekkingarstarfsmanna þá er ekki til einn þekkingargrunnur sem er samþættaður. Þekkingargrunnur sem hægt er að hagnýta. Þekking um framleiðni þekkingarstarfsmanna er dreifð yfir mörg rannsóknarsvið og er í miklum smáatriðum. Þessi rannsókn stefnir á að skoða framleiðni þekkingarstarfsmanna á heildrænan hátt með verkfræðilegri nálgun, með því að skoða kerfin sem tengjast þekkingarstarfsmönnum. Rannsóknin notar fyrstu þrjár athafnirnar í mjúkri kerfisnálgun (Soft Systems Methodology) til að skoða vandamálið hvernig á að stýra og bæta framleiðni þekkingarstarfsmanna með því að rýna í ritrýndar greinar á kerfisbundinn hátt. Fyrstu þrjár athafnirnar í mjúkri kerfisnálgun eru: (1) leita upplýsinga um vandasamt ástand, (2) búa til viðeigandi líkön af markvissum athöfnum (Purposeful Activity Models), og (3) ræða um ástand út frá líkönum. Niðurstöður rannsóknarinnar eru svo notaðar til að leggja fram tillögu af heildrænum ramma um framleiðni þekkingarstarfsmanna. Rannsóknin samanstendur af þremur greinum: (I) A Soft Systems Approach to KWP - Analysis of the Problem Situation, (II) A Soft Systems Approach to KWP:a Purposeful Activity Model for the Individual og (III) Towards a Holistic KWP framework. Til þess að þróa heildrænan ramma um framleiðni þekkingarstarfsmanna, voru ályktanir dregnar úr þeim ritrýndu greinum sem teknar voru fyrir og niðurstöður athafnanna í mjúkri kerfisnálgun túlkaðar til þess að greina aðalatriðin og þá þætti sem hafa áhrif á þau. Aðalatriðin sem mynda huglæga ramann er ástand einstaklingsins, vinna og útkoma. Útkoman af viðeigandi vinnu getur verið virði fyrir einstaklinginn, aðra í félagslegu kerfi hans og skipulagsheildin. Það er mannlegt eðli að hallast að því að búa til virði fyrir sjálfan sig, þess vegna þarf skipulagsheildin að samræma þeirra þarfir við það sem býr til virði fyrir einstaklinginn til að hámarka framlag þeirra til skipulagsheildarinnar. Þetta er hægt með því að hafa áhrif á ástand einstaklingsins í gegnum ytri þætti eins og verðlaunakerfi, menningu, stuðning og sambönd til þess að beina þekkingarstarfsmanninum í áttina að æskilegri hegðun. Það eru einnig innri þættir sem hafa áhrif á ástand þekkingarstarfsmannsins svo sem hegðun þeirra, eiginleikar, heimsmynd og túlkun á umhverfinu og upplifunum. Ástand einstaklingsins hefur áhrif á innsæi hans þegar hann er að meta vinnu sína og taka ákvarðanir í ferlinu að koma hlutum í verk. Þessi rannsókn auðgar þekkingu á framleiðni þekkingarstarfsmanna með því að gefa yfirsýn yfir þá ótal þætti sem hafa áhrif á framleiðni einstaklingsins og draga þá saman í einfalt og hnitmiðaðan huglægan ramma. Þessi rannsókn notar einnig nýja nálgun á mjúkri kerfisnálgun með því að aðlaga það til að nota ályktanir dregnar úr ritrýndum greinum frekar en að nota viðtöl og umræður við hagsmunaaðila.

Dedication

To my family who always believe in me.

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Paper II: Óskarsdóttir, H.G.; Oddsson, G.V.; Sturluson, J.Þ.; Sæmundsson, R.J. A Soft Systems Approach to Knowledge Worker Productivity: A Purposeful Activity Model for the Individual. Adm. Sci. 2021, 11, 110. https://doi.org/10.3390/admsci11040110

Paper III: Óskarsdóttir, H.G.; Oddsson, G.V.; Sturluson, J.Þ.; Sæmundsson, R.J. Towards a Holistic Framework of Knowledge Worker Productivity. Adm. Sci. 2022, 12, 50. https://doi.org/10.3390/admsci12020050

Abbreviations

KWP - Knowledge Worker Productivity
KW - Knowledge Worker
SSM - Soft Systems Methodology
SSM1 - First SSM Activity, Analysis of the Problem Situation
SSM2 - Second SSM Activity, Formulating a Purposeful Activity Model
SSM3 - Third SSM Activity, Debating the Situation
PAM - Purposeful Activity Model
RQ - Research Question
CATWOE - Customers, Actors, Transformation process, Worldview, Owners, Environment
LR1 - Systematic Literature Review of KWP Challenges
LR2 - Systematic Literature Review of Personal Productivity Self-Help Books as a Proxy for Industry
LR3 - Snowballing Literature Review to Explore Concepts Relevant to the Process Defined in the Root Definition for the Individual as a Problem Owner
LR4 - Systematic Literature Review to Explore how Existing Literature is Dealing with KWP
C1 - Categorization phase where main subjects were categorized into themes and the main KWP challenges targeted by the literature identified from the themes
C2 - Categorization phase where activities were identified relevant to acquiring the input, the activities to transform it, and the activities to do something with the output of the process defined in the root definition for the individual as a problem owner
C3 - Categorization phase where concepts were extracted and categorized into groups relevant to the individual and constructs created from each group
CR - Concept Group, Communication & Relationships
PCD - Concept Group, Personal Characteristics & Development
WJS - Concept Group, Well-Being & Job Satisfaction
PKM - Concept Group, Personal Knowledge Management
TA - Concept Group, Task Approach
OCE - Concept Group, Organizational Commitment & Engagement

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1 Introduction

The basis of engineering is to apply scientific principles to the design and building of structures, machines, processes and so on. Industrial engineering took engineering practices and applied them to the analysis, design, and optimization of work. Frederick Taylor is known as the father of industrial engineering because he revolutionized the approach of manual worker productivity with scientific management. Now there are reliable frameworks, tools and methods used to manage and improve the productivity of manual and routine work. It has been optimized by streamlined processes and systems which has made it easier to automate a lot of the necessary manual and routine work in various industries. Industrial engineers, therefore, need to shift their focus to the pressing issue of optimizing knowledge work. Many jobs today, are dependent on individuals who work with knowledge, so called knowledge workers (KWs). As stated in Óskarsdóttir and Oddsson (2017, p.1), "knowledge workers use their expertise, education or experience to create, share or apply knowledge in their job, so that they can contribute to their organizations. Their work is non-routine, creative and requires intelligence to solve new problems every day, make decisions and fulfill the requirements of customers and other stakeholders." Pastuszak et al. (2013) found that KWs are an integral part of intellectual capital and that it is important to find ways to better utilize and manage KWs so they can continuously contribute to the intellectual capital of their organization. Intellectual capital positively impacts productivity (Pastuszak et al., 2013).

For over seventy years, researchers have looked at individual issues relevant to knowledge worker productivity (KWP). Previous research has been carried out in different fields like psychology, ergonomics, sociology, engineering, medicine, and others. Diversity is good but it also creates problems such as a lack of overview and knowledge transfer between fields. This research attempts to explore KWP from an industrial engineering standpoint, by looking at the systems involved. Systems that transform inputs into outputs to contribute to expected outcomes. As Taylor (1911, p.7) stated in his principles of scientific management, "in the past the man has been first; in the future the system must be first". KWP must be approached in the same way. The first step in improving and managing KWP is understanding the systems involved with all their elements and relations. Deming (1994) maintained that 94% of problems are due to management issues and 6% to special courses. This means that the system is usually responsible for 80-90% of errors in outputs, making a system view necessary. The questions then become: what are the systems? what are the inputs and outputs? what are the expected outcomes? and who are the players in the systems? The intent of this research is to gain a deeper understanding of the individual KW and explore the interaction between the KW and the organization. There is a hope that this research can contribute to a theory of KWP and be a first step towards an applicable and generalized

framework for the management and improvement of KWP.

This research concatenates, merges, conceptualizes, and describes aspects of KWP identified from multiple literature reviews. It utilizes the first three activities in the soft systems methodology (SSM) to explore the problem situation, formulate a purposeful activity model for the individual KW and debate the situation using the results of these literature reviews. The findings are then used to propose a draft of a descriptive theory of KWP relevant to individual KWs and their work. The approach in this research was multidisciplinary in that sense that no field of study was excluded. It consists of three papers: (I) A Soft Systems Approach to KWP - Analysis of the Problem Situation (Óskarsdóttir and Oddsson, 2017), (II) A Soft Systems Approach to KWP: a Purposeful Activity Model for the Individual (Óskarsdóttir et al., 2021) and (III) Towards a Holistic KWP framework (Óskarsdóttir et al., 2022). Helga Guðrún Óskarsdóttir and Guðmundur Valur Oddsson conceived of and designed the research. Helga Guðrún Óskarsdóttir performed the literature reviews, analyzed the data, created the models with the help of Guðmundur Valur Oddsson and wrote the papers. Guðmundur Valur Oddsson, Jón Þór Sturluson and Rögnvaldur Jóhann Sæmundsson reviewed the papers. Each of the papers answer research questions that feed into the main purpose to contribute towards a theory of KWP. This is only a first step of many towards a theory of KWP. Table 1.1 shows the main research question and the sub-questions answered per paper.

Table 1.1. Research Questions.

Main Research Question		
What are the elements of KWP and how can their relationships be developed into a holistic framework of KWP?		
Paper	RQ	Sub-questions
I	I.1	What are the main challenges of KWP?
	I.2	How does the problem situation look from the viewpoint of the organization and the individual?
	I.3	What are the main systems and how do they interact?
II	II.1	What are the inputs and targeted outcomes of a system for the individual KW?
	II.2	How are the activities relevant to acquiring the input, the activities to transform it and the activities to do something with the output of a system for the individual KW linked?
III	III.1	How is existing literature dealing with KWP of individual KWs and how does it compare with the perspective captured by the purposeful activity model presented in paper II?
	III.2	From the findings of this research what important components and factors should a holistic KWP framework include?

The next sections give an overview of the current literature and discusses how the research was designed to answer these research questions as well as the methodologies used. The research questions are then answered with a short summary of the main results of each paper followed by discussions and conclusions. The three papers are appended to this PhD thesis in their original form.

2 Literature Review

Most literature relevant to knowledge worker productivity (KWP) focuses on one or only a few elements which can affect it, e.g. stress, motivation, knowledge management, engagement, work climate, management, job design and so on. Literature relevant to KWP can be split into two classes depending on the type of elements they focus on. The class of those who emphasize knowledge management, the process of organizing, sharing and analyzing knowledge e.g. by codifying it into external systems and handling the data and information, and the class of those who focus on retaining and optimizing the performance of knowledge workers (KWs) by investing in the workers themselves. Both of these classes have the perspective that knowledge is the resource and the KW is the package that contains it. Which leaves three options: (1) to try to remove the resource from the package, as the literature in the first class, knowledge management, attempts; (2) keep and manipulate the package to use the resource, by retaining and investing in the KW, as the literature in the second class attempts; (3) do both, manage the knowledge while retaining and investing in the knowledge worker in an holistic approach to KWP, as is attempted with this research.

Knowledge management research covers a wide range of subjects such as knowledge transfer, creation, adoption, flow, sourcing and dissemination (see, for example:, Seethamraju (2000); Ambos and Schlegelmilch (2009); Nonaka (1994); Nonaka and Ryoko (2003); Kang et al. (2007); Polanyi (1966); Urbancova et al. (2016); Fiol and Lyles (1985); Bogdanowicz Maureen and Bailey Elaine (2002); Valkokari and Helander (2007)). It also covers information use behavior like search, extraction and information overload (see, for example: Edmunds and Morris (2000); Hemp (2009); Yildiz et al. (2021); Hwang et al. (2015); Grundspenkis (2007)). In the past two decades the most popular subjects have been connected to knowledge management and technology, for instance, the design, utilization and usefulness of information and knowledge management systems (see, for example: Oyefolahan and Dominic (2013); Maier (2007); Kundapur and Rodrigues (2012); Jarrahi et al. (2021)). Information and knowledge management systems are often used to store and distribute data and information as well as handle access to knowledge by creating communities of experts and facilitating collaboration.

These studies provide important insights into how the KW works with knowledge and how to utilize knowledge as a resource. In particular, by studying how individuals work with knowledge and how knowledge can be extracted so that others can utilize it. However, by focusing on knowledge as a resource independent of the package that it comes in, the KW, it is hard to predict the success of any interventions regarding working with knowledge because many influencing factors are overlooked.

Research on retaining and investing in KWs covers an even wider range of subjects

than knowledge management, such as job satisfaction, culture, worker behavior, stress, commitment, psychological distress, social support, ergonomics, autonomy, motivation, engagement, health, work identity and so on (see, for example: Muller-Smith (1997); Gambardella et al. (2015); Hwang and Yoo (2012); Dylag et al. (2013); Ditton (2009); Maslach and Leiter (1997); Kira et al. (2010); Greenblatt (2002); Boyatzis (1982); Orgambidez and Benitez (2021); Meneghel et al. (2016); Joo and Lee (2017); Alessandri et al. (2018); Kassem et al. (2019)). These studies provide important insights into the many factors that influence the human at work but usually only focus on one or a few of them in depth. This is essential to understand each individual factor better but it leads to a lack of an overview of how these many factors can influence each other.

There are few papers that explore many of these factors and how they influence each other in regards to KWP, especially both from knowledge management class as well as the retaining and investing in KWs class. One such paper is Okkonen et al. (2018) where they look at how the physical work environment, organizational culture, motivation, satisfaction and use of information and communication technology either enable or restrain how KWs in different professions work with knowledge which in turn affects their performance.

3 The Research Design and Methods

The main purpose of this research is to contribute towards a theory of knowledge worker productivity (KWP). Theories provide clear explanations, frameworks for analysis, and methods for field development (Wacker, 1998). Theories provide a base which can be built upon. When it comes to KWP there is no single integrated body of knowledge which can be used for analytical and empirical testing and applied to real world problems. Knowledge and research relevant to KWP is distributed through multiple fields of study and at a high level of detail. There is a vast amount of existing literature that touches on factors that influence KWP. The first step towards a theory of KWP should, therefore, utilize existing literature, extract the fundamental elements that affect KWP, and explore how they work together from a high level of abstraction using a holistic approach.

According to Wacker (1998), a formal theory contains the following four parts: definitions of terms or variables, a domain where the theory applies, a set of relationships of variables and specific predictions. There are many theory-building methods available. For example, Handfield and Melnyk (1998) split the theory-building process into five steps: 1a) Discovery, 1b) Description, 2) Mapping, 3) Relationship building, 4) Theory Validation and 5) Theory Extension / Refinement. Meanwhile, Filippini (1997) proposed a theory-building process consisting of three phases: description phase (characterization of elements of interest), explanation phase (construction of a framework which defines and justifies the relations between variables which should generate testable hypothesis), and theory testing phase (which permits modification and development of concepts and frameworks). This research uses the simplified theory-building process proposed by Carlile and Christensen (2005). They split the theory-building process into two stages which are iterated through and build theories cumulatively, the descriptive stage and the normative stage. The descriptive stage is preliminary because researchers need to move through it to develop a normative theory which is based on careful field-based research. This research contributes to a descriptive theory of KWP by iterating through the descriptive stage three times. Future research is needed to complete a descriptive theory of KWP which can be tested and moved into the normative stage. The descriptive stage consists of three steps: (1) observation, (2) categorization/classification and (3) association/building relationships.

Managing and improving KWP has all the signs of a wicked problem. Rittel and Webber (1973) defined wicked problems as problems that have no boundaries and fixed definitions. This means that there are no right or wrong solutions to wicked problems, only better or worse from the perspective of different stakeholders with their own interests, values, and worldviews. Wicked problems have many varying viewpoints, that change with interpretations of new experiences or knowledge of those involved (Checkland, 2011). These viewpoints are often competing. Checkland (2011) developed

the soft systems methodology (SSM) to deal holistically with wicked problems using systems thinking. It has four main activities that are iterated through, each with its own set of tools to guide the inquiry into a problem situation towards an acceptable solution that is aligned with all viewpoints and does not intensify competing interests. The four main activities are (Checkland, 1993, 2000):

1. Finding out about a problem situation
    - The problem situation is explored by gathering information and analyzing it using some of the proposed tools, e.g. analysis of the intervention (who initiates the study, who wishes to do something about the situation and who are the problem owners which give different perspectives), analysis of the social system (roles, norms, and values in the situation), analysis of the political system (how power is expressed in this situation), rich pictures (informal pictures used to describe the situation visually), and root definitions (a specific format for defining relevant systems as transformation processes expressed by CATWOE (**C**ustomers, **A**ctors, **T**ransformation process, **W**orldview, **O**wners, **E**nvironment)).
2. Formulating purposeful activity models (PAMs)
    - PAMs are formulated from the root definitions from the first activity. They are built by assembling and linking activities relevant to acquiring the input of the transformation process defined in the root definition, the activities to transform it, and the activities to generate the targeted outcome. PAMs are hand-drawn with soft lines to emphasize that they are working models, not permanent, and only relevant within the context of the study. They are a tool to facilitate structured debates of a situation from different viewpoints. PAMs are not an accurate representation of the real world, but representation of the process of how the world is explored.
3. Debating the situation
    - A structured debate which compares the PAMs created in the second activity to how other stakeholders perceive the problem situation to initiate a discussion that highlights assumptions, finds accommodations among conflicting views, and identifies actions for improvement.
4. Taking action for improvement
    - Changes, identified from the soft systems process to improve the problem situation, are implemented. The problem situation is monitored to see if the changes have the intended effect and if not the soft systems cycle is restarted.

The SSM was chosen in the design of this research to help structure the association step in the descriptive theory-building stage. This seemed like a good methodology to explore KWP holistically using systems thinking because of the wicked nature of the problem situation of managing and improving KWP. Instead of polling a set of stakeholders of the problem situation as is usually done in SSM, literature reviews were used as a proxy. As mentioned above, there is a vast amount of knowledge in existing literature, but it is fragmented, detailed, and distributed over many different fields of study. A logical first step towards building a theory of KWP is to explore the problem situation by extracting elements from existing literature. Literature reviews were used in the observation and categorization steps in the descriptive theory-building and SSM activities were used in the association step when exploring relationships between the elements extracted from the literature and abstracting them into a holistic systems view.

Figure 3.1 shows the structure of the research and how it moves through the three steps of descriptive theory-building in each paper cumulatively building up an integrated

body of knowledge towards a theory of KWP. Four literature reviews (LR1-LR4 in fig.3.1) were executed in three iterations of the observation step from which data was extracted and constructs created in three iterations of the categorization phase (C1-C3 in fig.3.1). The findings from the literature reviews were then used to execute the first three activities in the SSM (SSM1-SSM3 in fig.3.1) and draw up a draft of a descriptive theory of KWP in three iterations of the association step.

In paper I a systematic literature review of KWP challenges (LR1) was executed on the Web of Science in June 2016 and a systematic literature review of personal productivity self-help books as a proxy for industry (LR2) was executed in September 2013. LR1 searched for papers that touched on a problem or challenge facing KWs. Thirty-nine papers were selected and read. LR2 searched for books on Amazon.com with the keywords, productivity, personal productivity, effective, effectiveness, efficiency, and knowledge worker productivity, using a software program developed by the researchers. The software program traversed through the hierarchy of relevant Amazon.com book categories for each keyword resulting in 1903 books, of which 272 were selected and the 40 most popular books (according to the Amazon sales rank) read. From these literature reviews the main subjects were categorized into themes and the main KWP challenges targeted by the literature identified from the themes (C1). The knowledge gained from these literature reviews was then used in the first SSM activity, analysis of the problem situation (SSM1). Two problem owners were identified, the organization and individual KW. An analysis of the intervention, rich pictures, CATWOE and root definitions were done for each problem owner.

Paper II built on the results of paper I and delved deeper into the problem situation from the perspective of the individual KW. A snowballing literature review to explore concepts relevant to the process defined in the root definition for the individual as a problem owner (LR3) was executed. It explored *what is value* in knowledge work as the targeted outcome of the process and the concepts competencies, knowledge, and personal resources as the input of the process. The knowledge gained from paper I and this literature review were used to identify activities relevant to acquiring the input, the activities to transform it, and the activities to do something with the output of the process defined in the root definition for the individual as a problem owner (C2). The activities were linked together in the second SSM activity, formulate a PAM for the individual as a problem owner (SSM2).

In Paper III a systematic literature review to explore how existing literature is dealing with KWP (LR4) was executed on the Web of Science in May 2021. It searched for papers that touched on approaches, frameworks, tools, or models, which aim to tackle the productivity, performance, effectiveness, efficiency, or management of KWs. Ninety-seven papers were read. Concepts were extracted and categorized into groups relevant to the individual and constructs created from each group (C3).

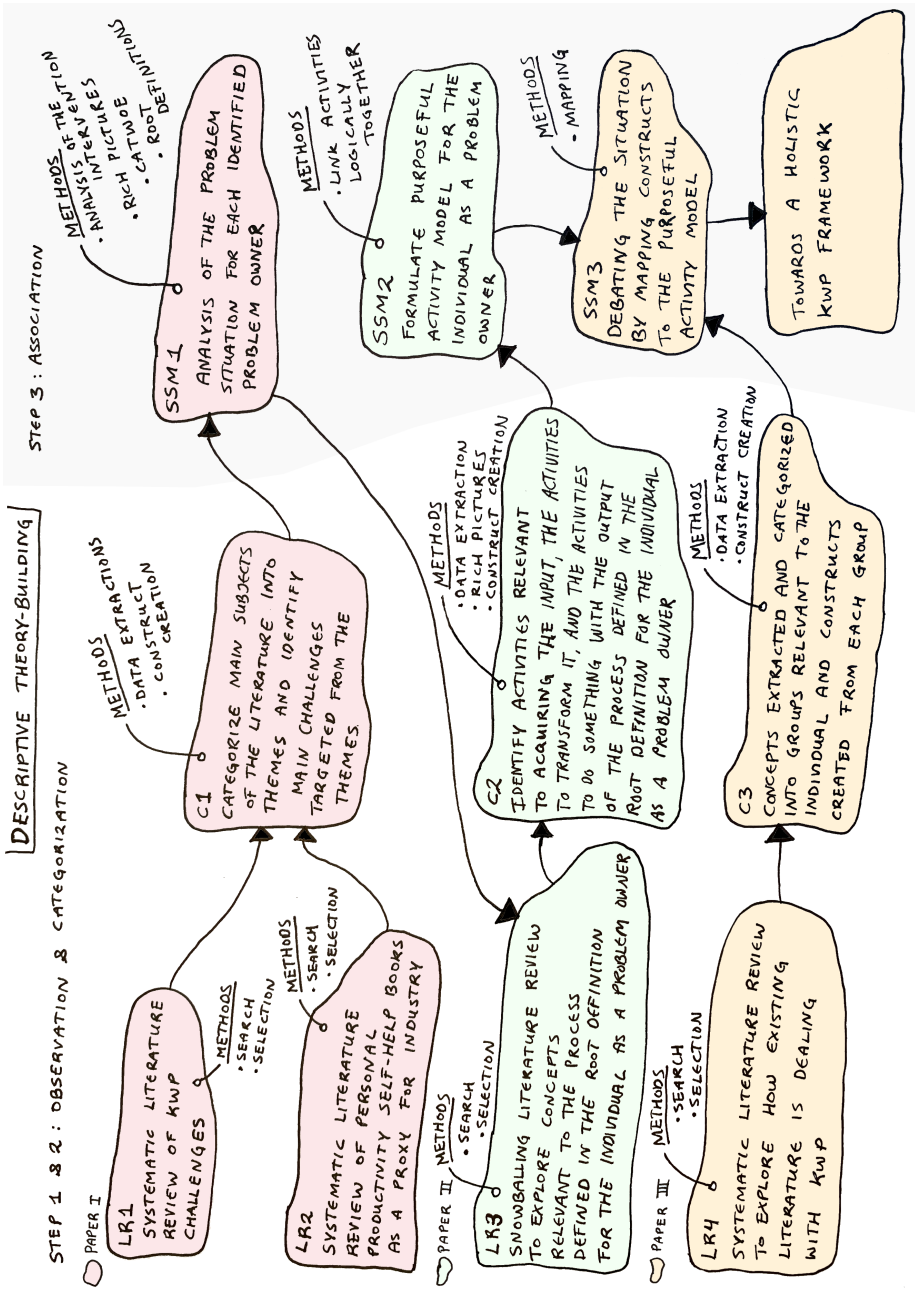

Figure 3.1. The structure of the research.

The concepts were grouped by theme. Twelve themes were identified, six relevant to the individual and six relevant to the structure, initiatives, and environment of the organization in which the KW works. Paper III only moved forward with the six

groups with concepts relevant to the individual. The key insights identified for each grouped were used in the third SSM activity, debating the situation by mapping the key insights to the PAM (SSM3). The findings were used to develop a draft of a holistic KWP framework. The draft of a holistic KWP framework was created from keywords extracted from the mapped PAM and grouped together into components, possible measures in the form of levels and influential factors.

The next section gives an overview of the results of the research, but more detail on the methods used can be found in the papers themselves.

4 Results

This section will give a short overview of the results of the research by summarizing the answers to the seven sub-questions tackled by the three papers. The main research question, *What are the elements of KWP and how can their relationships be developed into a holistic framework of KWP?*, was only partly answered by this research. This research mainly identified elements of KWP relevant to individual KWs and their work. The elements of KWP from the perspective of the organization have yet to be investigated fully but this research gives some insight into those elements through the interaction of the organization with the individual KW. This research resulted in a draft of a holistic KWP framework showing that the relationships between the elements can be developed into a holistic theory of KWP. Further research must be done to expand this draft to encompass both the individual and the organization as well as delve deeper into the elements and their relationships to find ways to measure and operationalize them to create a theory of KWP that can be tested. The next three subsections will walk through the results of each paper which cumulatively contribute to the main research question by identifying elements and exploring relationships. The draft of a holistic KWP framework is presented in the last paper.

4.1 Paper I (Óskarsdóttir and Oddsson, 2017)

Paper I answered three sub-questions: *What are the main challenges of knowledge worker productivity (KWP)? How does the problem situation look from the viewpoint of the organization and the individual?*, and *What are the main systems and how do they interact?* To answer these questions two literature reviews were executed and the first activity in the soft systems methodology (SSM), analysis of the problem situation, as mentioned in the section above.

4.1.1 Main Challenges of KWP (RQ I.1)

The systematic literature review of KWP challenges (LR1) gave insight into the problem situation of managing and improving KWP from the perspective of the organization. Meanwhile, the systematic literature review of the personal productivity self-help books as a proxy for industry (LR2) was found to give insight into the problem situation from the perspective of the individual knowledge worker (KW).

Four main challenges of KWP were identified in LR1 from the perspective of the organization: information needs and knowledge interdependence; motivation, work engagement and health; organizational structure and changes; and the nature of knowl-

edge work. Table 4.2 summarizes the inferences drawn about the challenges from the literature.

Table 4.2. Summary of inferences drawn about the challenges of KWP from LR1 which gives the perspective of the organization from Paper I.

Challenges	Inferences Drawn about the Challenge
Information needs and knowledge interdependence	The organization needs to create a knowledge sharing environment and promoting collaboration while preserving opportunities for the individual to see impact of his own personal contribution.
Motivation, work engagement and health	The organization needs to create a work environment, which promotes health, motivates, and engages their workers, to get optimum performance from them and make them want to work for the organization.
Organizational structure and changes	The organization needs to figure out what structure will not hinder the performance of their knowledge workers yet fulfill the requirements of their customers, industry standards, cultures, and other stakeholders.
Nature of knowledge work	There is a need to understand the nature of knowledge work and the knowledge worker to fully grasp the challenge of knowledge worker productivity.

Eight main challenges of KWP were identified in LR2 from the perspective of the individual KW: too much demand and insufficient resources; effectiveness; self-development and self-awareness; achieving and/or setting goals; performing to full potential; making thinking more productive; successful relationships and collaborations; and motivation. Table 4.3 summarizes the inferences drawn about the challenges targeted by the personal productivity self-help books.

Table 4.3. Summary of inferences drawn about the challenges of KWP from LR2 which gives the perspective of the individual from Paper I.

Challenges	Inferences Drawn about the Challenge
Too much demand and insufficient resources	The individual knowledge worker needs to deal with demands from himself, the organization and each role in his social system using his personal resources, knowledge, available information and available time.
Effectiveness	The individual knowledge worker cannot fulfill every demand on him, he needs to choose what to do, how to do it and when to do it. The challenge is knowing which tasks to focus on to create value for the organization, the individual knowledge worker, or others in his social system.
Self-development and self-awareness	The knowledge worker needs to know what his personal resources are to utilize them to improve his effectiveness, efficiency, motivate himself to get things done and handle the pressures of the demands made on him as well as know which competences and skills he needs to develop.
Achieving and/or setting goals	The challenge of achieving and/or setting goals stems from the popularity of goals as tools to help the knowledge worker get the right things done and get the right results, in other words be effective. The challenge is successfully using this tool.
Performing to full potential	Performing to full potential is the challenge of managing the personal resources the worker has identified with self-awareness and nurtured with self-development (includes issues such as health, stress, exhaustion and psychological distress).
Making thinking more productive	Thinking is a skill the knowledge worker needs to use in everything he does. Making thinking more productive can increase knowledge creation, decrease mistakes of judgment, increase creativity, and allow the worker to better assess risk.

Successful relationships and collaborations	The challenge of successful relationships and collaborations stems from knowledge worker interdependence and the human need to feel connected with others.
Motivation	The challenge of motivation for the individual knowledge worker is finding and nurturing intrinsic motivation to arouse himself to action and get things done.

The identified challenges were used to explore the problem situation from the viewpoint of the organization and the individual. The next subsection presents the results of the analysis of the problem situation, the first activity in the SSM.

4.1.2 Problem Situation (RQ I.2)

Rich pictures were drawn up per problem owner that describe the problem situation from their point of view using inferences made from the analysis of the intervention and the literature reviews. Figure 4.2 shows the rich picture describing the problem situation from the point of view of the individual KW.

KWs have physical, cognitive, social, and emotional personal resources and competencies such as skills, knowledge, perspective, and networks. They use self-awareness to facilitate the management of these personal resources, to identify their competencies, identify opportunities for self-development, and create intrinsic motivation. By managing their personal resources KWs can perform to full potential (green arrow in fig.4.2) leading to an increase in KWP but if they deplete their personal resources they may experience exhaustion and stress (red arrow in fig.4.2) leading to a decrease in KWP. KWs think and make decisions that lead to actions that fulfill demands. The organization, relationships and the self-development need of a KW all make demands on the KW which indicate what is value.

KWs need to take in account time available, information available, energy available and what value is when making decisions. The state of the KW's personal resources provides him/her with a sense of his/her available energy. Actions may require collaboration and can usually be done in more than one way. KW's can increase their productivity by engaging in effective and efficient actions (green arrow in fig.4.2) and decrease their productivity by wasting time on actions that do not create value (red arrow in fig.4.2). Actions can have a depleting or restorative effect on the KW's personal resources and therefore, contribute to the state of the KW's personal resources and whether he/she is performing to his/her full potential or not.

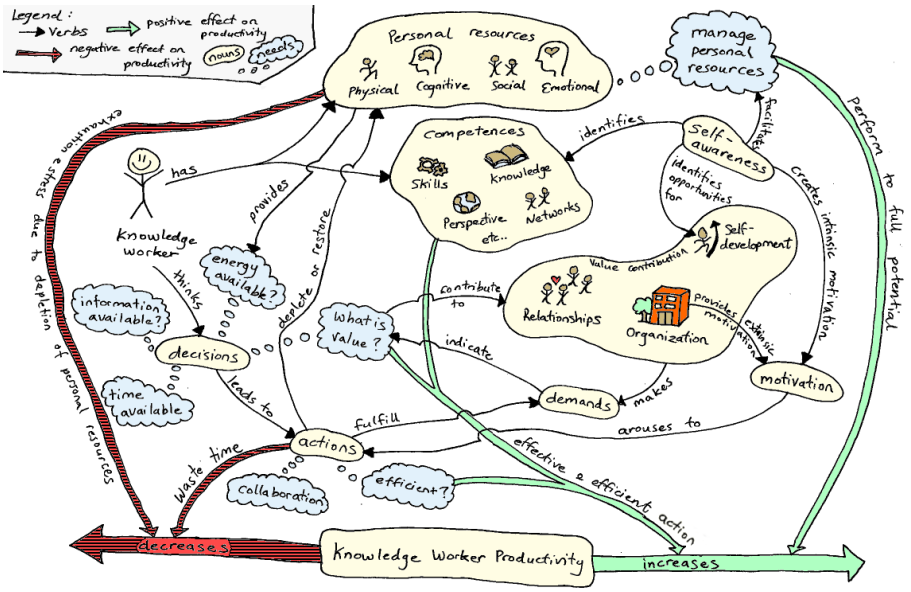

Figure 4.2. Rich picture of the problem situation with the individual as the problem owner from Paper I.

Figure 4.3 shows the rich picture describing the problem situation from the point of view of the organization. The organization defines organizational objectives and needs influenced by customers, industry standards, business environment and so on. The organizational objectives and needs communicate what is value through the work environment and demands that the organization makes on its KWs. If demands are fulfilled which create value by contributing to organizational objectives and needs it should increase KWP (green arrow in fig.4.3). The organization creates a work environment through its structure, work design, technology, incentives, culture and so on.

The work environment needs to fulfill the needs of the KWs in the organization for them to perform up to their full potential. If the needs of KWs are not fulfilled, they underperform and are likely to quit leading to more turnover and loss of knowledge from the organizational knowledge base. The work environment should promote collaboration, engage workers, promote knowledge sharing, promote health, and motivate. KW's that withhold knowledge and won't collaborate will underperform due to low knowledge contribution. The organizational knowledge base gives an organization it's competitive advantage. KWP decreases if the KWs underperform due to low knowledge contribution, fulfill demands which are time-wasters, or underperform due to unfulfilled needs (see red arrows on fig.4.3).

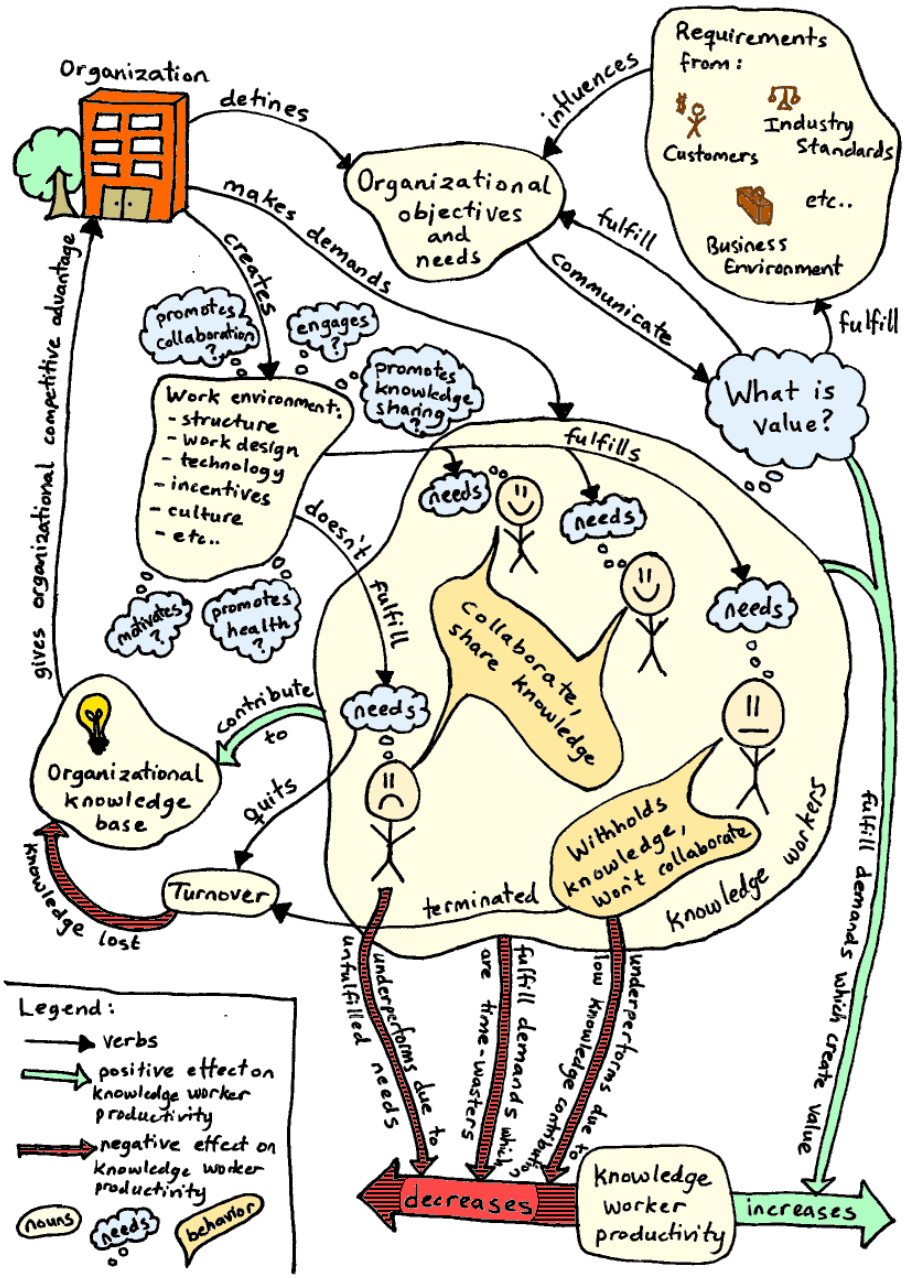

Figure 4.3. Rich picture of the problem situation with the organization as the problem owner from Paper I.

Table 4.4 shows the main conclusions drawn from the rich pictures of the individual as a problem owner and the organization as a problem owner.

Table 4.4. Main conclusions from the rich pictures in Paper I.

Problem owner	Main conclusions
Individual	-The individual knowledge worker must manage his personal resources to perform to his full potential. If he depletes his personal resources, he experiences exhaustion and stress which lower his performance. -The individual knowledge worker must be effective and efficient and not waste energy and time on actions that do not create value.
Organization	-The organization must communicate organizational objectives and needs so knowledge workers can fulfill demands that create value and not waste time on the wrong things. -The work environment needs to promote collaboration and knowledge sharing to facilitate knowledge worker contribution to the organizational knowledge base, which gives the organization competitive advantage. Also, knowledge workers who withhold knowledge and won't collaborate underperform due to restricted access to resources. -The work environment needs to fulfill the needs of the knowledge workers to get optimum performance from them. A knowledge worker whose needs are unfulfilled will underperform.

After exploring the problem situation through drawing rich pictures based on inferences made from the literature review the main systems could be defined using the tools, CATWOE and root definitions, from SSM.

4.1.3 Main Systems and Their Interaction (RQ I.3)

A root definition is a description of a system in the form of a transformation process. Table 4.5 shows the two root definitions formulated for each system, a system owned by the organization and a system owned by the individual.

Table 4.5. Root definitions of a system owned by the organization and the individual from Paper I.

Problem Owner	Root Definition
Organization	A system, owned by the organization, which transforms perceived effort of knowledge workers into perceived value by the organization by creating a work environment, which supports the needs of the workers and influences them to increase their value contribution to the organization.
Individual	A system, owned by the individual, which transforms perceived effort of the individual knowledge worker into perceived value by the organization by managing personal resources, being effective and efficient.

Figure 4.4 is a simple rich picture that shows the interaction between the system. The KW performs effective actions efficiently that create value for the organization, shares knowledge and communicates his/her own needs. The organization communicates what they perceive as value and provide a work environment that fulfills the needs of their workers, motivates towards value creation, and promotes collaboration and knowledge sharing.

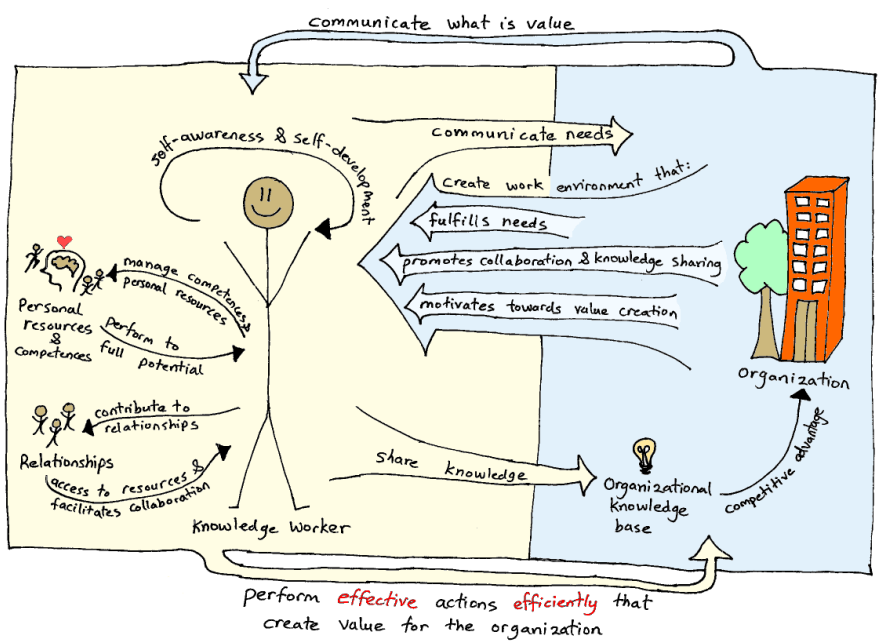

Figure 4.4. The resulting simple holistic view of the interaction between the individual and the organization from the exploration of the problem situation in Paper I.

The literature was revisited to explore the interaction between the two systems defined by the root definitions. The academic literature can be split into two classes by what they believe is the solution to effectively working with knowledge. Both classes assume that effectively working with knowledge is the main factor influencing KWP. One faction believes that the solution is knowledge management which fulfills information needs, enables knowledge sharing, and prevents information overload. Organizations need to manage their organizational knowledge base since it gives them a competitive advantage. Therefore, the organization needs to promote collaboration and knowledge sharing to increase the KW's contribution to the organizational knowledge base.

From the perspective of the individual, to contribute to the organizational knowledge base the individual KW uses self-awareness and self-development. Self-awareness to recognize what knowledge they have, what to share and when to collaborate. Self-development to adapt new knowledge to enrich the organizational knowledge base. The KW also needs to acquire and develop relationships to have access to resources, the knowledge of others, and collaborate successfully.

The other faction believes that knowledge cannot be effectively codified, and therefore, the solution is to invest in the workers themselves through increased motivation, work engagement, and commitment to the organization. If knowledge cannot be codified into external systems, organizations need to invest in their KWs to retain them. Knowledge is lost through turnover. By fulfilling the needs of KWs, their performance and commitment can be influenced.

From the perspective of the individual, KWs need self-awareness and self-development to identify their needs and manage their personal resources so they can perform to their full potential. The KW needs to communicate to the organization what their needs are so the organization can try to fulfill them with their work environment and motivate towards value creation on behalf of the organization.

The next section outlines the main results of Paper II which takes a closer look at the system owned by the individual.

4.2 Paper II (Óskarsdóttir et al., 2021)

Paper II answered two sub-questions: *What are the inputs and targeted outcomes of a system for the individual KW?* and *How are the activities relevant to acquiring the input, the activities to transform it and the activities to do something with the output of a system for the individual KW linked?* To answer these questions the second activity in the SSM was executed, formulating purposeful activity models (PAMs).

4.2.1 Inputs and Targeted Outcomes of a System for the Individual KW (RQ II.1)

The inputs and targeted outcomes of a system for the individual KW were identified from the findings of Paper I. To find the inputs of a system for the individual KW, what resources KWs use in their work were explored. KWs use knowledge, competencies, and personal resources when executing actions. The targeted outcome was found to be value, but what is value in knowledge work? A snowballing literature review (LR3) was used to explore these inputs and targeted outcome.

Value in knowledge work is not clear cut. What is perceived as value from the viewpoint of the organization is not necessarily the same as what the KWs themselves perceive as value. The inferences made from LR3 were summarized in figure 4.5. The organization communicates what they perceive as value through their culture, environment, and leadership. The social system, likewise, communicates what they perceive as value through behavior, actions, and attitudes. KWs interpret through socialization what the organization or others in their social system perceive as value. Through self-awareness KWs identify their own needs which they communicate through their own behavior, actions, and attitudes. KWs consider their own needs and their interpretations of what the organization or others in their social system perceive as value when making decisions on what actions to execute, when and how. KWs are effective when they manage to focus on the right tasks to create their intended value. That is when what the organization or others in their social system perceive as value is in alignment with what the KW perceives as value.

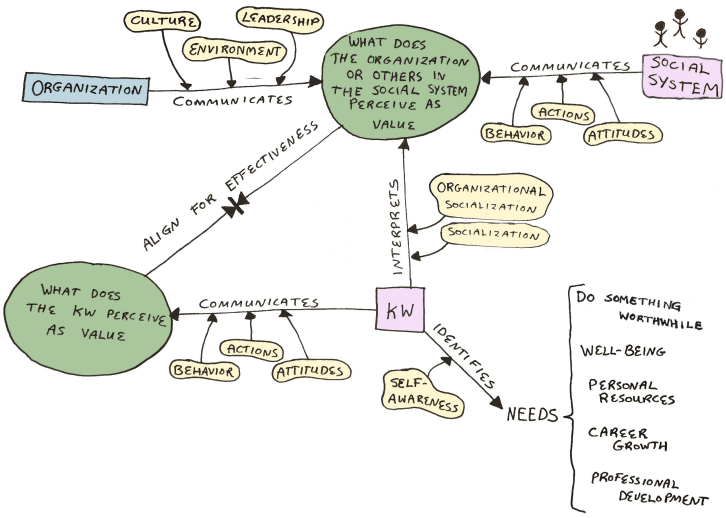

Figure 4.5. Value in knowledge work from Paper II

The main purpose of KWs is to acquire, create, share, or apply knowledge in their job to create value. Working with knowledge is very complex and depends on many factors such as the environment, culture, perspectives of individuals, social connections between individuals, and the availability of technology, information, and data. Three rich pictures were drawn to summarize the inferences made from LR3 about knowledge acquisition, creation, application, and transfer. These rich pictures can be seen in Paper II.

Personal resources were found to be aspects of the self, linked with resiliency. KWs engage in dispositional orientations and habitual behaviors which either restore or deplete their personal resource reserves to deal with stressors. Personal resources can be cognitive, psychological, physical, or social. A KW's well-being and performance can be improved by choreographing actions to optimize the use of the KW's personal resources. If a KW's personal resources are depleted below a resiliency threshold, he/she is likely to experience exhaustion or burnout. Two rich pictures were drawn to summarize the inferences made from LR3 about personal resources which can be seen in Paper II.

Competencies are behavior patterns organized around intent and imply what KWs can do and what they want to do. Competencies allow KWs to engage in behavior patterns that lead to a high level of performance. A rich picture, which can be seen in Paper II, was drawn which shows different levels of competencies, what affects them, and how they contribute to a high level of performance.

Knowledge gained from LR3 on value, knowledge, competencies, and personal resources was used to identify activities in the transformation process defined by the root definition of a system owned by the individual and formulate a PAM, the second activity in the SSM.

4.2.2 Purposeful Activity Model (RQ II.2)

The root definition of a system owned by the individual from Paper I was found to be too restrictive when developing the PAM. It did not include the conflict of interest that arises when the KW is figuring out what is value. A new root definition was formulated: *A system, owned by the individual KW, in which the KW uses resources to execute actions exerting effort to create tangible or intangible artifacts with the intention of creating value*.

Figure 4.6 shows the resulting PAM. Seven activities were identified as relevant to acquiring the input: appreciate what is value, appreciate competencies, appreciate information sources, appreciate personal resources, acquire, and develop competencies, acquire and maintain information sources, and manage personal resources. They were grouped into two groups *awareness* (yellow in fig.4.6) and *personal aspects* (pink in fig.4.6). Five activities were identified that the KW executes in the transformation: identify actions which contribute to value creation, evaluate competencies and knowledge needed for actions, evaluate effort needed to execute actions, select actions, and execute actions exerting effort. They were grouped together in *actions* (blue in fig.4.6). Three activities were identified to do something with the output: communicate results of actions to relevant parties, share knowledge acquired while executing actions, and evaluate whether actions created value. They were grouped together in *value contribution* (green in fig.4.6).

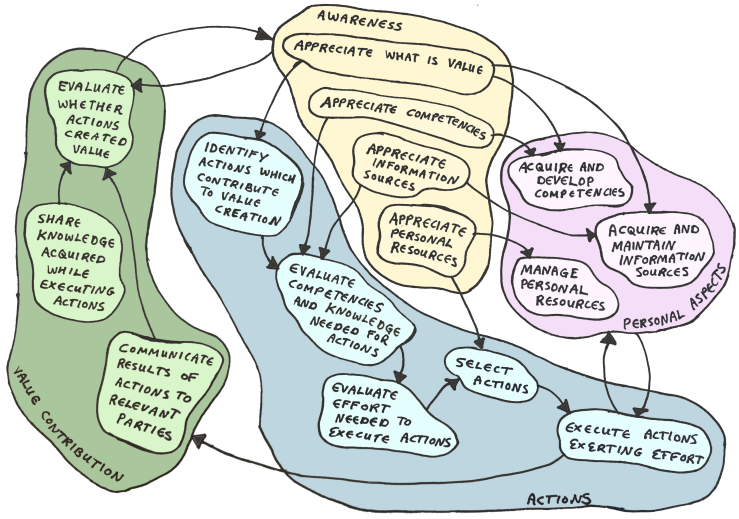

Figure 4.6. The resulting purposeful activity model of a system for the individual from Paper II

From the resulting PAM and knowledge gained from the literature reviews some key takeaways were summarized which explored the interaction between the individual KW and the organization. Table 4.6 shows these key takeaways from Paper II.

Table 4.6. Key Takeaways from Paper II.

Key takeaways
The KW might not create the value he intends if there is a mismatch between the KW's interpretation and what others perceive as value. - **Organizations** need to make sure the organizational culture, environment and leadership reflect what is value to the organization. - **KWs** need to integrate successfully to the organization by observing, imitating and building relationships with successful and competent insiders.
The KW intrinsically gravitates towards actions that fulfill his own needs. - **Organizations** need to design the actions, required to fulfill organizational objectives, to fulfill the needs of KWs as well and use incentives to align the value of the KW and the organization. - **KWs** need to use self-awareness to identify their needs and communicate them.
The KW's personal resource levels affect how much effort is exerted when executing actions. - **Organizations** need to give KWs the autonomy to manage the timing and sequencing of their own work. - **KWs** need to strategically sequence and time their sources of restoration to offset their sources of depletion for high performance.
Focusing too heavily on efficiency improvements might create a bias for choosing actions that create known value immediately or require the least amount of effort. - **Organizations** need to encourage and support innovative actions that might or might not create value, to maintain their competitive advantage. - **KWs** need to invest in self-development, by choosing actions that require new knowledge or competencies, so that they can create more value down the road.
KWs are interdependent so value is often created by helping others, sharing knowledge and delivering results timely so that others can use them to generate value. - **Organizations** need to have a climate of supportiveness, belongingness and mutual trust for their KW's to be able to create a shared cognitive frame as well as encourage knowledge sharing and helping behaviors. - **KWs** need to engage in helping behaviors, share their knowledge and build relationships to access information and knowledge.

The next section outlines the main results of Paper III which debates the situation, the third activity in SSM and proposes a draft of a holistic KWP framework.

4.3 Paper III (Óskarsdóttir et al., 2022)

Paper III answered two sub-questions: *How is existing literature dealing with KWP of individual KWs and how does it compare with the perspective captured by the PAM presented in paper II?* and *From the findings of this research what important components and factors should a holistic KWP framework include?* To answer these questions a systematic literature review to explore how existing literature is dealing with KWP was executed and the insights gained mapped to the PAM to debate the situation, the third activity in SSM. From the findings a draft of a holistic KWP framework was proposed.

4.3.1 Debating the Situation (RQ III.1)

The literature review searched for papers with a topic that touched on approaches, frameworks, tools, or models, which aim to tackle the productivity, performance, effectiveness, efficiency, or management of KWs. Six groups were formed by theme with concepts relevant to individual KW's and their work: communication & relationships, personal characteristics & development, well-being & job satisfaction, personal knowledge management, task approach, and organizational commitment & engagement. The papers that addressed concepts in each group were read to extract the main ideas relevant to the groups theme and concepts, explore the association between concepts within the group and how they influence KWP. This resulted in a summary for each group from which key insights were formulated from inferences made from the literature. Table 4.7 lists the key insights per concept group from Paper III.

Table 4.7. Insights from LR4 per concept group from Paper III.

Concept group	Ref	Insight
Communication & Relationships	CR1	Shared experiences create shared mental models which are necessary for the transfer of knowledge. Relationships are built on shared experiences and foster feelings of belonging and trust which aids in the creation of mental models and the willingness to engage in organizational citizenship behaviors.
	CR2	The intent of communication depends on the interplay of the level of personal gain of the communication and the level of organizational gain of the same communication. Organizational culture and reward systems impact the alignment of these two aspects.
Personal Characteristics & Development	PCD1	Preferred behavior leads to the willingness to succeed at challenging tasks, help others without expecting anything in return and make positive attributions to attain success without overcoming to adversity and giving up. This state has been attributed to psychological capital and engaging in organizational citizenship behaviors. Role identity, how the individual sees himself/herself in work, affects how they perceive causations which in turn affects intentions for future behavior. The individual's social identity, whether the worker has a sense of unity, trust, and belongingness within the organization, can positively impact these preferred behaviors.
	PCD2	The level of motivation towards engaging in preferred behaviors is influenced by an individual's motives, which are elements of personality that drives behaviors shown, and motivators such as personal growth, operational autonomy, task achievement and financial incentives.
	PCD3	There are many spectrums of orientations, influenced by cultures, experiences, personality and personal value systems of individual workers, which affect behaviors shown. The organization needs to find KWs with the appropriate orientation combo, that takes in account the person-job-environment fit, which leads to preferred behaviors.
	PCD4	To drive KW's towards engaging in preferred behaviors organizations should be aware of the motivators of individual workers to motivate them towards organizational goals and support the workers in personal development.
Well-being & Job Satisfaction	WJS1	The level of well-being, in the form of emotional and physical state, can range from happy, with predominantly positive feelings, through neutral to burnout, with high levels of emotional exhaustion and health problems. The level is influenced by the person-environment fit, individual factors, such as attitudes, behaviors, personalities and coping processes, and organizational factors including the person's subjective experience of the organizational environment and expectancy.

	WJS2	The level of job-satisfaction is a subset of well-being where the emotional state results from the perception of fulfillment in one's job where the individual's interests and needs are aligned with what the organization provides. The level is influenced by motivating factors, such as personal growth, achievement and recognition, and the presence of hygiene factors, such as salary, physical environment, and support.
	WJS3	To influence the level of well-being and job satisfaction the organization should ensure perception of organizational support, ensure feelings of belonging and trust, cultivate a culture of transparency, collaboration, honesty, flexibility, commitment, and professionalism.
Personal Knowledge Management	PKM1	Absorptive capacity, in the form of sensing, collecting, organizing, processing, and maintaining information, dictates the individual's ability to work with knowledge.
	PKM2	A combination of the following attitudes towards working with knowledge influences personal knowledge management: proactiveness, sharing, transparency, formality and expanding horizons.
	PKM3	The KW engages in the practices of knowledge reuse and social learning to appreciate and utilize information sources.
	PKM4	The KW engages in the practice of social networking to acquire and maintain his/her information sources.
Task Approach	TA1	Innately, KWs are driven by heuristics to manage risk/reward when prioritizing tasks and getting things done.
	TA2	Time management skills should be used to minimize task reconfiguration costs by arranging tasks and creating strategies to deal with interruptions.
Organizational Commitment & Engagement	OCE1	An optimized commitment level (continuance, normative or affective) manifests in workers engaging in more preferred behaviors (in the form of psychological capital) enhancing the organization's interests and does not over expend the personal resources of the worker.
	OCE2	To not over expend the personal resources of the worker the organization should invest in their workers, design jobs sufficiently to reduce role ambiguity and conflict, and cultivate a collaborative learning environment in where the worker perceives support.
	OCE3	Engagement describes the level of vigor, absorption and dedication of the worker which impacts work done, motivation and behavior in the workplace.
	OCE4	Engagement level fluctuates depending on situational factors and personal resources.

These insights were mapped to the PAM from Paper II to debate the situation. The third activity in SSM, debating the situation, compares how others view the problem situation with that captured in the PAM. The results of the mapping can be seen in figure 4.7. The mapping showed that there are some gaps in the literature found in the systematic literature review. Most insights tackle activities related to acquiring the input in awareness and personal aspects. Very few insights target the activities used in the transformation process in actions and relevant to generating the target outcome in value contribution.

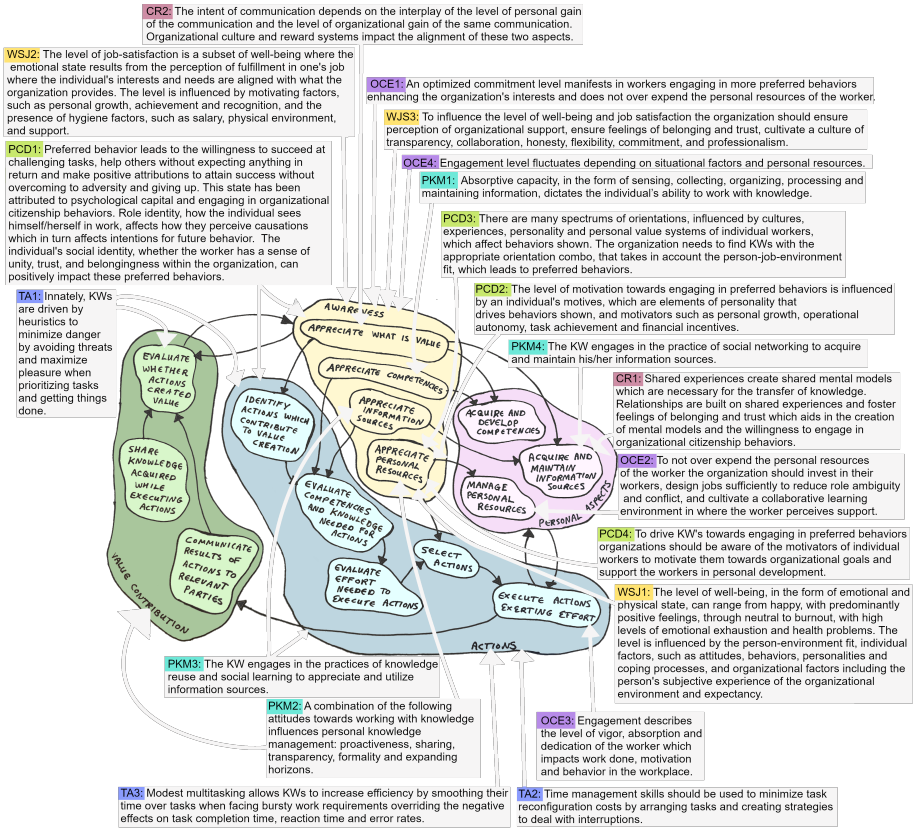

Figure 4.7. The insights from the literature review executed in Paper III mapped to the PAM of system for the individual from Paper II.

The systematic literature review resulted mostly in more *what* elements that influence KWP instead of *how* as was hoped. The lack of operationalizable *how* elements extracted from the literature review means that more steps need to be taken before an operationalized model of KWP can be proposed. Therefore, a draft of a holistic KWP framework was proposed instead as a step towards an operationalized model of KWP.

4.3.2 A Draft of a Holistic KWP Framework (RQ III.2)

The draft of a holistic KWP framework was formulated from keywords extracted from the mapped PAM and grouped together into two components, the state of the individual and work done. Two more components were added to the framework based on the findings in the research, the organization and outcome. Figure 4.8 shows the draft of a holistic KWP framework.

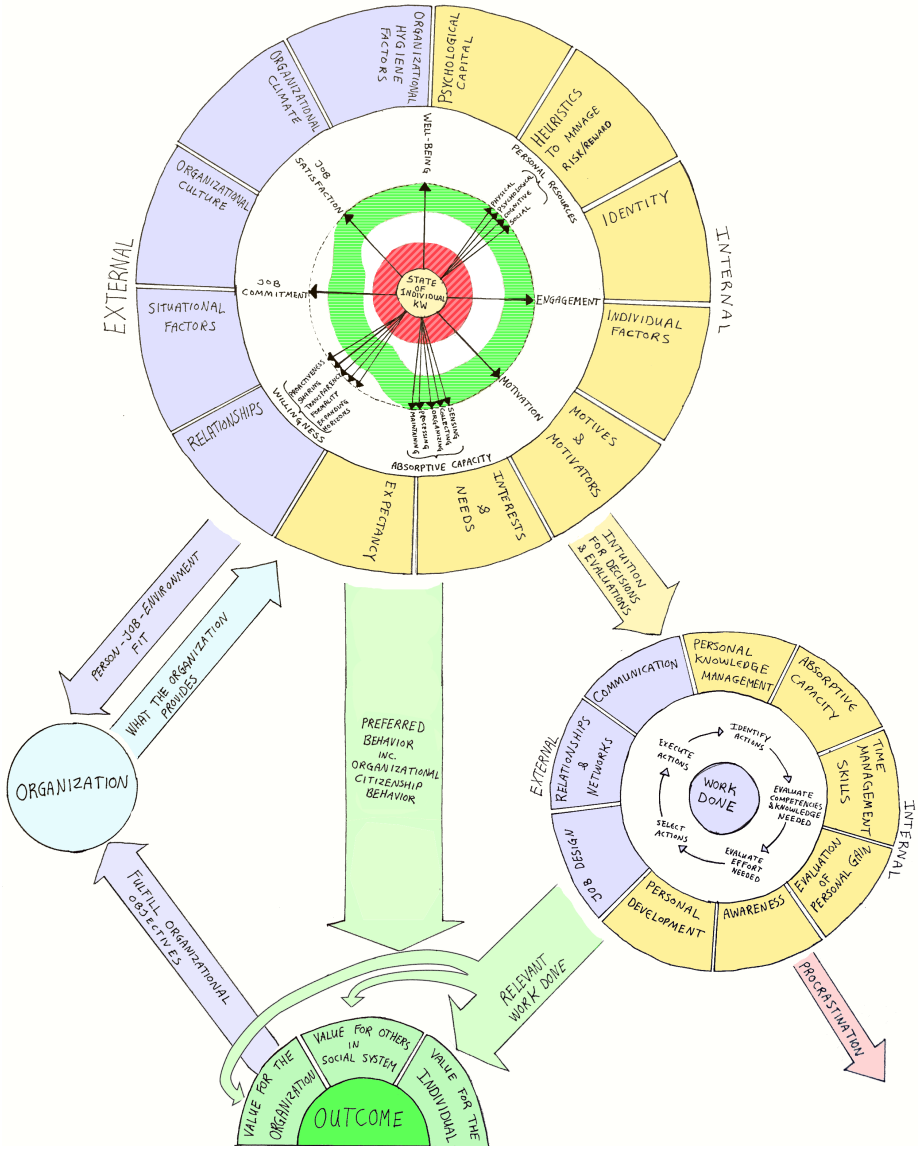

Figure 4.8. The resulting draft of a holistic KWP framework from Paper III.

The organization component does not have any detail since this research has focused on literature regarding the individual KW. But it is connected to the other components with influential interactions. The outcome component is based on the findings from Paper II on value in knowledge work. KWs inherently gravitate towards creating value for themselves but also contribute to value creation for others in their social system and the organization. That is why the relevant work done arrow is thicker towards value for the individual than the other two value outcomes. This highlights the need for the

organization to align what they perceive as value with what the individual perceives as value to maximize their benefit of the work done by the KW. This can be done by influencing the state of the individual KW, through external factors such as reward systems, culture, support, and relationships, to guide the KW towards engaging in preferred behaviors such as organizational citizenship behavior.

The state of the individual component shows a radar chart with eight important levels as axis: level of well-being, personal resources (physical, psychological, cognitive, and social), engagement, motivation, absorptive capacity (sensing, collecting, organizing, processing, and maintaining information), willingness (proactiveness, sharing, transparency, formality, and expanding horizons), job commitment and job satisfaction. The red area shows the undesirable state of each level while the green area shows the desirable state. Around the radar chart are seven internal factors that influence the state and five external factors. They are psychological capital, heuristics to manage risk/reward, identity, individual factors, motives & motivators, interests & needs, expectancy, organizational hygiene factors, organizational climate, organizational culture, situational factors, and relationships. The state of the individual affects the KW's intuition when evaluating work and making decisions in the work done component.

The work done component includes the main activities the KW engages in to get work done as well as six internal factors and three external factors that influence the KW's work. These factors are personal knowledge management, absorptive capacity, time management skills, evaluation of personal gain, awareness, personal development, job design, relationships & networks, and communication. Paper III goes into detail about this draft of a holistic KWP framework. The next section discusses the findings of this research and what the next steps are in the building of a theory of KWP.

5 Discussions

The purpose of this research was to contribute towards a theory of knowledge worker productivity (KWP). There is no single integrated body of knowledge which can be used for analytical and empirical testing and applied to real world problems. There is a vast amount of existing literature relevant to KWP, but it is distributed through multiple fields of study and at a high level of detail. The first step towards a theory of KWP should, therefore, utilize existing literature, extract the fundamental elements that affect KWP, and explore how they work together from a high level of abstraction using a holistic approach. Which is what this research did by striving to answer the main research question using four literature reviews and the soft systems methodology (SSM). A couple of hundred references were used in this research to identify elements of KWP and explore their relationships. Each reference contributed to the results with insights into some elements, but no specific references had more influence than others.

The main research question was: *what are the elements of KWP and how can their relationships be developed into a holistic framework of KWP*. Seven sub-questions were created that contributed towards an answer to the main research question. These seven sub-questions are answered in the three papers which cumulatively build up an integrated body of knowledge towards a theory of KWP and propose a draft of a holistic KWP framework using the findings. The result section above summarized the answers to each sub-question. Each paper identified some elements of KWP relevant to the individual knowledge worker (KW) and even though more research is needed to complete a theory of KWP, a draft of a holistic KWP framework was proposed showing that the relationships between the elements can be developed into a holistic framework of KWP.

This research identified many different types of elements and gained insight from exploring them and their relationships. First elements regarding the different challenges of KWP were identified, both from the point of view of the individual KW and the organization. Some of these challenges were: too much demand and insufficient resources; effectiveness; self-development and self-awareness; achieving and/or setting goals; performing to full potential; making thinking more productive; successful relationships and collaborations; motivation; information needs and knowledge interdependence; work engagement and health; organizational structure and changes; and the nature of knowledge work. Then the elements value, knowledge, personal resources and competencies were explored further to examine the relationships of these elements with others and how they influence KWP.

Finally, six concept groups of elements were formed by theme with concepts relevant to individual KWs and their work: communication & relationships, personal characteristics & development, well-being & job satisfaction, personal knowledge man-

agement, task approach, and organizational commitment & engagement. Within these groups were elements, that were used in the holistic framework of KWP, such as well-being, personal resources, engagement, motivation, absorptive capacity, willingness, job commitment, job satisfaction, psychological capital, heuristics to manage risk/reward, identity, individual factors, motives & motivators, interests & needs, expectancy, organizational hygiene factors, organizational climate, organizational culture, situational factors, relationships, personal knowledge management, time management skills, evaluation of personal gain, awareness, personal development, job design, relationships & networks, and communication. Insights on KWs and KWP were summarized by abstracting the knowledge obtained from the exploration of the relationships of the numerous elements identified. Following is an overview of the main insights gained.

KWs personal resource levels affect how much effort is exerted when executing actions. KWs need to strategically sequence and time their sources of restoration to offset their sources of depletion for high performance. If they deplete their personal resources, they experience exhaustion and stress which lower their performance. Therefore, organizations need to give KWs the autonomy to manage the timing and sequencing of their own work, but the individual KW must also be effective and efficient and not waste energy and time on actions that do not create value. Focusing too heavily on efficiency improvements might create a bias for choosing actions that create known value immediately or require the least amount of effort. Organizations need to encourage and support innovative actions that might or might not create value, to maintain their competitive advantage. Meanwhile, KWs need to invest in self-development, by choosing actions that require new knowledge or competencies, so that they can create more value down the road.

The organization must communicate organizational objectives and needs so KWs can fulfil demands that create value and not waste time on the wrong things. The KW might not create the value he intends if there is a mismatch between the KW's interpretation and what others perceive as value. Organizations, therefore, need to make sure the organizational culture, environment and leadership reflect what is value to the organization. Meanwhile, KWs need to integrate successfully to the organization by observing, imitating and building relationships with successful and competent insiders. KWs intrinsically gravitate towards actions that fulfil their own needs. Organizations need to design the actions, required to fulfil organizational objectives, to fulfil the needs of KWs as well and use incentives to align what is value to the KW and the organization. A KW whose needs are unfulfilled will underperform. KWs need to use self-awareness to identify their needs and communicate them.

KWs are interdependent so value is often created by helping others, sharing knowledge and delivering results timely so that others can use them to generate value. The work climate, therefore, needs to promote collaboration and knowledge sharing to facilitate KW contribution to the organizational knowledge base, which gives the organization competitive advantage. Organizations need to have a culture of supportiveness, belongingness and mutual trust for their KWs to be able to create a shared cognitive frame as well as encourage knowledge sharing and helping behaviors. KWs need to engage in helping behaviors, share their knowledge and build relationships to access information and knowledge. KWs who withhold knowledge and won't collaborate underperform due to restricted access to resources.

To develop a holistic framework of KWP, the interpretations and inferences made cumulatively throughout the journey from the literature reviews and the results of the SSM activities were abstracted into main components and their influencing factors. The main components of the conceptual framework are the state of the individual KW, work done and outcome. Outcome of relevant work can be value for the individual KW, others in the social system and the organization. It is human nature to gravitate towards creating value for oneself, therefore, the organization needs to align their needs with what creates value for the individual KW to maximize value contribution towards their organizational goals and objectives. This can be done by influencing the state of the individual KW, through external factors such as reward systems, culture, support, and relationships, to guide the KW towards engaging in preferred behaviors such as organizational citizenship behavior. There are also internal factors that affect the state of the KW, which are influenced by the KW's actions, traits, worldview, and interpretation of his environment and experiences. The state of the individual KW affects the KW's intuition when evaluating work and making decisions in his process of getting things done.

The framework highlights indicators and activities that are connected to the productivity and performance of the individual KW as well as identifying factors that influence these indicators and activities. This gives an idea of what an operationalizable model should consider. Further study is needed into how each factor influences the state of the individual KW and work done as well as the interactions between them. This could be done by executing more specific literature reviews on these factors and utilizing causal diagrams to explore the interactions.

More research is needed to complete a theory of KWP which can be tested and moved into the normative stage for application. This research identified elements of KWP relevant to the individual KW but elements relevant to the organization itself have yet to be identified. The organization was only explored through its interactions with the individual KW. The literature reviews in this research identified numerous *what* elements relevant to KWP but found few *how* elements. The lack of operationalizable *how* elements extracted from the literature means that more steps need to be taken before an applicable model of KWP can be proposed. From the findings in the literature reviews, it seems that the focus is more on the efficiency of KWs rather than on the effectiveness. There is a need to define and develop consistent ways to measure KWP (which includes both efficiency and effectiveness) before an applicable model can be tested. Measures that consider the subjectivity of value and effort, as well as the latency of some value. The KW needs to invest in self-development and engage in innovative actions, to have a competitive advantage and advance the organization, which creates latent value that is not actualized right away.

The literature reviews in this research did not catch all relevant literature. There was an apparent lack of literature on well-being, ergonomics, the influence of the physical environment, stress, and management strategies actively being used in the industry. It seems that research on these topics is not connected to the keywords used in the literature reviews in this research such as KW, productivity, performance, effectiveness, and efficiency. More literature reviews should be executed that look at these topics and extract the relevant elements to KWP. Many of the management strategies being actively used in the industry do not come from academic research. They are being developed

in organizations as an attempt to deal with the problems they face in managing and improving the productivity of their KWs. These strategies are often designed to solve a specific challenge within a specific organization and therefore, context dependent but are being adopted by different organizations with similar problems. These are strategies such as agile management developed by software developers, nudge management developed by Google and the Netflix manifesto. It would be interesting as future research to explore the strategies relevant to managing and improving KWP, which are being used in the industry, and find out *how* they are being applied and what they have in common. This would contribute to a holistic theory of KWP by extending it to include both the challenges and solutions from the industry point of view. It could highlight some gaps in academic research relevant to KWP.

SSM is originally designed to solve human problems within organizations using discussions with multiple stakeholders to learn about a problem situation from different viewpoints and using systems thinking to create a common view of the problem situation to identify possible solutions that do not intensify conflicts. KWP is inherently a human problem. The productivity of the KW needs to be directed to create value for the organization because the KW's knowledge cannot easily be assimilated into the organizational process like manual and routine work. KWP needs to be managed through humans. The SSM, therefore, worked well to structure the association step in the descriptive theory-building in this research. SSM was adapted to use inferences made from literature reviews rather than using discussions with stakeholders. As future research it would be interesting to explore the associations even deeper by using causal diagrams and system dynamics to model the effect of interventions. Causal diagrams can be used to identify intervention points which influence behaviors in the system. They could give useful insights for the creation of applicable methods, frameworks, and models in the theory of KWP.

6 Conclusions

This study contributes to a theory of KWP by developing a new conceptual framework which highlights elements that are connected to the productivity and performance of the individual KW as well as identifying factors that influence these elements. By taking a holistic approach using systems thinking, connections between elements that are traditionally studied apart came to light, allowing the researcher to abstract the main ideas into a concise framework. This is significant because most research relevant to KWP focuses only on one or a few elements giving a great understanding of individual elements and some specific relationships. However, there is a lack of an overview of the many elements that can influence a situation. Therefore, many of the initiatives taken to improve and manage KWP give unpredictable results depending on factors that are often hidden and unknown. Many jobs today, are predominantly knowledge work. This makes organizations dependent on value created by KWs. This study adds to the literature by giving an overview of the many elements that affect the productivity of the individual KW, abstracting them into key insights and drawing up a simplified and concise conceptual framework. This study also uses a new approach to SSM by adapting it to use inferences made from literature reviews rather than using interviews and discussions with stakeholders.

Paper I

A Soft Systems Approach to Knowledge Worker Productivity-Analysis of the Problem Situation

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Helga Guðrún Óskarsdóttir and Guðmundur Valur Oddsson conceived and designed the research; Helga Guðrún Óskarsdóttir performed the research, analyzed the data and wrote the paper.

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A Soft Systems Approach to Knowledge Worker Productivity—Analysis of the Problem Situation

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Abstract: Low knowledge worker productivity is an important problem that needs to be addressed. Current research addressing this problem is fragmented and deals with different isolated elements of the problem. There is a need for a holistic approach to knowledge worker productivity. This paper takes the first steps of a holistic approach to knowledge worker productivity by using soft systems methodology to describe the problem situation. The main challenge of this research was the abstraction of the results from two literature reviews into simple rich pictures and specific root definitions to identify the fundamentals of knowledge worker productivity. The problem situation was explored from the perspective of two problem owners, the organization and the individual knowledge worker. The rich picture from the perspective of the organization highlighted that the organization must communicate what they perceive as value and create a work environment that promotes collaboration, encourages knowledge sharing, motivates and fulfills the needs of their knowledge workers. The rich picture from the perspective of the individual knowledge worker highlighted the fact that knowledge workers need to manage their personal resources, be effective and efficient to maximize their own productivity. This paper attempts to integrate these two perspectives into a holistic view.

Keywords: soft systems methodology; rich picture; personal resources; energy management; organization; work environment; knowledge worker productivity; management; knowledge management; retaining knowledge workers

JEL Classification: D03; D20

1. Introduction

Drucker (1999) stated that the most valuable asset of a 20th century organization was its production equipment and predicted that the most valuable asset of a 21st century organization would be its knowledge workers and their productivity. He was right: knowledge workers can be the key to an organization's competitive advantage (Jayasingam and Yong 2013). Knowledge workers use their expertise, education or experience to create, share or apply knowledge in their job, so that they can contribute to their organizations. Their work is non-routine, creative and requires intelligence to solve new problems every day, make decisions and fulfill the requirements of customers and other stakeholders. The number of knowledge workers has increased due to trends such as new sectors of knowledge production within the economy (Scarbrough 1999), new technology and automation that reduce the need for manual work (Gunasekaran et al. 1994) and a more service-oriented market.

Low knowledge worker productivity is an important problem that needs to be addressed. Organizations are dependent on the value produced by knowledge workers. They need to be able to affect the productivity of knowledge workers to run and improve their business. In 1959,

Peter F. Drucker drew attention to the fact that the discipline of personnel management wasn't equipped to handle the challenges people face doing knowledge work (Drucker 1959). Personnel management practices were based on unskilled or semiskilled machine work (Drucker 1959). How knowledge worker productivity is approached, therefore, needs to be revolutionized like Frederick Taylor revolutionized how manual worker productivity was approached with scientific management. Unfortunately the methods, such as scientific management, used in the 20th century to increase the productivity of manual work are not directly relevant to knowledge workers (Drucker 1966). Scientific management assimilated the knowledge of the worker into the organizational process (Paton 2013). This was possible because manual workers use their skills to execute routine tasks, which do not require constant problem solving and decision making. On the other hand, the knowledge worker is only valuable if he owns his knowledge assets (Paton 2013). To contribute he needs to pervade data and information with decision and reflection, which makes the knowledge created inseparable from the individual (Seethamraju 2000). The knowledge worker must be able to act autonomously and manage himself to unlock the value of his knowledge (Paton 2013; Mandt 1978). Since his knowledge cannot be assimilated into the organizational process the productivity of the worker needs to be directed to create value for the organization. Value is subjective, so the organization needs to communicate what is perceived as value to them.

Even though many breakthroughs have been made on the subject of knowledge worker productivity current research addressing this problem is fragmented and deals with different isolated elements of the problem. There is a need for a holistic approach to knowledge worker productivity to find applicable methods to manage and improve it. This research is a first step of many to tackle the knowledge worker productivity challenge with a holistic approach using systems. This paper describes the problem situation of low knowledge worker productivity by drawing conclusions from data gathered in two literature reviews and defines relevant systems using soft systems methodology. Soft systems methodology was created as a response to the complexity of everyday problems that were hard to fit into mathematically expressed general theory of systems (Checkland 1993). Checkland (1993) found that one reason for the complexity of these everyday problems was because each stakeholder had different views of the problem and therefore what constitutes the system. The soft systems approach therefore identifies problem owners that give the point of view of the system. Knowledge worker productivity is a good example of such a multi-dimensional problem.

Taylor (1911) said "in the past the man has been first; in the future the system must be first". Knowledge worker productivity is in the same state now as manual worker productivity was in the year 1900 (Drucker 1999). All eyes are on the individual knowledge worker but not the systems that he functions in. Even though the knowledge worker needs to have autonomy to manage himself he is confined and influenced by the systems in his world. There is a need to define these systems and analyze how they affect the knowledge worker. The soft systems process consists of seven stages which are the problem situation, unstructured; the problem situation, expressed; root definitions of relevant systems; conceptual models; comparison of conceptual models with the problem situation; feasible desirable changes; action to improve problem situation (Checkland 1993). This research executes the first three stages by using some of the tools Checkland (1993), Checkland and Scholes (1999) provide such as the three analyses, rich pictures, CATWOE and root definitions. These tools are discussed in detail in the method section. This research hopes that by exploring the problem and defining the relevant systems of knowledge worker productivity using soft systems methodology will give insight and provide a stepping stone to a holistic approach to knowledge worker productivity.

Current research can be split into two factions: (i) the faction of those who emphasize knowledge management, the process of codifying knowledge into external systems and handling the data and information. It assumes that knowledge worker productivity can be improved by fulfilling information needs, minimizing information overload and making knowledge sharing easier; and (ii) the faction that focuses on retaining knowledge workers through increased motivation, work-engagement and commitment to the organization. That faction assumes that knowledge cannot be effectively codified

and that the best way to retain organizational knowledge and improve knowledge worker productivity is by investing in the workers. Other popular subjects include managing knowledge workers, health problems of knowledge workers and teamwork. There is a need to combine the findings of current research, identify the elements that affect knowledge worker productivity and explore how they work together by creating a holistic view.

This paper explores the problem situation of low knowledge worker productivity by abstracting the results of literature reviews into simple rich pictures and specific root definitions of relevant systems. To gain an understanding of the problem situation literature reviews of knowledge worker productivity challenges were executed, one of academic papers and another of a proxy for industry. The literature reviews identified four main knowledge worker productivity challenges targeted by current research and eight main challenges targeted by industry. This information was used in a soft systems approach to analyze the problem situation and define relevant systems. The soft systems approach identified two problem owners, the organization and the individual knowledge worker, and resulted in two rich pictures of the problem situation and two root definitions for relevant systems. This paper also explores the interactions between these two systems by creating an abstract holistic view of knowledge worker productivity.

2. Methods

This research used the seven stage model from the soft systems methodology described by Checkland and Scholes (1990) and executed the first three stages to analyze the problem situation and define relevant systems. Table 1 shows an overview of the execution of the first three stages.

Table 1. An overview of the execution of the first three stages of the soft systems approach.

Execution Step	Description	Results of the Execution	Section
Stage 1: The problem situation, unstructured	To get an overview of the knowledge worker productivity challenge two literature reviews were executed. A literature review of knowledge worker productivity challenges on the Web of Science and a literature review of personal productivity self-help books as a proxy for industry.	Identified four main knowledge worker productivity challenges targeted by current research and eight main challenges targeted by industry	2.1. 2.2.
Stage 2: The problem situation, expressed	The inferences made from the literature reviews were used to identify problem owners, execute an analysis of the intervention and draw rich pictures of the problem situation.	Two problem owners identified, the organization and the individual knowledge worker. A rich picture was drawn for each problem owner.	2.3
Stage 3: Root definitions of relevant systems	A CATWOE analysis was performed to help formulate a root definition of relevant systems.	Two root definitions were formulated, one for each problem owner.	2.3

The following sections describe the methods used for each of the stages in the table above.

2.1. Literature Review—Academic

A literature review search was executed on the Web of Science in June 2016. It searched for papers with a topic that touched on a knowledge, information or white-collar worker productivity problem or challenge. The search resulted in fifty-nine papers from which forty-five were selected by title review. If the title indicated any relevance to the topic it was chosen. The search term can be found in Table 2.

Table 2. Literature review search term.

Search term	Timespan
TS = (((productiv* OR perform* OR effectiv* OR effici* OR manag*) NEAR (((knowledg* OR profession* OR information*) NEAR/1 worker*) OR (white NEAR/1 collar*)) NEAR (problem* OR challenge*)))	All years

Six papers were not available, so thirty-nine papers were read to extract information about what challenges they were targeting and proposing solutions to. The main subjects of each paper were then categorized into themes and main challenges identified from those themes.

2.2. Literature Review—Industry

The literature review used personal productivity self-help books as a proxy for industry and was designed using Kitchenham (2004) guidelines for performing systematic literature reviews in software engineering. Personal productivity self-help books were chosen as a proxy for industry since they are mostly written by consultants working with organizations and individual knowledge workers with industry experience. Of the forty popular personal productivity self-help books read in this literature review, 63% of the authors are consultants and 19% of authors are writing from personal experience. Only 17% of the authors come from the academic world. The authors had on average 18 years of experience working with productivity issues and 50% of the authors had founded companies around their ideas. The objective of the literature review was to get insight into the productivity challenges of the individual knowledge worker.

To find popular personal productivity books for the literature review the researchers developed a software program, ReviewSearchHelper (Óskarsdóttir 2013, 2014), to search and fetch information systematically from the online retailer Amazon.com. It used the Amazon Product Advertising API to search for books on Amazon.com (Óskarsdóttir 2014). The ReviewSearchHelper traverses through the hierarchy of Amazon.com book categories for each keyword and extracts information about the books in included categories (Óskarsdóttir 2014). For more detailed information about this software and the codebase itself see references (Óskarsdóttir 2013, 2014).

The search was performed in September 2013. The keywords used in the search were: productivity, personal productivity, effective, effectiveness, efficiency and knowledge worker productivity. An unrestricted book search gave 41,097 book results. This indicated that the search needed to be limited. This was done by excluding book categories from the search. The list of book categories from Amazon.com was manually reviewed using an exclusion criteria checklist that can be seen in Table 3.

Table 3. Book category exclusion criteria.

Exclude if results are:
• About a specific industry or roles, dependent on tools or software, religion specific, about historical events, about job search or hiring, about managing or leading people or about organizations not individuals

A restricted book search was then executed only in the selected book categories for each keyword, which resulted in 1903 book results. A selection criteria checklist with an emphasis on the productivity of the individual knowledge worker was used to manually select 272 relevant books from the 1903 unique book results. Table 4 shows the book selection criteria.

Table 4. Book selection criteria.

Include if:
• Focus on improving readers personal productivity (e.g., improving creativity, discretion, performance measures, incentives, technology, defining tasks and results, goals, efficiency, effectiveness, defining quality, focus, autonomy, accountability and continuous learning)
Exclude if:
• About organizational productivity, team productivity, improving productivity of others through management, improving communications and manipulation skills, improving leadership skills, life fulfillment or job hunting • Industry, religion or tool specific • Specific target group e.g., teenagers or women only
Other criteria:
• Must be available as either hardcover or paperback, must be registered on the amazon best sellers rank, must be original work, only one book by author or author group

There was a language bias since only English books were selected. The Amazon.com sales rank was used as a popularity indicator and the forty most popular selected books were read. A data extraction form was filled out per book where main challenges targeted by the books and ideas about productivity were extracted. Table 5 shows an overview of the execution of the literature review of personal productivity self-help books.

Table 5. An overview of the literature review of personal productivity self-help books.

Execution Step	Description	Results of the Execution
Unrestricted book search	Searched Amazon.com for each keyword ordered by relevance	41,097 book results
Restricted book search	1. list of book categories manually reviewed using an exclusion criteria checklist	24 categories included
	2. searched Amazon.com in included book categories for each keyword ordered by relevance	1903 book results
Book selection	1. book results manually reviewed using a selection criteria checklist	272 books included
	2. selected books ordered by ascending Amazon sales rank	40 most popular books read
Data extraction	Data extraction forms filled out per book	8 unique challenges identified

Table 6 shows the included book categories organized by their hierarchy. Each child category is subset of the parent. The books were extracted from the child book categories unless the parent category had fewer than a hundred books.

Table 6. Included book categories and their hierarchy.

Included Parent	Included Children	Included Children 's Children
Business & Investing	Management & Leadership	Decision-Making & Problem Solving, Management, Management Science, Motivational
	Skills	Time Management
Professional & Technical	Business Management	
Health Fitness & Dieting	Psychology & Counseling	Occupational & Organizational, Personality, Creativity & Genius
Self-Help	Happiness, Motivational, Personal Transformation, Self-Esteem, Stress Management, Success, Creativity, Memory Improvement	

The information from both literature reviews was used in the next phase to express the problem situation.

2.3. Problem Situation Expressed and Root Definitions Defined

The first step was to identify the problem owners. A problem owner is someone who has a feeling of unease about a situation, senses inconsistencies in the system and feels that things could be better (Checkland 1993). The problem situation is viewed from the point of view of the problem owners. The problem owners were identified from common themes within the literature. To analyze the problem situation Checkland and Scholes (1999) recommend executing three analyses and drawing rich pictures of the problem situation. Table 7 gives an overview of these analyses.

Table 7. The three analyses.

Analysis		Objective of Analysis (Checkland and Scholes 1999)
1	Intervention	Identify the problem owners and how the system will be defined in terms of their perceptions and knowledge
2	Social system	Identify roles (social positions recognized as significant by the problem situation), norms (expected behaviors in roles) and values (how performance will be judged)
3	Political system	The process by which differing interests reach accommodation. How is power expressed?

This research was limited to the first analysis, of the intervention. The main objective of this research is to abstractify the problem situation and an analysis of the social system and political system goes into detail that would force a lower level of abstraction. The analysis of the intervention consisted of questions that the researchers answered using inferences made from the literature reviews. Appendix 2 in Checkland (1993) was used as a guideline when formulating the questions. Table 8 lists the questions.

Table 8. The questions of the analysis of intervention.

Questions
What is the problem owner's version of the nature of the problem?
What are the problem owner's reasons for regarding the problem as a problem?
What are the problem owner's expectations of a problem-solving system?

The next step was to draw rich pictures of the problem situation using the analysis of the intervention. Rich pictures are visual representations of the problem situation (Checkland 1993; Checkland and Scholes 1999). They are used to present the problem situation in a form that captures the different facets of a problem in a holistic way, helps identify themes in the system and create a mutual understanding of the problem (Checkland 1993; Checkland and Scholes 1999). Rich pictures do not have any formal modeling symbols since every problem situation is different. In this research to draw the pictures, verbs and nouns were extracted from the analysis of the intervention and the identified challenges from the literature reviews. The nouns became shapes and the verbs arrows that logically connected the shapes. Some of the concepts in the shapes had what were called needs, which were drawn as thought bubbles on the pictures. These needs were, for example, characteristics, actions or information that are not necessarily present, but could affect the problem situation. Speech bubbles were used to represent behavior of actors in the problem situation. Large arrows were used to highlight the verbs that have a direct effect on knowledge worker productivity. Solid green arrows have a positive effect but the striped red arrows a negative effect. Table 9 shows these different symbols:

Table 9. The symbols used in the rich pictures.

Symbols	Descriptions
	Verbs that logically connect nouns extracted from the analysis of the intervention and the challenges identified in the literature reviews.
	Verbs that have a direct positive effect on knowledge worker productivity.
	Verbs that have a direct negative effect on knowledge worker productivity.
	Nouns extracted from the analysis of the intervention and the challenges identified in the literature reviews.
	Needs which are, for example, characteristics, actions or information that are not necessarily present, but could affect the problem situation.
	Behavior of actors in the problem situation.

From the interpretations of the rich pictures root definitions were defined for relevant systems. A root definition is a description of the system in the form of a transformation process in which some entity, input, is changed into a new form of the same entity, output (Checkland and Scholes 1999). To help define the system Checkland recommends using the acronym CATWOE. Table 10 shows what CATWOE stands for.

Table 10. CATWOE (Checkland and Scholes 1999).

Letter	Stands for	Description
C	Customers	The victims or beneficiaries of the transformation process (T).
A	Actors	Those who would do T.
T	Transformation process	The conversion of input-output.
W	Weltanschauung	The perspective which makes T meaningful in context.
O	Owner	Those who could stop T.
E	Environmental constraints	Elements outside the system which it takes as given.

The next section presents the results from the two literature reviews. The papers and books were analyzed and similar ideas grouped together to give an overview of the main knowledge worker challenges being targeted.

3. Knowledge Worker Productivity Challenges

The literature review of academic papers was found to give insight into the problem from the perspective of organizations but the literature review of the industry proxy was designed to give insight into the problem from the perspective of individuals. The literature review of knowledge worker productivity challenges identified four main challenges targeted by the papers and eight main challenges targeted by industry. The next subsections go into these results in detail.

3.1. Challenges Targeted by Current Research

Thirty-nine papers were read with the intent of discovering what knowledge worker productivity challenges they were targeting. The main subjects of the papers were gathered and grouped by theme. Four main challenges were identified from the themes. The four main challenges are information needs and knowledge interdependence; motivation, work engagement and health; organizational structure and changes; and the nature of knowledge work. Most of the papers targeted the challenge

of information needs and knowledge interdependence. The second most popular challenge was motivation, work engagement and health. Table 11 shows which papers targeted which challenge and an overview of the subjects of the papers.

Table 11. Subjects of challenges targeted by past research.

Challenges	Subjects	Papers	No. Papers	% of Read Papers
Information needs and knowledge interdependence	Information management of mobile workers (Makinen 2012), managing email (Kalman and Ravid 2015) , ideal workforce composites and distribution of responsibility (Shao et al. 2014; Delbridge et al. 2000), methods for providing context-based information (Lai 2015; Liu et al. 2012; Ke and Liu 2011; Jung 2008; Liu and Ke 2007), knowledge sharing (Hasan and Pfaff 2012; Ambos and Schlegelmilch 2009; Li and Chang 2009; Duguid 2006), knowledge management (Seethamraju 2000; Barjis et al. 2011; Chatti 2012; Ulbrich et al. 2014).	(Seethamraju 2000; Makinen 2012; Kalman and Ravid 2015; Shao et al. 2014; Delbridge et al. 2000; Lai 2015; Liu et al. 2012; Ke and Liu 2011; Jung 2008; Liu and Ke 2007; Li and Chang 2009; Ambos and Schlegelmilch 2009; Duguid 2006; Barjis et al. 2011; Chatti 2012; Ulbrich et al. 2014)	17	44%
Motivation, work engagement and health	Motivation and autonomy (Gambardella et al. 2015; Gleadle et al. 2012), motivating dispersed workers (Keneley 2008; Mudambi et al. 2007), organizational commitment (Hwang and Yoo 2012; Manville and Obe 2003; Stanton 1972), workplace boredom (Van der Heijden et al. 2012), value congruence and work engagement (Dylag et al. 2013), social relationships in the workplace (Agumba and Fester 2010; Ditton 2009), work hours and health (Kwon et al. 2014), health problems in knowledge work (Richardson and Larsen 1997).	(Gambardella et al. 2015; Gleadle et al. 2012; Keneley 2008; Mudambi et al. 2007; Hwang and Yoo 2012; Manville and Obe 2003; Stanton 1972; Van der Heijden et al. 2012; Dylag et al. 2013; Agumba and Fester 2010; Ditton 2009; Kwon et al. 2014; Richardson and Larsen 1997)	13	33%
Organizational structure and changes	Identities within ever-changing workplaces (Amidon and Blythe 2008), problems with complex structures and processes (Vaughan 1999), refocus priorities within fast changing organizations using critical success factors (Bullen 1995), shift focus from production to knowledge work (Hori 1993), need for capital investment for the office worker (Devilliers 1980).	(Amidon and Blythe 2008; Vaughan 1999; Bullen 1995; Hori 1993; Devilliers 1980)	5	13%
Nature of knowledge work	Differences between manual work and knowledge work (Drucker 1999; Martin 2013), an empirically informed analysis of knowledge work is needed (Darr and Warhurst 2008), a need to change how we learn (Garrick and Clegg 2001).	(Drucker 1999; Martin 2013; Darr and Warhurst 2008; Garrick and Clegg 2001)	4	10%

After analyzing the main challenges of the thirty-nine papers in the literature review of knowledge worker challenges the following inferences were drawn about the four main challenges identified. The challenge of information needs and knowledge interdependence emphasizes the fact that knowledge workers need to work together to achieve organizational goals. They need to obtain the information that they need to solve problems and manage it (Lai 2015; Ke and Liu 2011; Jung 2008; Liu and Ke 2007; Hasan and Pfaff 2012; Li and Chang 2009). They need to transfer their own knowledge to others to contribute to the organization (Hasan and Pfaff 2012; Ambos and Schlegelmilch 2009; Li and Chang 2009; Duguid 2006). Knowledge workers are sometimes hesitant to share their knowledge since they recognize the power it gives them and do not want to become redundant. Organizations often divide

workers into segments around divisions of knowledge (Duguid 2006). This can make knowledge sharing even more problematic and create tensions because of misunderstanding between the groups (Duguid 2006). Organizations become composites of many communities of practice whose differences create internal divisions instead of being an aggregate of individuals united in an organizational culture (Duguid 2006). Organizations must therefore develop a knowledge-sharing environment with appropriate systems and policies for knowledge management to support knowledge workers (Seethamraju 2000). The challenge from the perspective of organizations is creating a knowledge sharing environment and promoting collaboration while preserving opportunities for the individual to see impact of his own personal contribution.

That is where the challenge of motivation, work engagement and health comes in. Knowledge workers want the freedom to use their capabilities and feel competent (Muller-Smith 1997). Autonomy has been recognized as an important factor in motivating knowledge workers and increasing their commitment to the organization (Gambardella et al. 2015; Gleadle et al. 2012; Hwang and Yoo 2012). The worker's level of engagement has an effect on his performance. Van der Heijden et al. (2012) found that workers with high time management skills were less likely to be distracted as a result of workplace boredom. Dylag et al. (2013) found that if there was a conflict between a worker's personal values and the organizations there was a higher risk of professional exhaustion and decrease in work engagement. The work environment affects the mental and physical health of the knowledge worker (Ditton 2009; Kwon et al. 2014; Richardson and Larsen 1997). The challenge for the organization is creating a work environment, which promotes health, motivates and engages their workers, to get optimum performance from them and make them want to work for the organization.

Organizational structure and changes focuses on the external system that is influencing organizations as well as knowledge workers and its increasing complexity. The organization needs to figure out what structure will not hinder the performance of their knowledge workers and fulfill the requirements of their customers, industry standards, cultures and other stakeholders (Amidon and Blythe 2008; Vaughan 1999; Bullen 1995; Hori 1993). The complexity of organizational structures is increasing with globalization, outsourcing, mobile workers and need for cross-functional teams (Amidon and Blythe 2008). There is a need to understand the nature of knowledge work and the knowledge worker to fully grasp the challenge of knowledge worker productivity. Darr and Warhurst (2008) state that an empirically informed analysis of the knowledge worker's work is required to fully understand the productivity challenge. It is not enough to analyze the inputs or outputs of knowledge work, it is equally important to analyze the work practices themselves and the transformation (Darr and Warhurst 2008). Table 12 shows an overview of the discussed conclusions.

Table 12. Summary of inferences drawn about the challenges targeted by past research.

Challenges	Inferences Drawn about the Challenge
Information needs and knowledge interdependence	The organization needs to create a knowledge sharing environment and promoting collaboration while preserving opportunities for the individual to see impact of his own personal contribution.
Motivation, work engagement and health	The organization needs to create a work environment, which promotes health, motivates and engages their workers, to get optimum performance from them and make them want to work for the organization.
Organizational structure and changes	The organization needs to figure out what structure will not hinder the performance of their knowledge workers yet fulfill the requirements of their customers, industry standards, cultures and other stakeholders.
Nature of knowledge work	There is a need to understand the nature of knowledge work and the knowledge worker to fully grasp the challenge of knowledge worker productivity.

The next section presents the results from the literature review of a proxy for industry, which give an insight into the challenges of the individual knowledge worker.

3.2. Challenges Targeted by Industry

Forty popular personal productivity self-help books were analyzed, as a proxy for industry. The assumption was that they would give insight into the challenges experienced by the individual knowledge worker within organizations from the perspective of consultants and the knowledge worker himself. The primary and secondary subjects of the books were gathered and grouped by theme. The primary subjects reflect the main themes of the books and the secondary subjects, other themes that the books also emphasized. Table 13 shows which books target which primary challenges.

Table 13. Primary challenges targeted by the books.

Primary Challenges	Books	No. Books	% of Read Books
Too much demand and insufficient resources	(Allen 2001; Tracy 2013; Leland and Bailey 2008; Perry 2012; Song et al. 2007; Pash and Trapani 2011; Chandler 2011; Vanderkam 2010; Stack 2004; Henry 2011; Harvard Business Essentials 2005)	11	28%
Self-development and self-awareness	(Covey 2004; Hubbard 2011; Duhigg 2012; Tan 2012; Blanchard et al. 2005; Goleman 1999; Baumeister and Tierney 2011; Deci 1995)	8	20%
Effectiveness	(Drucker 1966; Covey et al. 1994; Koch 2008; Meier 2010; Stanier 2010; Bennington and Lineberg 2010)	6	15%
Achieving and/or setting goals	(Selk 2009; Moran and Lennington 2013; Holden 2012; Scott 2004; Lewis 2012; Babauta 2008)	6	15%
Performing to full potential	(Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010; Kelley 1998a, 1998b; Gleeson 2009)	5	13%
Making thinking more productive	(Checkland 1993; De Bono 2000; Paul and Elder 2013; Maxwell 2009)	4	10%

The primary challenges identified were: too much demand and insufficient resources; self-development and self-awareness; effectiveness; achieving and/or setting goals; performing to full potential and making thinking more productive. The following inferences were drawn about these six primary challenges. Too much demand and insufficient resources was the most common challenge within the books. The individual knowledge worker needs to deal with demands from himself, the organization and each role in his social system using his personal resources, knowledge, available information and available time. When the worker binds emotionally or intellectually to a demand it becomes a commitment (Moran and Lennington 2013). Having too many commitments can quickly overwhelm the worker, making it harder to keep them (Allen 2001; Leland and Bailey 2008; Meier 2010). A lot of the stress workers experience comes from badly managed commitments, which pull at the worker's attention (Allen 2001). The most popular solution to this challenge was time management, which focuses on minimizing time-wasters, being aware of time in relationship to the tasks and improving time-task effectiveness (Drucker 1966; Allen 2001; Leland and Bailey 2008; Covey 2004).

The challenge of self-development and self-awareness touches on the fact that the knowledge worker needs to know what his personal resources are to utilize them to improve his personal productivity, motivate himself to get things done and handle the pressures of the demands made on him. Personal resources can be grouped into physical, emotional, social and cognitive resources. Physical resources are the individual's strength, endurance and restfulness, which stems from sleep, nutrition, exercise and breathing (Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010). Emotional resources are the individuals' emotional capacities and perceived experiences, which include self-control, self-esteem and empathy (Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010).

Social resources include social skills, communication, sense of connectedness to others and spiritualism, which comes from the individual's connection to deeply held values, purposes and vision (Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010). Cognitive resources are the worker's natural and learned intellectual capacities and his ability to access them (Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010). Self-development is the process of developing competences, acquiring new skills and learning (Tracy 2013; Goleman 1999; Covey et al. 1994) while self-awareness is the workers knowledge of his own internal states, preferences, resources and intuitions (Goleman 1999). To improve self-awareness and increase self-development the books suggest tools such as mindfulness; identifying strengths, weaknesses, personal values, principles and a personal vision; changing perspectives and attitudes; continuous learning and focusing on continuous improvement.

Effectiveness is doing the right thing or getting the right results, which is third most common challenge (Tangen 2005). The challenge is knowing which tasks to focus on to create value for the organization, the individual knowledge worker or others. The books agree that the knowledge worker needs to identify his key result areas. Key result areas of the knowledge worker's job are where he can utilize his strengths, knowledge and competence to contribute the most to the performance and results of the organization (Drucker 1966; Tracy 2013; Covey et al. 1994; Koch 2008; Moran and Lennington 2013). Key result areas are where talent, passion and value meet (Meier 2010). The rest of the challenges identified are related to the first three. The challenge of achieving and/or setting goals stems from the popularity of goals as tools to help the knowledge worker get the right things done and get the right results, in other words be effective. Goals are statements of what the worker wants to achieve or how he will achieve it (Selk 2009).

Performing to full potential is the challenge of managing the personal resources the knowledge worker has identified with self-awareness and nurtured with self-development. Every thought, feeling and action has an effect on the worker's personal resources; some of them deplete resources while others restore resources (Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010). Most activities can both restore and deplete different resources and their effects change throughout life (Greenblatt 2009). A worker can use self-awareness to identify what effect activities have on their personal resources and invest time in balancing restoration and depletion to minimize the risk of burnout (Meier 2010; Loehr and Schwartz 2003; Schwartz et al. 2010). The most common restorers are sleep, working within your strengths, sunlight and exercise (Greenblatt 2009). The most common depleters are emotional labor, interruptions and cultures of relentless enthusiasm (Greenblatt 2009). Making thinking more productive is a specific challenge that arises because of nature of knowledge work. Thinking is using data, facts and experiences to make inferences and judgments to create meaning, answer questions or solve problems (Paul and Elder 2013). Thinking is a skill the knowledge worker needs to use in everything he does. Making thinking more productive can increase knowledge creation, decrease mistakes of judgment, increase creativity and allow the worker to better assess risk (Loehr and Schwartz 2003).

Most of the secondary challenges, that the books target, are the same as the primary challenges in other books. New challenges identified as secondary are successful relationships and collaborations and motivation. Table 14 shows which books target which secondary challenge.

Twelve books targeted the secondary challenge of successful relationships and collaborations. The knowledge worker only has part of the knowledge needed to get his job done, so collaborating is vital (Goleman 1999). He is only effective if and when other people make use of what he contributes (Drucker 1966). Relationships are connections between people comprising of mutual enjoyment, respect, shared experiences, reciprocity and trust (Koch 2008). Healthy relationships can be a powerful source of both positive energy and of renewal (Lewis 2012; Schwartz et al. 2010). Creating relationships to proactively develop dependable pathways to experts that can help the worker complete tasks is called networking (Kelley 1998a, 1998b). The books that targeted this challenge focused on knowledge sharing, understanding the perspective of others, having compassion, communication, leadership, followership and getting the support that the knowledge worker needs to get his job done. The

challenge of successful relationships and collaborations stems from the interdependence between knowledge workers and the human need to feel connected with others.

Table 14. Secondary challenges targeted by the books.

Secondary challenges	Books	No. Books	% of Read Books
Successful relationships and collaborations	(Drucker 1966; Song et al. 2007; Covey 2004; Tan 2012; Blanchard et al. 2005; Goleman 1999; Covey et al. 1994; Koch 2008; Scott 2004; De Bono 2000; Maxwell 2009; Kelley 1998a, 1998b)	12	28%
Effectiveness	(Allen 2001; Tracy 2013; Perry 2012; Vanderkam 2010; Harvard Business Essentials 2005; Moran and Lennington 2013; Lewis 2012; Babauta 2008; Meadows 2008)	9	23%
Achieving and/or setting goals	(Leland and Bailey 2008; Pash and Trapani 2011; Stack 2004; Duhigg 2012; Baumeister and Tierney 2011; Stanier 2010; Gleeson 2009)	7	13%
Self-development and self-awareness	(Henry 2011; Bennington and Lineberg 2010; Selk 2009; Loehr and Schwartz 2003; Greenblatt 2009; Schwartz et al. 2010; Paul and Elder 2013)	7	13%
Motivation	(Chandler 2011; Hubbard 2011; Deci 1995; Meier 2010)	5	10%

Motivation is defined as an affective state that arouses a worker to action, directs, persists and engages him in certain activities (Cheng and Yeh 2009). Motivation can be intrinsic or extrinsic (Drucker 1966; Deci 1995; Meier 2010; Stanier 2010; Lewis 2012; Loehr and Schwartz 2003). Intrinsic motivation comes from the worker's thoughts, feelings or body (Meier 2010; Loehr and Schwartz 2003) while extrinsic motivation is when the worker is motivated by rewards, punishment or other external motivators (Meier 2010; Loehr and Schwartz 2003). Intrinsic motivation is at the heart of creativity, accountability, healthy behavior and lasing change (Deci 1995). The books that targeted this challenge focused on intrinsic motivators such as autonomy, competence, purpose, vision, a compelling why, compelling outcomes and sense of accomplishment through small wins. The challenge of motivation for the individual knowledge worker is finding and nurturing intrinsic motivation to arouse himself to action and get things done. Table 15 shows an overview of the inferences made about each of the eight challenges identified in the personal productivity self-help books.

Table 15. Summary of inferences drawn about the challenges targeted by the books.

Challenges	Inferences Drawn about the Challenge
Too much demand and insufficient resources	The individual knowledge worker needs to deal with demands from himself, the organization and each role in his social system using his personal resources, knowledge, available information and available time.
Effectiveness	The individual knowledge worker cannot fulfill every demand on him, he needs to choose what to do, how to do it and when to do it. The challenge is knowing which tasks to focus on to create value for the organization, the individual knowledge worker or others in his social system.
Self-development and self-awareness	The knowledge worker needs to know what his personal resources are to utilize them to improve his effectiveness, efficiency, motivate himself to get things done and handle the pressures of the demands made on him as well as know which competences and skills he needs to develop.
Achieving and/or setting goals	The challenge of achieving and/or setting goals stems from the popularity of goals as tools to help the knowledge worker get the right things done and get the right results, in other words be effective. The challenge is successfully using this tool.

Table 15. *Cont.*

Challenges	Inferences Drawn about the Challenge
Performing to full potential	Performing to full potential is the challenge of managing the personal resources the worker has identified with self-awareness and nurtured with self-development (includes issues such as health, stress, exhaustion and psychological distress).
Making thinking more productive	Thinking is a skill the knowledge worker needs to use in everything he does. Making thinking more productive can increase knowledge creation, decrease mistakes of judgment, increase creativity and allow the worker to better assess risk (Loehr and Schwartz 2003).
Successful relationships and collaborations	The challenge of successful relationships and collaborations stems from knowledge worker interdependence and the human need to feel connected with others.
Motivation	The challenge of motivation for the individual knowledge worker is finding and nurturing intrinsic motivation to arouse himself to action and get things done.

The next sections describe the results of the problem situation analysis, rich pictures and root definitions.

4. Problem Situation—Rich Pictures and Root Definitions

The organization and the individual knowledge worker were identified as the problem owners of the system based on the results of the literature reviews. An analysis of the intervention was performed for both problem owners by drawing conclusions from literature to answer the questions posed in section 2.3. Table 16 shows the results of this analysis.

Table 16. Analyses of the intervention, leading questions and answers (Checkland 1993).

Question	Answer for Each Problem Owner:	
	Individual	Organization
The problem owner's version of the nature of the problem is:	Low knowledge worker productivity is a problem for the individual knowledge worker because of the shift of responsibility of productivity from the organization to the individual. The individual knowledge worker is expected to manage and be accountable for his own career advancement, professional development and contribution to the organization (Drucker 1999; Letiche and van Hattem 2000).	Low knowledge worker productivity is a problem because the organization is dependent on knowledge workers to create value and contribute to the organizational knowledge base that is the organization's competitive advantage (Jayasingam and Yong 2013; Jayasingam et al. 2016).
The problem owner's reasons for regarding the problem as a problem are:	Those who cannot keep up with the demands of the autonomy and accountability resulting from this shift experience stress and exhaustion (Letiche and van Hattem 2000).	Being dependent on knowledge workers is a problem because they are human beings who have different needs that need to be fulfilled to get the optimum performance from them.
The problem owner's expectations of a problem-solving system are:	A system that supports the individual knowledge worker in managing his own career advancement, professional development and contribution to the organization.	A system that allows the organization to increase the value contribution of their knowledge workers and retain workers.
The assumed value of a problem-solving system is:	Supporting the individual knowledge worker in managing his own career advancement, professional development and contribution to the organization would allow them to deal with the increased demands and not experience stress and exhaustion increasing their overall personal productivity and satisfaction in life.	Increasing the value contribution of their knowledge workers and retaining them would allow the organization to gain competitive advantage and decrease overhead due to less turnover and better use of resources.

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The analysis above and the identified challenges were used to create rich pictures of the problem situation and define root definitions. The rich pictures give a simplified visual description of the problem situation from the perspective of the two problem owners, individual and organization. The root definitions describe the system in the form of a transformation process. The next sections present these rich pictures and root definitions for each of the problem owners.

4.1. Organization as Problem Owner

Figure 1 shows a rich picture of the problem situation from the perspective of the organization. The organization has some organizational objectives and needs which are influenced by external factors such as customers, industry standards and business environment. The organization must communicate what is value to them through their organizational objectives and needs. The solid green arrow shows that knowledge worker productivity increases if knowledge workers fulfill demands that create value. The striped red arrow from the knowledge workers shape shows that overall knowledge worker productivity decreases if the workers fulfill demands that are time-wasters. Demands that do not contribute to organizational objectives and needs are usually a waste of time.

The organization creates a work environment that fulfills the needs of some knowledge workers, but might not fulfill the need of others. The work environment consists of tangible and intangible things such as the organizational structure, work design, technology, incentives and culture. According to the results of the literature review of academic papers the work environment needs to promote health, collaboration and knowledge sharing as well as engage and motivate knowledge workers to improve their performance. If a work environment does not fulfill the needs of knowledge workers they will underperform, which will have a negative effect on overall knowledge worker productivity. If their needs are unmet for long it is likely that they will quit, increasing turnover. A high turnover rate means a lot of knowledge is lost from the organizational knowledge base. The organizational knowledge base gives the organization competitive advantage.

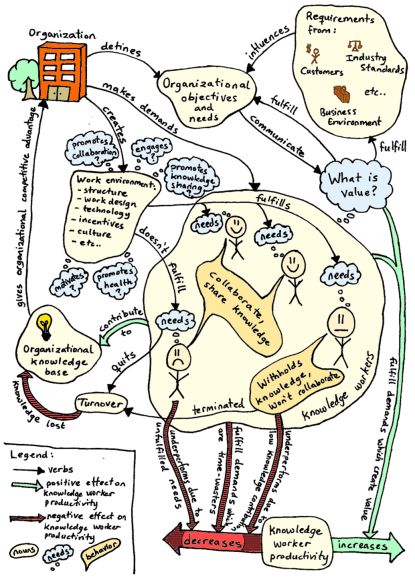

Figure 1. Rich picture of the problem situation with the organization as the problem owner.

Knowledge workers within an organization are usually interdependent. They rarely have all the knowledge or skills needed to achieve organizational objectives. By sharing knowledge and collaborating, knowledge workers strengthen the organizational knowledge base and less knowledge is lost due to turnover. Therefore, knowledge workers that refuse to collaborate and withhold knowledge underperform due to restricted access to resources, such as knowledge or skills their co-workers possess, and they contribute less to the organizational knowledge base. If these workers continue to underperform they might get dismissed leading to higher turnover and knowledge loss. From the rich picture three main conclusions can be made about the problem situation of low knowledge worker productivity from the perspective of the organization. Table 17 shows these conclusions.

Table 17. Main conclusions from the rich picture with the organization as the problem owner.

Main Conclusions
The organization must communicate organizational objectives and needs so knowledge workers can fulfill demands that create value and not waste time on the wrong things.
The work environment needs to promote collaboration and knowledge sharing to facilitate knowledge worker contribution to the organizational knowledge base, which gives the organization competitive advantage. Also, knowledge workers who withhold knowledge and won't collaborate underperform due to restricted access to resources.
The work environment needs to fulfill the needs of the knowledge workers to get optimum performance from them. A knowledge worker whose needs are unfulfilled will underperform.

From the conclusions above the organization has control over the work environment. According to these results, the organization should be able to improve knowledge worker productivity by creating a work environment that supports the needs of the knowledge workers and influences them to achieve organizational objectives. The root definition was defined from the conclusions of the rich pictures and a CATWOE analysis (Table 18).

Table 18. CATWOE for a system owned by the organization.

Letter	**Stands for**	**System Owned by the Organization**
C	Customers	Organization
A	Actors	Knowledge Worker
T	Transformation process	Perceived effort of knowledge workers transformed into perceived value by the organization
W	Weltanschauung (Perspective)	Knowledge worker productivity can be improved by supporting the needs of the knowledge workers and influencing them to achieve organizational objectives
O	Owner	Organization
E	Environmental constraints	Business environment, industry standards, culture, etc.

The CATWOE analysis showed that the organization benefits of a transformation, executed by the knowledge worker, of perceived effort of the individual knowledge worker into perceived value by the organization. The perspective (weltanschauung) is that knowledge worker productivity can be improved by supporting the needs of the knowledge workers and influencing them to achieve organizational objectives. The root definition is stated in Table 19.

Table 19. Root definition of a system owned by the organization.

Root definition—Organization
A system, owned by the organization, which transforms perceived effort of knowledge workers into perceived value by the organization by creating a work environment, which supports the needs of the workers and influences them to increase their value contribution to the organization.

The next section presents a rich picture of the problem situation from the perspective of the individual knowledge worker and defines a root definition of a system owned by him.

4.2. Individual Knowledge Worker as Problem Owner

The problem situation from the perspective of the individual knowledge worker stems from the shift of responsibility of productivity from the organization to the individual. Figure 2 shows a rich picture of the problem situation from the perspective of the individual knowledge worker. The knowledge worker has personal resources and competences. His competences consist of, for example, his knowledge, skills, perspective and networks. The knowledge worker uses his competences in everything he does. Self-awareness allows the worker to identify his competences, so that the worker can utilize his strengths and compensate for his weaknesses. It can also be used to identify opportunities for self-development and create intrinsic motivation. Motivation is necessary to arouse the worker to action, direct, persist and engage him in certain activities (Cheng and Yeh 2009). Intrinsic motivation comes from the worker's thoughts, feelings or body (Meier 2010; Loehr and Schwartz 2003) while extrinsic motivation comes from external rewards or punishment such as pay, incentives and reprimands. Organizations can use motivators to try to motivate workers to want to work and create value for them.

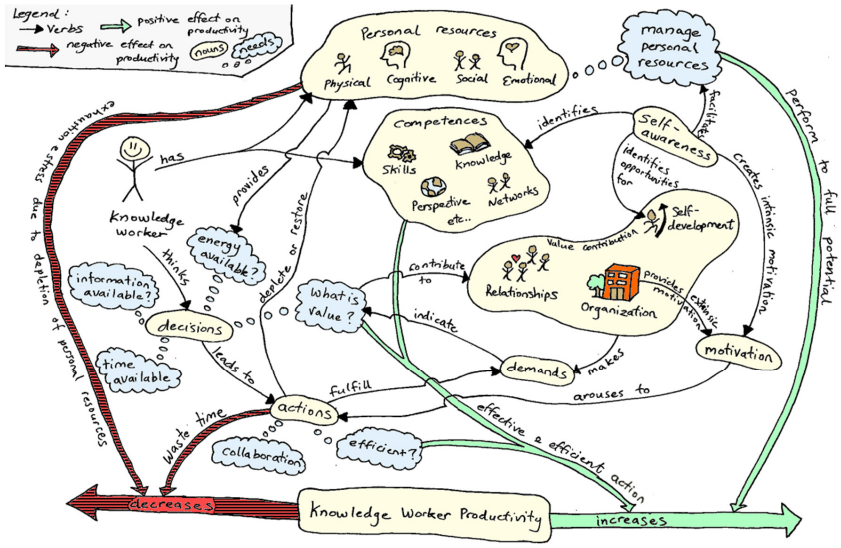

Figure 2. Rich picture of the problem situation with the individual as the problem owner.

Self-awareness facilitates personal resource management because the knowledge worker becomes more in tune with his state and needs. Personal resources can be grouped into physical, cognitive,

social and emotional resources as discussed in Section 3.2. If the knowledge worker manages his personal resources, he can perform to his full potential improving his productivity. If the knowledge worker depletes his personal resources, he may suffer from exhaustion and stress. Exhaustion and stress lowers his ability to perform and therefore his productivity.

The knowledge worker thinks and makes decisions that lead to actions. When making decisions the worker needs to take in account time available, information available, energy available and what would create value. The state of his personal resources provides the knowledge worker with a sense his available energy. Every action he takes either depletes personal resources or restores them. Actions may require collaboration and can usually be done in more than one way. The knowledge worker should strive to do things efficiently. The knowledge worker needs to know what actions create value to be effective. The knowledge worker can usually create value by contributing to relationships, the organization or self-development. Relationships fulfill the human need to feel connected with others, facilitate collaboration and are the foundation of networks, which give the worker access to resources. The knowledge worker creates value for the organization by contributing to its organizational objectives and needs. Self-development allows the knowledge worker to acquire new competences and increase his personal resources, improving his performance. These three groups all make demands on the knowledge worker, which he fulfills with his actions. The demands from these groups also give the worker an indication of what is value. The knowledge worker increases his productivity by being effective and efficient. He is effective if he utilizes his competences and strives to create value. Actions taken which do not create value are a waste of time.

From the rich picture, two main conclusions can be made about the problem situation of low knowledge worker productivity from the perspective of the individual knowledge worker. Table 20 shows these conclusions.

Table 20. Main conclusions from the rich picture with the individual knowledge worker as the problem owner.

Main Conclusions
The individual knowledge worker must manage his personal resources to perform to his full potential. If he depletes his personal resources he experiences exhaustion and stress which lower his performance.
The individual knowledge worker must be effective and efficient and not waste energy and time on actions that do not create value.

A CATWOE analysis was executed to explore a relevant system owned by the individual. The transformation is the same regardless of problem owner only the perspective (weltanschauung) has changed. The perspective is that the knowledge worker can improve his productivity by managing his personal resources, being effective and efficient. Table 21 shows the CATWOE analysis for a system owned by the individual.

Table 21. CATWOE for a system owned by the individual.

Letter	Stands for	System Owned by the Individual
C	Customers	Organization
A	Actors	Knowledge worker
T	Transformation process	Perceived effort of the individual knowledge worker transformed into perceived value by the organization
W	Weltanschauung (perspective)	The knowledge worker can improve his productivity by managing his personal resources, being effective and efficient
O	Owner	Individual
E	Environmental constraints	Laws, culture etc.

Table 22 states the root definition of a system owned by the individual defined from the rich picture and the CATWOE analysis. The root definition focuses on the productivity of the individual knowledge worker.

Table 22. Root definition of a system owned by the individual.

Root definition—Individual
A system, owned by the individual, which transforms perceived effort of the individual knowledge worker into perceived value by the organization by managing personal resources, being effective and efficient.

The next section discusses the results of this paper and contemplates the interaction between the two systems defined by the root definitions, organization and individual knowledge worker.

5. Contemplation of the Interaction between the Systems

To explore the interaction between the two systems defined by the root definitions the literature was revisited. This section discusses current research factions, the new perspective of the individual knowledge worker and then takes steps towards a holistic view of knowledge worker productivity.

5.1. Current Research Factions—Knowledge Management or Retain and Invest in Knowledge Workers

As mentioned in the introduction current research can mostly be split into two factions. One of those factions consists of those who believe that knowledge can be codified into external systems and that knowledge worker productivity can be improved through knowledge management. The other faction consists of those who do not believe that knowledge can be codified, so that the emphasis needs to be on retaining knowledge workers and investing in them. However, both factions mostly focus on knowledge not the knowledge worker himself. The perspective is that the knowledge is the resource while the knowledge worker is the package that contains it. You can either try to remove the resource from the package, as knowledge management attempts, or you can keep and manipulate the package to use the resource, by retaining and investing in the knowledge worker. Investing in the knowledge worker is just a means to an end.

The results of the literature review of academic papers showed these two factions in the identified challenges of information needs and knowledge interdependence and motivation, work engagement and health targeted by the academic papers. Knowledge management is a proposed solution to the challenge of information needs and knowledge interdependence. Knowledge management research covers a wide range of subjects pertaining to knowledge, such as knowledge transfer, creation, adoption, flow, sourcing and dissemination. It also covers information use behavior, such as search, extraction and information overload. Recently researching the benefits and problems of using technology like information systems and knowledge management systems as well as how to design these systems has been popular.

The main theme throughout knowledge management literature is that the organizational knowledge base gives the organization a competitive advantage and that organizations need to manage this organizational knowledge base. Knowledge workers need to contribute to this organizational knowledge base to be valuable to the organization. Therefore, to improve knowledge worker productivity the organization needs to devise of ways to increase the knowledge worker's contribution to the organizational knowledge base. They can do that through collaboration and knowledge sharing. Collaboration makes use of the knowledge of many to solve problems and get things done. Through collaboration knowledge is transferred from one worker to another and often new knowledge is acquired by all participants. Knowledge sharing can then be done by, for example, documenting knowledge into information systems or reports. Figure 3 shows a simplified view of the knowledge worker productivity problem from the perspective of knowledge management.

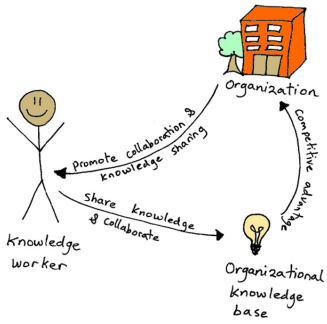

Figure 3. The knowledge worker productivity problem from the perspective of knowledge management.

Research on retaining and investing in knowledge workers propose solutions to the challenge of motivation, work engagement and health targeted by the academic papers in the literature review. If knowledge cannot be codified into external systems, organizations need to retain their knowledge workers and invest in them, to not lose organizational knowledge by turnover. Research in the faction of retaining and investing covers an even wider range of subjects than knowledge management, such as job satisfaction, worker behavior, stress, organizational commitment, psychological distress, social support, ergonomics and work identity. This faction believes that by fulfilling the needs of the knowledge worker his performance improves, giving the organization better access to his knowledge and increasing his commitment to the organization. If the knowledge worker's commitment is low he could leave the organization, taking his organizational knowledge with him. The main theme of this research is that the organization needs to fulfill the needs of the knowledge worker to increase performance and commitment to the organization. Figure 4 shows a simple view of the knowledge worker productivity problem from the perspective of retaining and investing in knowledge workers.

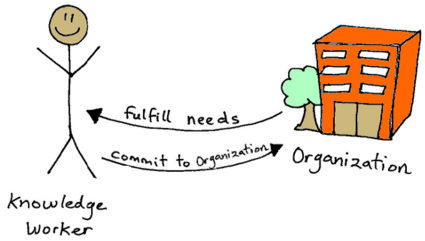

Figure 4. The knowledge worker productivity problem from the perspective of retaining and investing in knowledge workers.

When looking at these two factions from higher levels of abstraction, they do not oppose each other's theories but complement them. To solve the knowledge worker productivity challenge, the findings of these factions need to be combined into a holistic approach. There is a need to find a balance between codifying knowledge and investing in knowledge workers to increase their performance and commitment to improve knowledge worker productivity. There is one thing missing though in current research: the perspective of the individual knowledge worker. How does he fit into the knowledge worker productivity dilemma? The next section discusses insights that the perspective of the individual knowledge worker can give to the problem situation in the context of current research.

5.2. The Individual Knowledge Worker—A New Perspective

Most of the current research read did not tackle the knowledge worker productivity challenge from the perspective of the individual knowledge worker. The individual knowledge worker is only explored from the perspective of the organization. The individual knowledge worker's experiences and perceptions of his own productivity are rarely explored. The eight main challenges identified in the literature review of the personal productivity self-help books highlighted important factors the individual knowledge worker needs to deal with daily which affect his productivity. For example, the challenge of self-awareness and self-development touches on everything the knowledge worker does. He needs self-awareness and self-development to be effective and efficient. The worker needs to be effective and efficient to deal with demands with the resources he has. The perspective of the individual knowledge worker gives a new dimension to the knowledge worker productivity dilemma.

Figure 3 showed a simple view of the knowledge worker productivity challenge from the perspective of knowledge management research. If the dimension of the individual knowledge worker is added to that figure, two important factors stand out which are often forgotten. Figure 5 shows the extended figure. The individual knowledge worker needs self-awareness and self-development to contribute to the organizational knowledge base. Self-awareness allows the worker to know what knowledge he has which needs to be shared and self-development is necessary for the worker to adopt new knowledge to enrich the organizational knowledge base. The other factor is relationships. The individual knowledge worker needs to create and develop relationships to have access to needed resources, the knowledge of others, and collaborate successfully.

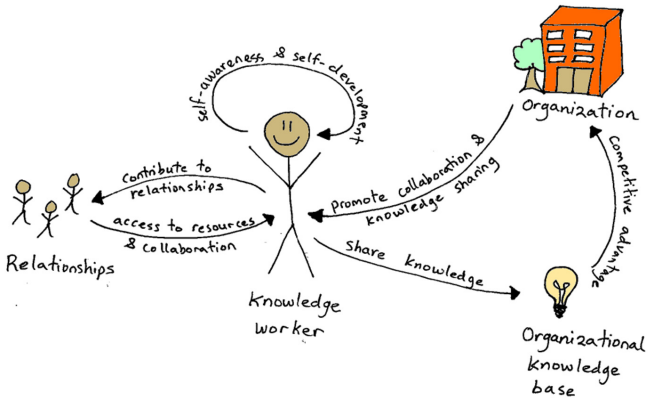

Figure 5. The knowledge worker productivity problem from the perspective of knowledge management including the individual knowledge worker.

The same can be done to the simple view of the knowledge worker productivity challenge from the perspective of retaining and investing in knowledge workers (see Figure 4). When the dimension of the individual knowledge worker is added to the figure, two important factors stand out as well. Figure 6 shows this extended figure. Self-awareness and self-development is again a factor. The knowledge worker needs self-awareness to identify his needs so that he can communicate them to the organization. If the knowledge worker communicates his needs, the organization can fulfill them more effectively. The other factor is personal resource management. The worker needs to manage his personal resources to perform to full potential. The worker also uses self-awareness and self-development to manage personal resources. This includes, for example, managing basic things like sleep, nutrition and exercise

as well as more complex things like controlling emotions, living in alignment with principles and social interaction.

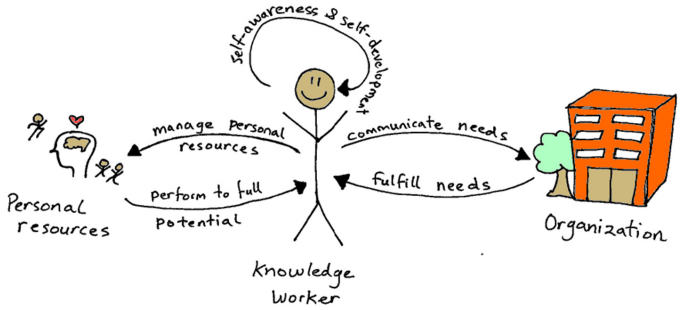

Figure 6. The knowledge worker productivity problem from the perspective of retaining and investing in knowledge workers including the individual knowledge worker.

The knowledge worker cannot just be a means to an end. The whole knowledge worker is the resource not just his knowledge. The individual knowledge worker needs to be proactive and take responsibility for his own productivity. The organization cannot control so many of the factors that influence his performance. The organization can only create the optimal work environment that supports the knowledge worker, helps him thrive and influences him to create value for the organization. However, the organization cannot do that if the knowledge worker does not know himself what he needs from his work environment and therefore cannot communicate his needs. The knowledge worker needs to manage his personal resources to perform to his full potential. If the knowledge worker does not manage his personal resources he is more susceptible to stress, exhaustion and burnout which leads to underperformance and creates a vicious cycle. This vicious cycle often ends with the employee leaving or being terminated.

The individual knowledge worker plays a significant role in a possible solution to the knowledge worker productivity challenge. There is a need to understand the individual knowledge worker and train him so that he can take responsibility for the factors only he has control over which affect his own productivity. Combining the two factions of current research and the dimension of the individual knowledge worker would be a first step towards a holistic view of knowledge worker productivity. This paper attempts this at a high level of abstraction. The next section discusses the resulting holistic view.

5.3. Towards a Holistic View of Knowledge Worker Productivity

The rich picture from the perspective of the organization highlighted three fundamental influencers of knowledge worker productivity. The organization must communicate what they perceive as value, the organization needs to promote collaboration and knowledge sharing and create a work environment where they motivate and fulfill the needs of their knowledge workers. Most research on knowledge worker productivity falls into one of these groups indicating a successful abstraction. This rich picture combines the fundamentals from the two factions of current research, knowledge management and retaining and investing in knowledge workers.

There is a clear thread running through current research that was visible when looking at the challenges targeted. That thread stems from changes connected to new information and communication technology, the nature of the knowledge worker and his job and the fact that modern organizations must rely on the knowledge of their workers for competitive advantage. Information and communication technology is facilitating the reorganization of bureaucratic structures, globalization,

outsourcing, mobility of workers and cross-functional teams (Amidon and Blythe 2008). Routine nonconformity, mistakes, misconduct and disasters are systematic products of the complex structures and processes that many modern organizations have (Vaughan 1999). Organizations must reorder their functional priorities by shifting their focus from production and product development to creating the right environment for their knowledge workers (Hori 1993).

Martin (2013) says that organizations make the mistake of structuring their knowledge workforce as they do a manual workforce where each employee is doing the same tasks every day, which is counterintuitive to the nature of the knowledge worker and his job. Knowledge work comes primarily in the form of projects, not routine daily tasks that can result in downtime if the workforces are organized around permanent full-time jobs (Martin 2013). Knowledge worker jobs need to be flexible so the organization can redeploy resources where needed (Martin 2013). A flexible structure would reduce overhead costs and lessen the likelihood of ending up in the destructive cycle of hiring and firing (Martin 2013). However, when many of the conventional methods of managing the productivity of manual work are applied to knowledge workers, their productivity improves even though current research agrees that knowledge work is fundamentally different from manual work. This phenomenon needs to be explored. One hypothesis is that most workers do not solely work as knowledge workers; part of their job is manual and involves routine tasks. Therefore, the conventional methods of managing productivity of manual work improve the manual part of a knowledge worker's job. Drucker (1999) called these workers technologists.

The rich picture from the perspective of the individual knowledge worker highlighted the fact that knowledge workers need to manage their personal resources, be effective and efficient to maximize their own productivity. This rich picture shows the fundamentals of the dimension of the individual knowledge worker discussed earlier. The two systems, from the perspective of organizations and individual knowledge workers, differ in their boundaries. The organization has control over the work environment and needs to influence knowledge workers to transform effort into value while the individual knowledge worker has control over himself and needs to influence the environment to transform effort into value. These two systems are interdependent and should complement each other to give the best insight into what can be done to improve knowledge worker productivity.

Figure 7 shows on a high level of abstraction how these two systems interact. On the highest level of abstraction, knowledge worker productivity is dependent on the success of the basic interactions of the organization communicating what is perceived as value to them and the knowledge worker performing effective actions efficiently to create that value. Inside the box in Figure 7 the fundamental interactions needed for the knowledge worker to perform effective actions efficiently are highlighted. The knowledge worker needs self-awareness and self-development to identify his needs, personal resources and competences. He can only then communicate his needs to the organization, share knowledge to contribute to the organizational knowledge base and manage his personal resources and competences to perform to full potential. If the knowledge worker is performing to full potential, he is using his personal resources effectively and efficiently. The individual knowledge worker needs to work within the boundary of his work environment. The organization needs to create a work environment that fulfills the knowledge worker's needs, motivates him towards creating value for the organization and promotes collaboration and knowledge sharing. Knowledge workers are interdependent and have a need to feel connected to others. The knowledge worker needs to spend time and energy in contributing to relationships to gain access to resources, such as other worker's knowledge. Relationships also facilitate collaboration, by creating e.g., mutual experiences, trust and respect, and fulfill the need to feel connected to others. The knowledge worker is being effective when spending time in forming and developing the right relationships. This process often does not look like value creating work, for example, employees on a coffee break or playing a game during office hours.

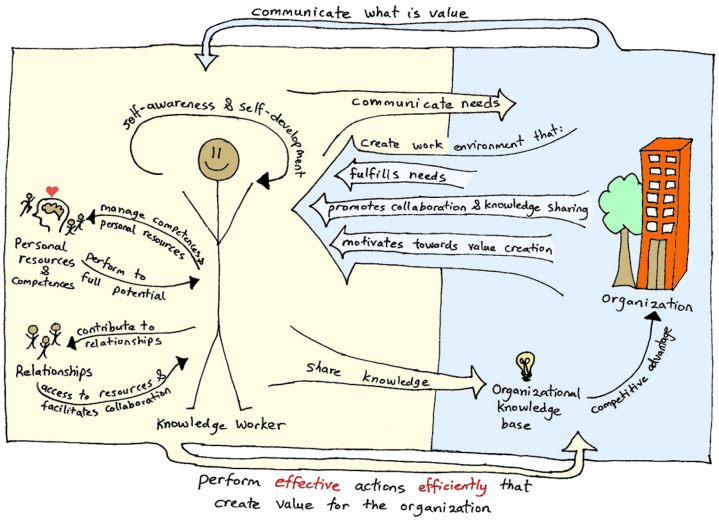

Figure 7. A simple holistic view of knowledge worker productivity.

This simple holistic view of knowledge worker productivity includes the fundamentals of the two factions of current research and the dimension of the individual knowledge worker identified in the literature reviews. The next section discusses recommendations for further research to get us closer to solving the knowledge worker productivity challenge.

6. Discussions

This research is a first step of many towards a holistic view of knowledge worker productivity. It focused on the abstraction of the problem situation into simple rich pictures and defining relevant systems. The simple rich pictures and root definitions are subjective interpretations of knowledge worker productivity based on inferences made in the two literature reviews. The perspectives of the researchers influenced the interpretations and inferences made throughout the process. This research only tackled the first three stages of the soft systems approach. The social and political system were not included and in the literature reviews restrictive search parameters were used which might have excluded some papers of possible significance.

There is a need to go back to the fundamental questions around knowledge worker productivity such as what are the characteristics of knowledge workers, how does knowledge work differ from manual work and how do the knowledge worker and organization interact? There is a lack of empirical studies that observe and analyze knowledge workers. Most initiatives that organizations take to improve knowledge worker productivity are a hit or miss depending on factors that are often hidden and unknown. The reason knowledge worker productivity has not been approached holistically very often is because of the perceived vastness of this problem. This vastness comes from the amount of and level of detail of current research. Therefore, the first step to a holistic approach is looking at the problem from the highest possible level of abstraction to identify the fundamentals of knowledge worker productivity. This paper presented such an abstraction from literature reviews of knowledge worker productivity challenges.

The next step in this research should be to take the results from the analysis of the problem situation and create conceptual models, using soft systems methodology. Conceptual models explore through logic what needs to be done to achieve the purpose conveyed in the root definitions. They

give insight into possible intervention points to improve knowledge worker productivity and give ideas for research opportunities. Intervention points are where a change could be made to improve the real problem situation. By looking at the rich pictures possible intervention points could be in creating the work environment, managing personal resources and communication between organizations and their knowledge workers. These are factors that can have positive or negative effect on knowledge worker productivity depending on how they are tackled. The effect of changes at the intervention points can be explored by digging deeper into these intervention points and using other tools, such as causal loop diagrams and system models using system dynamics. Future research can contribute to the holistic view of knowledge worker productivity by, for example, doing literature reviews on intervention points, case research on parts of the conceptual model and action research on intervention points. It would also be beneficial if future research would complete the analyses, of the social system and political system, to explore their effect on the knowledge worker productivity system. The social system and political system probably play a large part in the hidden and unknown factors that make productivity initiatives a hit and miss. The final objective is to find applicable methods and tools to manage and improve knowledge worker productivity.

There is a treasure trove of information regarding knowledge worker productivity in academic and popular literature. There is a need to consolidate it to create a holistic view of knowledge worker productivity to aid in the revolution of the management of knowledge workers.

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Paper II

A Soft Systems Approach to Knowledge Worker Productivity: A Purposeful Activity Model for the Individul

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Helga Guðrún Óskarsdóttir and Guðmundur Valur Oddsson conceived of and designed the research; Helga Guðrún Óskarsdóttir performed the research, created the model, and wrote the paper. Jón Þór Sturluson and Rögnvaldur Jóhann Sæmundsson reviewed the paper. All authors have read and agreed to the published version of the manuscript.

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Article

A Soft Systems Approach to Knowledge Worker Productivity: A Purposeful Activity Model for the Individual

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Abstract: This research attempted to find and define holistic systems that affect the productivity of the knowledge worker (KW), using the soft systems methodology (SSM). It is not enough to look at the management and improvement of knowledge worker productivity (KWP) from the viewpoint of the organization. The viewpoint of the individual KW needs to be considered as well. The KW owns the means of production; they carry their knowledge in their heads and take it with them when changing jobs. This paper proposes a conceptual framework that describes the process in which the KW uses resources to execute actions to create tangible or intangible artifacts with the intention of generating value. It was based on interpretations and inferences made from an extensive literature review using the snowballing method. This paper highlights what implications the lessons learned from the conceptual framework have on managing and improving KWP and delves deeper into four key concepts: value in knowledge work, knowledge, personal resources, and competencies.

Keywords: knowledge worker; soft systems methodology; productivity; personal resources; value; knowledge; competencies; effectiveness; efficiency; actions

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1. Introduction

Most jobs today are knowledge based or at least have aspects that are dependent on working with knowledge. The workers in these jobs are called knowledge workers (KWs). KWs have high degrees of expertise, education, or experience and use this to acquire, create, share, or apply knowledge in their jobs (Óskarsdóttir and Oddsson 2017). We are dependent on KWs not only to maintain and keep our economy strong, but also for innovations that will change the world. Knowledge is the key for establishing competitive advantage for many organizations and the key to solving problems that affect us all. KWs are the innovators that will shape the Fourth Industrial Revolution, which is already forcing organizations to reexamine how they do business.

In these modern times, it is becoming increasingly important that we manage the work of KWs to obtain consistent results and improve performance when needed. Organizations and public enterprises need to be able to perceive the productivity of KWs and preferably measure it. Most knowledge is inseparable from the individual, since knowledge is created by interpreting data and information using beliefs, perspective, and experience (Seethamraju 2000). A KW's knowledge cannot easily be assimilated into the organization's process as for manual and routine work. His/her effort needs to be directed to create value for the organization.

Pure manual work and routine work have almost been eradicated by automation. Manual work and routine work that have not yet been automated have been optimized by streamlined processes and systems. There are tried and true frameworks and methods to managing and improving the productivity of manual work and routine work. In knowledge work, however, we are still fumbling around in the dark. Nevertheless, there are

numerous approaches, frameworks, and methods that are being used to manage and improve knowledge worker productivity (KWP) with varying degrees of success. Their success seems to be context dependent and often fleeting. These frameworks and methods are designed to manage and improve KWP from different viewpoints in the context of the respective challenge at stake.

To give a few examples of the above: The *knowledge management* approach focuses on codifying knowledge into external knowledge bases with the aim of knowledge sharing, fulfilling information needs, and preserving the organizational knowledge base more easily. Meanwhile, *agile management*, originally developed for software development, focuses on social interactions, building relationships, and specific planning techniques to collaborate both with customers and colleagues to fulfill requirements. This gives the KWs tools to be more effective. Another approach to managing and improving KWP is *nudge management*, which was developed at Google. *Nudge management* draws on insights from behavioral science to design the organizational environment to direct the subconscious behavior of KWs to be more in line with the objectives of the organization (Ebert and Freibichler 2017). Examples of nudges are to provide healthy food in the cafeteria to increase worker well-being or design a culture of short meetings by adjusting the default meeting lengths in the software used to book the meetings. These are just a few examples of approaches, frameworks, and methods that organizations are trying to use with differing results to manage and improve their KWP.

All these approaches, frameworks, and methods have something to contribute to optimizing KWP. However, there seems to be lack of a holistic approach to managing and improving KWP. The first step to a holistic approach is to identify the fundamentals of KWP by looking at the problem from a high level of abstraction. There is a vast amount of current research in multiple research fields with a high level of detail that touches on factors that influence KWP. This makes it difficult to obtain a complete holistic view. It is not enough to look at the management and improvement of KWP from the viewpoint of the organization. The viewpoint of the individual KW needs to be considered as well. The KW owns the means of production; they carry their knowledge in their heads and take it with them when changing jobs (Drucker et al. 1997).

There has been a shift of the responsibility of productivity from the organization to the individual, driven by the nature of working with knowledge. Career growth, professional development, and the contribution to the organization have become the worker's own responsibility (Drucker 1999; Letiche and van Hattem 2000). Those who cannot keep up with the demands of the autonomy and accountability resulting from this shift may experience stress and exhaustion (Letiche and van Hattem 2000). Chronic stress can contribute to both physical and mental health problems. Many believe that there is a burnout epidemic because of the fundamental changes in the workplace and the nature of our jobs (Kroft 2020; Maslach and Leiter 1997). Burnout is a state of emotional exhaustion that can lead to anxiety and depression. Burnout makes people feel fatigued and unable to cope with daily tasks, reducing their performance (Maslach and Leiter 1997). Some workers even become unable to work and drop out of the labor force (Salvagioni et al. 2017).

Although the responsibility of productivity has shifted from the organization to the individual KW, the KW is confined and influenced by the systems in his/her environment. The KW's job can be viewed as a process, a process by which the KW uses resources (input), such as knowledge or time, to execute actions to create tangible or intangible artifacts (output) with the intention of generating value (outcome). Evaluating the KW's contribution, in other words the value he/she creates from the effort exerted when executing actions, is quite complex. In this context, the KW's productivity can be viewed as the ratio of value created to effort exerted by the KW while executing the actions that created the value. Both value and effort are subjective. The perception of the KW's productivity is thus influenced by who is perceiving it. What creates value depends on the context, the stakeholders, and their interests and perspectives. It is, therefore, important to have both the efficiency and

effectiveness of the KW in mind when exploring KWP. Efficiency is about doing things better, while effectiveness is about doing things right.

Value can also be latent. Latent value can, for example, be found in acquiring new knowledge, trying new methods, and other innovative activities. Value is, therefore, not always directly linked to the effort exerted by the KW, making it difficult to measure his/her productivity. Effort is the physical or mental activity performed by the KW. To give an example, under chronic stress, the KW might perceive that he/she needs to exert more effort to generate the same value he/she did before. However, his/her employers might perceive his/her level of effort as the same. This will cause a mismatch in the individual KW's perception of his/her productivity and the organization's perception of his/her productivity.

Óskarsdóttir and Oddsson (2017) found two factions of current research that view the problem of managing and improving KWP from the ideas of their solutions. Both factions assume that effectively working with knowledge is the main factor influencing KWP. One faction believes that the solution is in fulfilling information needs, knowledge sharing, and preventing information overload, making knowledge management the solution. Knowledge management is the process of codifying knowledge into external systems. The other faction believes that knowledge cannot be effectively codified, and therefore, the solution is to invest in the workers themselves through increased motivation, work engagement, and commitment to the organization. Both factions look at the problem of managing and improving KWP from the viewpoint of the organization.

If managing and improving KWP is looked at from the viewpoint of the individual knowledge worker, both the problem description and solutions change. Óskarsdóttir and Oddsson (2017) detected in a literature review of a proxy for industry that individual knowledge workers experience the following challenges as influential to their productivity: too much demand and insufficient resources, choosing what to do and how to do it, self-development, self-awareness, successful relationships, tapping into their full potential, collaboration, the productivity of their thinking, and motivation. Solutions to these challenges have been proposed and used with varying degrees of success. For example: time management, personal resource management, or energy management, key result areas, goals, networking, communication, leadership, motivators, and so on.

Managing and improving KWP has all the hallmarks of a wicked problem. Rittel and Webber (1973) defined a wicked problem as a problem that does not have a fixed definition and has no boundaries. Wicked problems have three things in common (Checkland 2011):

1. They have many viewpoints, which often are competing;
2. These viewpoints are not constant, but change with interpretations of new experiences or knowledge of individuals or groups;
3. The individuals in the situations behave purposefully rather than from intuition or randomly.

In wicked problems, how one understands the problem depends on one's idea for solving it. As Rittel and Webber (1973, p. 162) put it: "One cannot understand the [wicked] problem without knowing about its context, one cannot meaningfully search for information without the orientation of a solution concept, one cannot first understand, then solve". There are no right or wrong solutions, only better or worse from the viewpoint of stakeholders, who all have different interests, values, and worldviews.

It is, therefore, important to view a wicked problem from many viewpoints to identify actions for improvement that are aligned with all viewpoints and do not intensify competing interests (Checkland 2011). The soft systems methodology (SSM) was developed by Checkland (2011) to deal with wicked problems holistically using systems thinking. The SSM consists of four main activities: (1) finding out about a problem situation, (2) formulating purposeful activity models, (3) debating the situation, and (4) taking action for improvement.

This research attempted to find and define holistic systems that affect the productivity of the KW to increase our understanding of KWP, so applicable frameworks and methods can be found to manage, measure, and improve it holistically. We used the SSM to explore

KWP and formulate a purposeful activity model of the system from the viewpoint of the individual KW. In other words, we executed the second activity in the SSM. Purposeful activity models are tools in the SSM to facilitate structured debates of a situation from different viewpoints (Checkland 2011). The debate is used to find accommodations among conflicting viewpoints. The purposeful activity models are not an accurate representation of the real world, as models built for simulation, but a model of the process of how we explore the world.

Soft systems are described in the form of a transformation process. Purposeful activity models are therefore built by assembling and linking the activities relevant to acquiring the input, the activities to transform it, and the activities to do something with the output (Checkland 2011). Once a purposeful activity model from the viewpoint of the individual has been created, the next step, according to the path set by Óskarsdóttir and Oddsson (2017), is to formulate a purposeful activity model of the system owned by the organization. Only after both of these viewpoints have been explored can the situation be debated and actions for improvement identified. These are the last two activities in the SSM.

A literature review was executed to identify the activities relevant to the process that describes the system from the viewpoint of the individual KW. This is the process in which the KW uses resources to execute actions to create tangible or intangible artifacts with the intention of generating value. The insights gained from this literature review are detailed in the section below. They were used to develop the purposeful activity model and map the identified activities. The purposeful activity model is presented in Section 3 with a discussion about how it was developed. This paper then concludes with a discussion on what implications the insights gained from the purposeful activity model have on KWP.

2. Literature Review

A literature review was executed using the snowballing method. The aim was to explore *what is value* in knowledge work and these three concepts: competencies, knowledge, and personal resources. They were identified as important to the activities of the knowledge worker (KW) when creating value (Óskarsdóttir and Oddsson 2017). This section provides an overview of the results of this literature review.

2.1. Value in Knowledge Work

When exploring the question, "*What is value* in knowledge work?", some conflicting interests become clear. It is not given that what is perceived as value from the viewpoint of the organization is the same as what the KW himself/herself perceives as value. A KW in a modern protean or boundaryless career needs to balance his/her own well-being, career growth, professional development, and contribution to the organization. In some cases, these are aligned, where the same actions contribute to the organization and the KW's needs. Often though, these are in conflict, and the KW must choose actions that contribute to one at the expense of another. Usually in those circumstances, the KW chooses the actions that give him/her the most benefits rather than contributing to his/her organization.

Robertson and Flint-Taylor (2009) stated that it is in the best interest of the organization to ensure that when a KW needs to make decisions or commit high degrees of effort, that the choice, that will maximize his/her well-being, is in alignment with the organization's objectives. KWs find it difficult to make decisions that might damage or deplete their personal resources and would rather commit effort in a task that is psychologically rewarding. Well-being at work is derived from positive emotions and an overall *sense of purpose* that gives direction and meaning to one's actions. The experience of achievement, striving and doing something that is seen as worthwhile, elicits well-being (Robertson and Flint-Taylor 2009).

The organization should, therefore, invest in getting to know their KWs. Then, they can orchestrate their organizational culture, environment, and leadership to maximize value creation that contributes to their objectives and the well-being of their workers (Eriksson et al. 2017). The organization needs to communicate their organizational objec-

tives and needs to their KWs and motivate them to create value for them. Figure 1 describes this conflict between these viewpoints and how they are communicated.

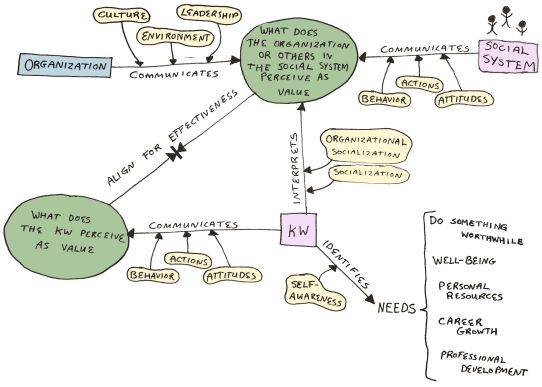

Figure 1. Perceiving value; organization, social system and knowledge worker (KW).

The organization communicates what they perceive as value through their organizational culture, environment, and leadership. The organizational culture conveys how things are done within an organization and what matters (Louis 1980). Leadership manipulates the culture and formulates the work environment (Alimo-Metcalfe et al. 2008). It is vital to learn the culture to develop a scheme for interpreting everyday events within the organization (Louis 1980).

This is usually done through observation and modeling of insiders' behaviors (Jia et al. 2020). By observing successful and competent insiders, the KW obtains information about the appropriateness of imitation and the likelihood of receiving valued outcomes for behaving similarly or expressing similar values (Weiss 1978). This process is called organizational socialization (Cooper-Thomas and Anderson 2006; Louis 1980). Livi et al. (2018) observed that in today's labor market instability, KWs need to keep up with continuous changes within organizations and are often forced to modify their work and social environment. Organizational socialization, therefore, does not only occur in the initial stage of a KW's career anymore, but is a continuous process (Livi et al. 2018).

The KW's social system includes his/her colleagues, personal network, professional network, and community. People in a KW's social system communicate what they perceive as value through their behavior, actions, and attitudes. Creating value for others in your social system can be a source of well-being. For example, helping others can provide positive emotions and contributing to your community can give a *sense of purpose*. It also builds relationships that can have a restorative effect on the KW's personal resources and gives the KW access to knowledge he/she might need to create value for the organization. The KW interprets what others in his/her social system perceive as value through socialization. Socialization is a similar process as organizational socialization and allows an individual to integrate successfully into a society, community, or other social groups. Socialization allows a group of people to have a shared cognitive frame and is built on shared experiences, trust, imitation, and observation (Kang et al. 2007; Nonaka 1994; Weiss 1978).

The KW identifies his/her needs using self-awareness, needs that can, for example, be connected to his/her well-being, personal resources, need to do something worthwhile, career growth, or professional development. Self-awareness refers to how conscious an individual is of his/her self-image, own inner state, preferences, personal resources, and

his/her impact on others (Goleman 1999; Hall 2004). The KW communicates what he/she perceives as value through his/her behavior, actions, and attitudes. The KW takes into account his/her own needs and his/her interpretation of what the organization or others in his/her social system perceive as value when making decisions on what actions to execute, when, and how.

As Óskarsdóttir and Oddsson (2017, p. 12) stated, "the individual knowledge worker cannot fulfill every demand on him, he/she needs to choose what to do, how to do it, and when to do it. The challenge is knowing which tasks to focus on to create value for the organization, the individual knowledge worker or others in his/her social system". The KW is effective when he/she manages to focus on the right tasks to generate his/her intended value, in other words, when what the organization or others in his/her social system perceive as value is in alignment with what the KW perceives as value.

It is also useful for the KW to understand the general mechanisms of economic value creation, to better discern where he/she can contribute to the organization. To create economic value, the outcome of the KW's actions needs to fulfill a need of a stakeholder of the organization in a way that contributes to the organizations objective to realize profits. Economic value can be created by the actions of the KW, but it is only captured when it is exchanged for a profit (Bowman and Ambrosini 2000).

Profits are made when the price paid is higher than the costs of the resources used to create the job, task, product, or service. Therefore, the KW needs to identify actions that contribute to value creation and be able to execute those actions with as few resources as possible. This means that individuals can contribute to value creation by executing actions more efficiently to lower costs (Bowman and Ambrosini 2000). This is also relevant in the public sector even though profit is not the main objective. Public services and enterprises need to do the most general good with the funding that they have. To do that, it is important that their KWs are effective and efficient in creating value for their constituents.

Resources are not only physical, such as materials or equipment, but also intangible, such as the KW's own effort. A KW's effort has a direct monetary cost such as wages, overhead costs, and other benefits the organization pays the KW for his/her time. However, a KW's effort can also have a more indirect cost. For example, a KW that uses too much effort to execute actions can become exhausted, which can lead to a diminished performance, presenteeism, absenteeism, and health problems (Aboagye et al. 2019; Cropanzano et al. 2003).

KWs primarily work for organizations that depend on the ideas and knowledge of their employees for their success (Amar 2004). Innovation is the main competitive advantage of such organizations. Human knowledge is used to innovate what is done and how it is done (Amar 2004), for example creating a fresh approach to an objective or task, improvements to a product, or even a whole new product. It is an investment in possible future value and is therefore inherently risky. Yet, at the same time, successful innovations are the key to an organization's superior profits and growth.

The outcome of innovation is highly uncertain, and the effects of innovation are difficult to measure (Kline and Rosenberg 2009). This creates a challenge when looking at knowledge worker productivity (KWP). It is difficult to discern whether the effort exerted will result in value and, if so, when that value will be realized. This does not mean that a KW that performs innovative actions is unproductive. There needs to be balance in executing actions that create known value and innovating actions that might or might not create value within organizations, to both preserve current profits and grow to realize superior profits.

Innovation can be split into two types—high risk, radical innovation and small, cumulative, evolutionary changes that might reduce costs or enhance a product (Kline and Rosenberg 2009). Both types are important. Control of costs through evolutionary changes is important to remain competitive in the short run, while the movement to radical innovation is often necessary to survival in the long run. An organization needs to nurture an environment that supports cooperation between KWs to leverage their knowledge (Kang et al. 2007). A cooperating environment allows the organization to exploit

and extend knowledge for competitive advantage and encourage entrepreneurial activity, resulting in radical innovation.

The actions of organizational members are the source of an organizations success, but it is often difficult to contribute specific value to specific organizational members. Their work is interdependent, making the combined result of the KWs' contributions greater than the sum of each individual contribution (Bowman and Ambrosini 2000). It is important to be aware of the level of interdependence. Sometimes, value can be created by helping a colleague, sharing knowledge, and delivering results in a timely manner so that colleagues can use them. These helping behaviors that facilitate organizational productivity by affecting colleagues' performance have been discussed under many concepts such as extra-role performance, organizational citizenship behavior, and contextual performance (Borman and Motowidlo 1997; Cooper-Thomas and Anderson 2006; Podsakoff et al. 1997; Smith et al. 1983; Van Scotter and Motowidlo 1996). This interdependence is explored in the next section about knowledge.

2.2. Knowledge

The KW seldom has all the knowledge and information needed to create value. Kang et al. (2007) stated that knowledge is the most distinctive and inimitable resource available to organizations. According to Lee and Yang (2000), "information is data organized into meaningful patterns" and information is transformed into knowledge when an individual understands, interprets, and applies the information in the context of his/her unique personal experiences, lessons learned, judgments, and intuitions.

Polanyi (1966) stated that knowledge has a tacit element and an explicit element, that is "we can know more than we can tell"(p. 4). The explicit element is what we can tell, while the tacit element is what we know that we cannot identify to tell. It is hidden, highly personal, and context dependent (Nonaka 1994). The explicit element of some knowledge consists of the information or events that the individual reacts to and, therefore, can identify and express in words and numbers (Nonaka 1994; Polanyi 1966). Meanwhile, the tacit element of that knowledge is the awareness of the particulars of that information or event, which gives the context and influences how the individual anticipates, interprets, and reacts (Polanyi 1966). In other words, these particulars are only known in the context of that information or event and therefore cannot be codified as the explicit element of the knowledge. Explicit knowledge can be codified and even shared through an information technology (IT) system (Gonzalez and Martins 2014; Lee and Yang 2000).

To give an example, a KW can leave a meeting with a customer and write internal meeting notes for his/her team that the customer liked specific features (explicit knowledge), but if you ask him/her how he/she knows that the customer liked the features, he/she could only vaguely tell why he/she came to that conclusion (tacit knowledge). The KW would have relied on his/her awareness of particulars such as his/her interpretation of the body language of the customer or of some of the questions or comments the customer made. This interpretation is influenced by the KW's perceptions, which stem from his/her previous experiences, beliefs, and perspective (Nonaka and Ryoko 2003).

Figure 2 shows the four modes of knowledge conversion of Nonaka (1994). He assumed that knowledge is created through the conversion of tacit and explicit knowledge. The four modes are externalization, internalization, socialization, and combination.

Externalization is the conversion of tacit knowledge into explicit knowledge through a process that reveals hidden tacit knowledge, allowing the KW to articulate it as explicit knowledge and express it as information. Internalization is the conversion of explicit knowledge into tacit knowledge through application in relevant situations. Socialization is the conversion of tacit knowledge in the social environment into tacit knowledge of the individual through action or perception. Combination is the creation of new explicit knowledge by sorting, adding, recontextualizing, or recategorizing explicit knowledge (Nonaka 1994; Nonaka and Ryoko 2003).

These four modes of conversion will be used in the discussion on how the KW works with knowledge. The main purpose of a KW is to acquire, create, share, or apply knowledge in his/her job to create value. Figure 3 shows important factors pertaining to how the KW acquires, creates, or applies knowledge, while Figure 4 focuses on knowledge transfer, which is the basis of sharing knowledge.

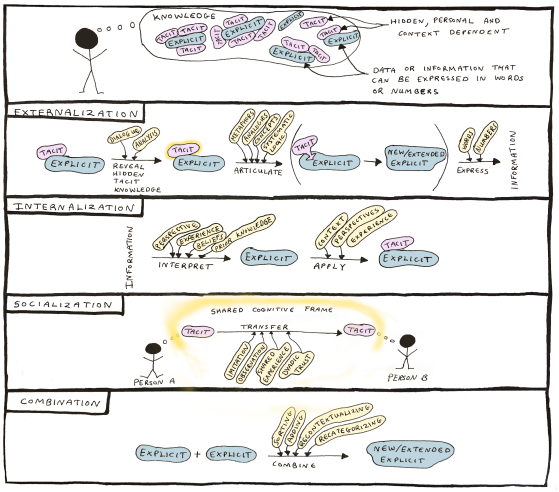

Figure 2. The four modes of knowledge creation of Nonaka (1994).

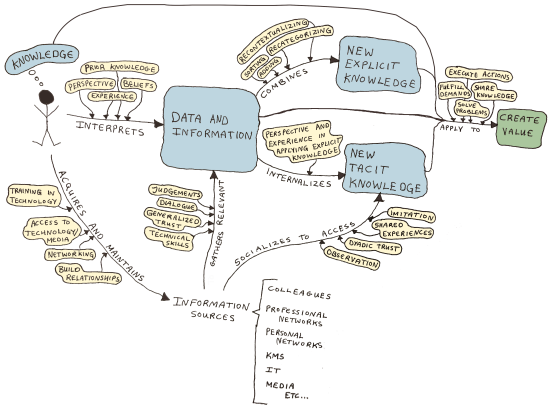

Figure 3. Acquire, create, and apply knowledge.

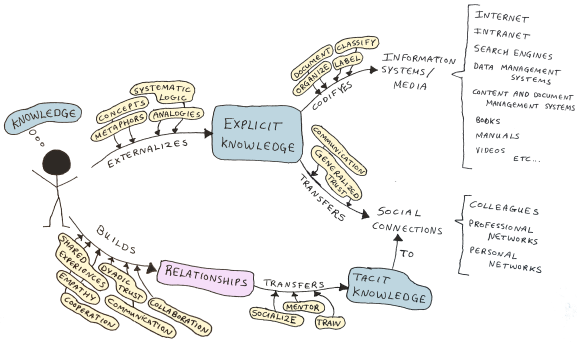

Figure 4. Knowledge transfer.

As mentioned above, the KW interprets data and information using his/her perspective, prior knowledge, experience, and beliefs. Data and information can be gathered, interpreted, and reconfigured by sorting, adding, recategorizing, or recontextualizing to create new explicit knowledge. This is the process of combination from Figure 2 (Nonaka 1994).

Data and information can be converted into tacit knowledge by individuals through internalization (Nonaka 1994). In the internalization process, the KW creates new tacit knowledge by interpreting the explicit knowledge using his/her perspective and experience in applying the explicit knowledge. The new tacit and explicit knowledge acquired or created in these processes can then be applied along with prior knowledge, data, and information to create value by allowing the KW to fulfill demands, execute actions, or solve problems that depend on the knowledge. The KW should also share his/her newly found knowledge to create value by contributing to the organizational knowledge base.

The KW needs to gather data and information to acquire or create the knowledge he/she needs to be able to execute these value-creating actions effectively and efficiently. Information can come from colleagues, professional or personal networks, technology, media, etc. The KW needs to know what information sources are available, as well as how to acquire, access, and maintain them.

The KW should be selective in the information he/she gathers since assimilating information and creating knowledge takes time and effort. In some instances, the KW could create more value by delegating an action to someone who already has the knowledge rather than trying to internalize it himself/herself. Developments in information technologies have drastically increased the availability of information (Edmunds and Morris 2000). The KW needs to be aware that not all information is created equal and should use his/her judgments to discern useful and relevant information.

Most organizations use information and communication technology (ICT) systems to store and distribute their data and information (Mládková 2011), for example ICT systems such as data management systems, content and document management systems, intranet solutions, search engines, workflow management systems, business intelligence systems, groupware, and so on (Maier 2007). The usefulness of such systems is dependent on the KWs themselves, whether they keep them up to date with relevant data and information and actually use them as information sources. It is, therefore, important that the KW be aware of these systems as potential information sources and receive training on how to codify and retrieve data and information from them.

Social relations are considered the most efficient means for transferring both tacit and explicit knowledge between individuals (Kang et al. 2007). This means that appreciating information sources is inherently understanding the social constructs within the organization

or expert communities in which the KW is. Different types of social connections give access to different information sources. Strong and dense social connections, built on dyadic trust through direct personal experiences, are great sources for exploitative learning, which involves refining and deepening existing knowledge. This is because shared experiences are the key to transferring and acquiring tacit knowledge (Nonaka 1994). Individuals need to have a shared cognitive frame of reference to recognize, understand, and exchange tacit knowledge (Kang et al. 2007). This allows individuals to share each other's thinking processes through observation, imitation, and practice (Nonaka 1994).

This means, to access information or knowledge from colleagues or other members of an appropriate expert community, building relationships is key. The KW can build relationships and access information or knowledge by socializing, cooperating, collaborating, and communicating. Communication can take place either using face-to-face communication or using communication technologies such as email, messaging platforms, social media, telephones, or web conferencing platforms.

Networking is a way to acquire new information sources. It is a set of behaviors designed to build informal interpersonal relationships to exchange affect, information, benefits, and influence (Michael and Yukl 1993). Today, much networking happens in the virtual world of the Internet or web through social media instead of face-to-face. Social media refers to applications or web sites that enable users to exchange information and provide tools to support the maintenance of relationships, aid in the discovery of potential relationships, and the conversion of potential ties into weak and strong ties (Shalini et al. 2018; Van Zyl 2009).

Weak and nonredundant social connections, built on generalized trust accorded to the KW because he/she is a member of the same social unit, are great sources for explorative learning. Explorative learning involves the pursuit of knowledge that differs from the status quo and does not exist in the organization (Kang et al. 2007). In weak and nonredundant social connections, a dialogue needs to take place to convert the tacit knowledge of the parties into explicit knowledge through what Nonaka (1994) called the externalization process. Since the parties do not have shared experiences, they need to use metaphors and analogies to articulate their own perspectives and reveal hidden tacit knowledge. Through successive rounds of meaningful dialogues, concepts are created with consistent and systematic logic. This results in explicit knowledge that can be codified, communicated, and learned by others.

Figure 4 shows important factors connected to knowledge transfer that have been discussed above. The KW can create value by being an information source to others and take time to share his/her knowledge, both explicit through codification and tacit through social interactions such as socializing, mentoring, and training.

Most KWs are interdependent, that is their actions are dependent on the actions of others. This interdependence can emerge from the complexity of tasks, where the KW does not have all the knowledge or skills needed to execute them, or from the design of work processes, where the tasks are serially linked (Rosendaal 2009). Another type of interdependence is when the KWs are working towards group goals or provided with group feedback (Van der Vegt and Van de Vliert 2002).

To create a relatively permanent competitive advantage for the organization, individual learning needs to be transformed into organizational learning (Urbancova et al. 2016). Organizational learning is the development of collective insights, knowledge, and associations between past actions and future actions (Fiol and Lyles 1985; Popper and Lipshitz 1998; Urbancova et al. 2016). It is not simply the sum of each member's learning even though organizations only learn through the experience and actions of individuals (Fiol and Lyles 1985; Popper and Lipshitz 1998).

Organizational learning creates the shared mental models, norms, and values over time that allow for the transfer of tacit knowledge (Fiol and Lyles 1985; Popper and Lipshitz 1998). These shared mental models, norms, and values are transmitted to present and future employees through the organizational culture and learning systems. By sharing

knowledge acquired while executing actions, the KW contributes to the learning systems of the organization. Until KWs share both their tacit and explicit knowledge within the organization, it is the individual's capital, not the organization's, and is therefore an unvalued asset by the organization (Bogdanowicz Maureen and Bailey Elaine 2002).

As is apparent in the discussion above, working with knowledge is very complex and depends on many factors. Such as the organizational environment, culture, the perspectives of individuals, social connections between individuals, and the availability of technology, information, and data. This complexity means that there are many fields and disciplines dealing with knowledge (Maier 2007). From these fields, the multidisciplinary field of knowledge management (KM) emerged, which is based on the belief that "there are substantial benefits to be gained from the systematic and conscious treatment of knowledge-related processes in organizations" (Maier 2007, p. 59). Many organizations have implemented KM initiatives to improve their way of handling knowledge to improve organizational performance (Maier 2007).

Knowledge management systems (KMSs), which rely on modern ICTs, are used as enablers of KM within organizations (Oyefolahan and Dominic 2013). They combine and integrate services for the handling of explicit and tacit knowledge (Maier 2007). KMSs facilitate, for example, the storing, organizing, distributing, and retrieval of explicit knowledge. They also provide services for the handling of tacit knowledge, which ease the identification of experts within the organization, the creation of communities of experts, and collaboration. Most larger organizations have some sort of KMS that the KW needs to be aware of and utilize to access information sources and as an information source itself.

The success of a KMS is dependent on the willingness of employees to use it, the willingness to codify their own knowledge into the system, acquire knowledge from the system, and create new knowledge through combination and collaboration with others (Oyefolahan and Dominic 2013). Factors such as training in the KMS technology, as well the as ease-of-use and quality of the KMS affect whether the KMS is adopted by the KWs in the organization (Kundapur and Rodrigues 2012).

With these emerging KMSs, ICT systems, and media outlets, such as the Internet, there is an abundance of information. It is, therefore, important to use discernment when choosing information sources and what information to process. This abundance of information may lead to information overload or analysis paralysis. Then, the KW cannot process all the information efficiently, leading to omissions, errors, and stress (Edmunds and Morris 2000). Information overload or analysis paralysis affect not only decision-making, but have a depleting effect on personal resources. Hemp (2009) stated "the stress of not being able to process information as fast as it arrives—combined with the personal and social expectation that, say, you will answer every e-mail message—can deplete and demoralize you". The next section delves into the KW's personal resources and how they are depleted and restored.

2.3. Personal Resources

Hobfoll et al. (2003) defined *personal resources* as aspects of the self that are generally linked to resiliency. They refer to an individual's sense of his/her ability to control and impact his/her environment successfully. Resiliency is the capacity to recover quickly from stress. These are resources such as self-efficacy, sense of mastery, optimism, characteristic degree of goal pursuit, social support, and self-esteem. Kira et al. (2010), on the other hand, defined *personal resources* as "mental abilities and states, such as knowledge and self-esteem", as well as "dispositional orientations or habitual behaviors, such as a preferred coping strategy or preventive behavior in maintaining one's health". Greenblatt (2002), meanwhile, defined *personal resources* as the physical, psychological, cognitive, and social resources at the disposal of an individual, which "provide the fuel necessary to engage with and accomplish all of life's activities".

Physical resources come from our body. They consist of our physical strength, endurance, and reactions to physical stimuli. Psychological resources refer to the individual's

affective capabilities, emotional intelligence, and responses to emotional stimuli. They include faith as well, which comes from the individual's connection to deeply held values, purposes, and vision. Cognitive resources are natural and learned intellectual capacities, the ability to access them, and the energy necessary to use them. Social resources include the capabilities to interact and connect with others, as well as the ability to access social resources for personal benefit.

The perspective of personal resources of Greenblatt (2002) seems to be different from the other definitions, but after a closer comparison, it becomes clear that these four groups of personal resources all encompass aspects of the self that are linked to resiliency. Figure 5 shows how these three definitions all refer to personal resources as aspects of the self linked to resiliency.

In Figure 5, resiliency seems to have a simple relationship with the personal resource reserves where resiliency lowers if the personal resource reserve decreases. This is a simplification of this relationship. According to Cake et al. (2017), resiliency is a dynamic process in which personal resources and contextual resources interact over time through particular strategies to enable sought-after mental states, such as enjoyment, self-esteem, professional engagement, satisfaction, well-being, and so on. Contextual resources include, for example, someone's social support, relationships, feedback, decision latitude, skills, discretion, and culture. Strategies, however, are the dispositional orientations and habitual behaviors that someone uses to try to restore their personal resource reserves, such as sleep, meditation, time management, nutrition, humor, and so on.

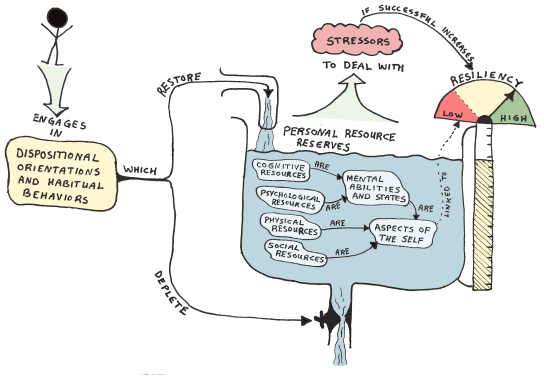

Figure 5. Definition: personal resources are aspects of the self linked to resiliency.

The KW's personal resources are subjective and influenced by the KW's perceptions of himself/herself and the world. This means that perceived personal resources change over time with the ever-changing worldview of the KW, in different situations and environments. The assessment of what personal resources are available and the threat of loss, actual loss, or resource gains usually happens subconsciously, causing habitual responses to different stressors and challenges in the environment. How an individual responds is a function of his/her personality, constitution, perceptions, and the context in which the stressors occur (Hobfoll 1989).

Habitual responses to offset resource loss are often called coping strategies or behaviors (Hobfoll 1989). When reacting to a loss of a resource, individuals make use of other resources that they possess, which can result in a depletion of those resources. When choosing to utilize a given coping strategy or behavior, the individual subconsciously evaluates his/her potential losses, determines what he/she loses by expending other resources, and

analyzes the chance of success. Circumstances that threaten an individual's status, position, economic stability, loved ones, health, basic beliefs, or self-esteem are common causes of personal resource depletion. Events that clearly reflect loss are the most psychologically threatening such as being fired, retirement, foreclosure, divorce, or death (Hobfoll 1989).

These kinds of big events are not needed for a knowledge worker to feel chronic stress that affects his/her performance. Multiple personal resources are used to accomplish tasks, and the tasks have a different effect on different personal resources (Greenblatt 2002). A task may have a depleting effect on one personal resource, but a restorative effect on another. Executing many tasks in a row using behaviors or in conditions that have a depleting effect on a specific personal resource will lead to chronic stress that undermines performance (Greenblatt 2002; Loehr and Schwartz 2001).

There is a resiliency threshold. If the personal resources are depleted below it, the typical impact of depleting behaviors or conditions are magnified and the impact of restorative behaviors or conditions are reduced. This is typically the cause of the exhaustion or burnout of KWs, a series of small personal resource losses that are insufficiently offset by personal resource gains, eventually using up the personal resource reserves necessary for successful coping strategies or behaviors. Figure 6 shows the interaction between the personal resource reserves and the effects of engaging in certain behaviors or conditions.

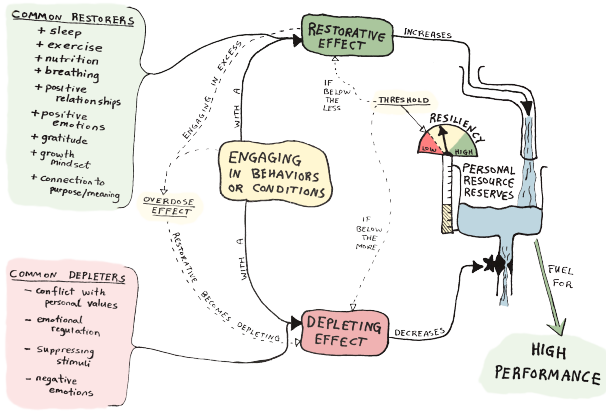

Figure 6. Personal resource reserves.

The KW's wellbeing and performance, therefore, can be improved by choreographing tasks to optimize the use of the KW's personal resources (Greenblatt 2002; Loehr and Schwartz 2001), that is to make sure that depleting behaviors and conditions are offset by restorative behaviors and conditions. It is not only important to balance depletion and restoration. The personal resource reserves can also be expanded by engaging in restorative actions more frequently or in actions that have a larger restorative impact. The KW needs to use self-awareness to identify his/her personal resources, his/her personal resource reserve levels, and the different effects his/her behaviors and the conditions he/she is in have on them. With this awareness, the KW can sequence his/her tasks strategically to positively impact resource levels (Greenblatt 2002).

There are though some common behaviors and conditions that are restorative for most people such as sleep, exercise, nutrition, breathing, positive relationships, positive emotions, gratitude, a growth mindset, and connecting to your purpose or meaning (Fritz et al. 2011; Greenblatt 2002; Loehr and Schwartz 2001; Peseschkian and Remmers 2020).

Greenblatt (2002) found in her research that a KW can experience what she called an overdose effect, when characteristically restorative behaviors or conditions become depleting when experienced in excess. Common behaviors and conditions that are depleting for most people are conflicts with personal values, emotional regulation, suppressing stimuli, and negative emotions (Greenblatt 2002; Loehr and Schwartz 2001).

2.4. Competencies

A competency is a set of behavior patterns organized around intent (Boyatzis 2008). Intent is the force that causes action toward an outcome (Spencer and Spencer 1993). This means that competencies both imply what a KW can do and what he/she wants to do (Ryan et al. 2009). Competencies allow the KW to demonstrate behavior patterns that lead to or cause effective or superior performance (Boyatzis 1982).

A competency may exist within the KW at various levels. Boyatzis (1982) defined three levels of a competency: (1) the subconscious level of motives and traits, (2) the conscious level of self-image and social role, and (3) the behavioral level of skill. Spencer and Spencer (1993) presented these levels in an iceberg model, where the visible components of a competency, skill and knowledge, stood up above the waterline, while the hidden components, self-image, traits, and motives, were under the water. The definitions of these components are (Boyatzis 1982; Spencer and Spencer 1993):

1. *Motives* are recurrent thoughts about a goal state or situation that drive an individual to a certain behavior;
2. *Traits* are a characteristic way an individual responds to certain stimuli, that is the consistent responses he/she has to similar situations or information;
3. *Self-image* is an individual's perception of himself/herself and the interpretation and labeling of that image in the context of values, both his/her own and the values in the environment;
4. *Social role* is an individual's view of how he/she fits in with regard to the characteristics he/she possesses and the interpreted expectations of others;
5. *Knowledge* is the internalized information an individual has in specific content areas;
6. *Skill* is the individual's ability to demonstrate specific behavior patterns that are functionally related to attaining a performance goal.

Figure 7 shows these components in an extended version of iceberg model of Spencer and Spencer (1993). The figure shows how the KW's characteristics and environment affect these components and how the components lead to effective or superior performance.

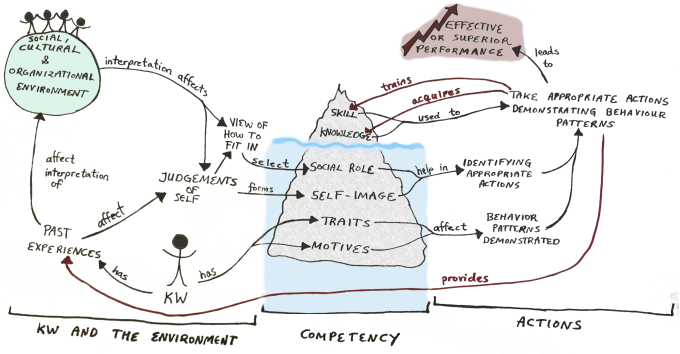

Figure 7. Levels of a competency, what affects them, and how they contribute to effective or superior performance.

It is best to read the figure from left to right starting at the KW stick figure. The KW has the underlying characteristics of motives and traits. The KW has past experiences, as well, that affect his/her interpretation of the social, cultural, and organizational environment. His/her past experiences and his/her interpretation of the environment affect his/her judgments of self, which form his/her self-image. His judgments of self and his/her interpretation of the environment affect how he/she views how he/she fits in, which influences what social role he/she selects in the situation.

The four components of a competency that are hidden under the water in the iceberg model control the surface behaviors (Garavan and Mcguire 2001). Traits and motives are at the base of the iceberg and are difficult to assess and develop (Spencer and Spencer 1993). They affect what behavior patterns are demonstrated. A KW will, therefore, be unsuitable for an organizational role if the KW lacks the traits and motives for the required competencies. This is the basis of the popular saying: hire for attitude or character and train skill.

Social role and self-image are a bit higher up, but still hidden under the waterline. They can be changed by training, psychotherapy, and positive developmental experiences (Spencer and Spencer 1993). They help in identifying the appropriate actions to take for effective or superior performance. Skill and knowledge are at the top of the iceberg, fully visible above the waterline. They are relatively easy to develop. Skill and knowledge are used to take appropriate actions, demonstrating specific behavior patterns that lead to effective or superior performance. By taking the appropriate actions, knowledge is acquired and the ability to demonstrate these specific behavior patterns improves, which effectively trains the skill. The collection of actions taken by the KW over time provide the past experiences of the KW.

Boyatzis (2008) identified three clusters of competencies connected to outstanding performance from research published in the last thirty years:

1. *Cognitive intelligence*—competencies that relate to "the ability to think or analyze information and situation" (p. 8), for example systems thinking and pattern recognition competencies;
2. *Emotional intelligence*—competencies that relate to "the ability to recognize, understand and use emotional information about oneself" (p. 8), for example self-awareness and self-management competencies;
3. *Social intelligence*—competencies that relate to "the ability to recognize, understand and use emotional information about others" (p. 8), for example social awareness and relationship management including empathy and teamwork competencies.

The KW needs to appreciate his/her own competencies when discerning what to do and how to do it. To appreciate his/her own competencies, the KW needs to acquire and develop the competency of self-awareness. Hall (2004) called it a metacompetency since it helps the individual learn how to learn new competencies. Self-awareness refers to how conscious the individual is of his/her self-image, own inner state, and his/her impact on others. Through his/her self-image, the individual perceives his/her particular set of competencies from his/her experiences, interests, values, his/her belief in his/her capabilities to perform certain tasks, and feedback from others (Hall 2004).

There is a vast amount of literature on factors that influence the work of the KW. This literature review focused on *what is value* in knowledge work, competencies, knowledge, and personal resources. No papers were found that connected all these concepts together to create a holistic view of the activities of the KW when creating value. This paper attempted to do just that. The next section uses the knowledge gained from the literature review to identify activities and develop a purposeful activity model of a system for the individual.

3. Purposeful Activity Model of a System for the Individual

The first step in the soft systems methodology (SSM) is to analyze the problem situation and define relevant systems from different viewpoints of stakeholders. These different viewpoints are called problem owners. A problem owner is someone who experiences

unease about a situation, is affected by it, and feels that it can be improved (Checkland 1993). The second step in the SSM is to formulate purposeful activity models for relevant systems for each problem owner. Purposeful activity models are a tool in the SSM. The objective of the SSM is not to draw up an accurate representation of the real world, but to structure an exploration of it as a learning system using systems thinking (Checkland 2000).

Óskarsdóttir and Oddsson (2017) executed two literature reviews to explore the problem situation of managing and improving knowledge worker productivity (KWP). They defined two relevant systems for two problem owners, the individual knowledge worker (KW) and the organization. This section goes into detail about the development of a purposeful activity model for the system, defined by Óskarsdóttir and Oddsson (2017), owned by the individual KW, and presents it.

3.1. Developing the Purposeful Activity Model

The SSM defines systems using root definitions that describe them as transformation processes. Purposeful activity models are, therefore, developed by identifying and linking the activities relevant to acquiring the input, transforming the input into output, and generating target outcomes (Checkland 2011). According to Zwikael and Smyrk (2012), outputs are tangible artifacts produced from the work of the transformation process. However, in the context of knowledge work, defining the outputs as tangible artifacts is too narrow. Outputs in knowledge work can be tangible, for example documents or products, but also intangible, such as services or knowledge. Let us extend the definition of output to include both tangible and intangible artifacts. Target outcomes, on the other hand, are intangible desired end-effects that arise when the output from the transformation process is utilized (Zwikael and Smyrk 2012).

Óskarsdóttir and Oddsson (2017, p. 18) defined the system for the individual KW as "a system, owned by the individual, which transforms perceived effort of the individual knowledge worker into perceived value by the organization by managing personal resources, being effective and efficient". This root definition was found to be too restrictive when developing the purposeful activity model. It does not include the conflict of interest that the KW needs to deal with when creating value. He/she needs to interpret *what is value* and choose whether to create value for himself/herself, for the organization, or for someone in his/her social system. The root definition above assumes that the KW can interpret effectively what the organization perceives as value and that the KW's objective is to only create value for the organization. A new root definition was formulated as seen in Table 1.

Table 1. Root definition of a system owned by the individual knowledge worker (KW).

Root Definition:
A system, owned by the individual KW, in which the KW uses resources to execute actions exerting effort to create tangible or intangible artifacts with the intention of creating value.

Figure 8 maps the root definition to the ITO model of a transformation process, where input is transformed into output, which generates target outcomes (Zwikael and Smyrk 2012).

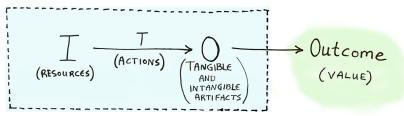

Figure 8. ITO model.

As seen in Figure 8, the inputs (Is) are resources. Resources can be anything the KW uses to execute actions to create artifacts, for example tangible resources such as office supplies, documents and technology, as well as intangible resources such as time, knowledge, competencies, and personal resources. Since the focus of this purposeful activity model is on the individual KW in the situation of managing and improving KWP, only resources that influence decision-making that affects KWP were explored. From the literature review, seven activities were identified that were needed to obtain the input, which were assembled into two groups, *awareness* and *personal aspects*.

In the *awareness* group are the activities: appreciate what is value, appreciate competencies, appreciate information sources, and appreciate personal resources. The word *appreciate* is used because it encompasses the importance of both fully understanding and recognizing the worth of these aspects in the *awareness* group. In the *personal aspects* group are the activities: acquire and develop competencies, acquire and maintain information sources, and manage personal resources.

The transformation (T) consists of the actions executed by the KW to transform the resources to the output (O) of tangible and intangible artifacts. In other words, the outputs (Os) are the results of the actions the KW takes. Five activities were identified that the KW needs to perform to execute actions with the intention of creating value. The activities were put together into the group *actions* and are: identify actions that contribute to value creation, evaluate the competencies and knowledge needed for actions, evaluate the effort needed to execute the actions, select actions, and execute actions exerting effort.

The targeted outcome is value. Value is subjective, so *what is value* is open to interpretation. To be able to reach a target outcome, the output needs to be delivered to someone who then utilizes it in a way that generates the target outcomes (Zwikael and Smyrk 2012). Three activities were identified that are needed to deliver the results of the KW's actions. They were put together into the group *value contribution* and are: communicate the results of actions to relevant parties, share knowledge acquired while executing actions, and evaluate whether actions created value.

The next section presents the purposeful activity model where the identified activities are linked logically together. Delving deeper into these activities and how they are interdependent gives a structure to our exploration of what influences the productivity of the KW at work. Figure 9 shows the four groups of activities identified and how they are linked.

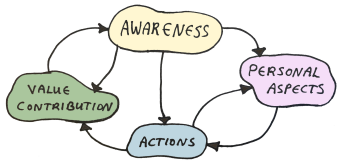

Figure 9. The four groups of a system for the individual.

The arrows show what groups and activities depend on each other. The activities in the *personal aspects* group depend on the activities in the *awareness* group. The arrow, therefore, points from *awareness* to *personal aspects*. The *actions* group uses *awareness* and *personal aspects* to execute actions, but acquiring and maintaining *personal aspects* takes place during the execution of *actions*. That is why there are arrows in both directions. *Value contribution* depends on the outcomes of *actions* and uses *awareness* to evaluate the value created, which in turn informs the KW. *Awareness*, therefore, also depends on activities in the group *value contribution*. These links will become clearer in the review of the purposeful activity model in the next section.

3.2. Purposeful Activity Model

The purposeful activity model of a system for the individual shows the activities the individual KW goes through when creating value and how they are linked. A KW goes through many of these activities subconsciously, making split-second decisions based on intuition. If a KW skips some activities or carries them out with the wrong assumptions, this could lead to less effective decisions or unnecessary effort, which can affect his/her productivity, for example wasting effort on actions that do not create value, executing actions using too much effort that are better suited for others, or delivering results of actions to irrelevant parties or even not at all.

Figure 10 shows the purposeful activity model of a system for the individual with the identified activities in the four groups: *awareness*, *personal aspects*, *actions*, and *value contribution*.

To execute appropriate actions, the KW needs to *identify actions that contribute to value creation*. This activity is at the top of the *actions* group in Figure 10. Every job is full of demands. The KW is inundated with demands from himself, the organization, and others in his/her social system. Nevertheless, being productive is not about blindly reacting to demands and getting things done, regardless of whether fulfilling the demands creates value or not.

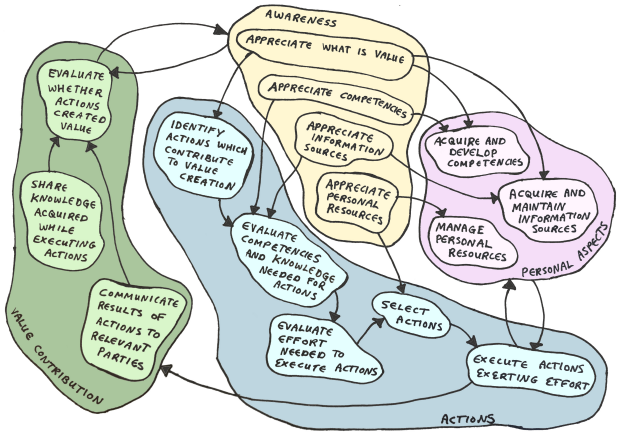

Figure 10. Purposeful activity model of a system for the individual.

If the KW binds emotionally or intellectually to a demand, it becomes a commitment. Too many commitments can overwhelm the KW by pulling at his/her attention. This has a depleting effect on his/her personal resource levels, causing undue stress. Under chronic stress, the KW needs to exert more effort when executing actions. The KW needs to *appreciate what is value* to be able to identify worthwhile actions from the constant demands on him. *Appreciate what is value* is the activity on top of the *awareness* group.

The KW appreciates what is value through self-awareness, socialization, and organizational socialization. The KW identifies his/her own needs, in other words what he/she finds valuable, using self-awareness. Socialization and organizational socialization are processes in which a KW adapts from an outsider to an integrated and effective insider. These processes give a group of people a shared cognitive frame built on shared experiences, trust, imitation, and observation. This allows the KW to interpret more successfully what the organization or others in his/her social system perceive as value, making it more likely that the KW creates the value he/she intends.

Appreciating what is value also touches on the evaluation of whether it is appropriate to execute actions that create known value or innovating actions that might or might not create value. Innovation is an investment in possible future value and is inherently risky. However, successful innovations can be the key to competitive advantage and human progress. Section 2.1 went into detail about factors that influence the appreciation of value extracted from the literature review.

The KW needs to *evaluate competencies and knowledge needed for actions* so he/she can *evaluate the effort needed to execute actions*, the next two activities in the *actions* group. To be able to *evaluate competencies and knowledge needed for actions*, the KW needs to *appreciate competencies* and *appreciate information sources*, the next two activities in the *awareness* group.

It is not enough to be aware of what actions contribute to value creation; the KW also needs to appreciate his/her own competencies to know where he/she has the unique ability to contribute. To appreciate his/her own competencies, the KW uses self-awareness. The individual perceives his/her particular set of competencies through the lens of his/her experiences, interests, values, his/her belief in his/her capabilities to perform certain tasks, and feedback from others. He/she must identify whether he/she needs to acquire new competencies to create value, develop the competencies he/she already has, or transfer into a more suitable job or role.

That brings us to the first activity in the *personal aspects* group, *acquire and develop competencies*. Different jobs and roles within organizations need different competencies. Some competencies can easily be acquired and developed, but others are more inherent, and the lack of them could make the KW unsuitable for some roles. A common example is of the highly valued expert that is promoted to a management role in which he/she becomes unsuccessful because he/she is lacking fundamental competencies needed for management, such as leading others and interpersonal understanding. Section 2.4 describes the components of competencies that affect how much effort it takes to acquire and develop them.

The KW seldom has all the information and knowledge required for an action. After the KW has discerned what he/she requires, the KW needs to *appreciate information sources*. Appreciating information sources is necessary to find and gather the required information or knowledge. It is important to put effort into acquiring and maintaining information sources to improve access and availability to information and knowledge. *Acquire and maintain information sources* is the second activity in the *personal aspects* group.

Information and knowledge can come from colleagues, a professional or personal network, technology, media, books, and so on. If the KW needs to acquire much new information or knowledge to execute an action, it might not be worth the effort and better to delegate to someone already having the knowledge. Social relations are considered the most efficient way to transfer knowledge. Acquiring and maintaining information sources is, therefore, mostly about obtaining new social connections and building relationships. Networking is a way to acquire new information sources through social connections, and building relationships is about creating shared experiences. Shared experiences allow individuals to have a shared cognitive frame of reference to recognize, understand, and exchange knowledge. Different types of social connections give access to different types of information or knowledge. Appreciating information sources is also about being aware of information communication technology (ICT) systems as potential information sources and acquiring the skills to utilize them. Section 2.2 explained factors that influence how the KW works with knowledge.

These are the factors the KW needs to have in mind when *evaluating the effort needed to execute actions*, the third activity in the *actions* group. KWs use their intuition, prior experience, self-awareness, and cues from their environment to perform this evaluation. KWs do not perform this evaluation consciously unless they need to for planning reasons. An action that requires developing new competencies or gathering much information might not be the most efficient choice, but might be an effective choice. For example, it might be effective if the competencies or knowledge acquired are useful for future actions.

From the insight gained from the evaluations, the KW *selects actions* to execute, the fourth activity in the *actions* group. When selecting actions, the KW must take into account the evaluations of the effort needed and his/her personal resource levels. He/she needs to *appreciate personal resources*, the last activity in the *awareness* group. Personal resources are aspects of the self linked to resiliency and provide the fuel necessary for high performance. Section 2.3 gave examples of personal resources and described how engaging in behaviors or conditions affect the personal resource reserves.

In essence, every action the KW takes affects his/her personal resource levels. Actions can be depleting or restorative. The KW needs to be aware of his/her personal resource levels and how an action affects him/her when selecting actions to execute. The KW needs to *manage his/her personal resources*, the last activity in the *personal aspects* group. The KW should strategically sequence and time the sources of restoration and depletion of his/her personal resources for high performance.

Executing many depleting actions in a row can bring the KW's personal resource levels below a resiliency threshold. Then, the impact of depleting events is magnified, and the impact of restorative events is reduced, leading to worsening performance. This kind of chronic stress without recovery can lead to exhaustion or burnout. The KW needs to reevaluate actions regularly in regard to their effect on his/her personal resources. The effect on his/her personal resources changes over time, in different situations, at different personal resource levels, and in relation to what is going on in his/her life.

After the KW has *selected actions*, he/she needs to *execute actions exerting effort*, the last activity in the *actions* group. While executing the actions, the KW uses his/her *personal aspects* in the group. The activities in that group are executed alongside the actions. As the KW interacts within the organization or his/her social system, he/she uses his/her prior education, experience, and competencies to develop his/her personal aspects, further adding to his/her human capital and to the value of the organization.

From the actions the KW executes, tangible and intangible artifacts are created. These artifacts do not have value until they are utilized in a way that generates value for the individual KW, the organization, or others in the KW's social system. This brings us to the last group in the model, the *value contribution* group. There are three activities in this group; *communicate results of actions to relevant parties*, *share knowledge acquired while executing actions*, and *evaluate whether actions created value*.

The KW should *communicate results of actions to relevant parties* to generate value from the artifacts he/she creates. Most KWs are interdependent; their actions are dependent on the actions of others. This interdependence can emerge from the complexity of tasks, from the design of work processes or from group goals and group feedback. The KW needs to be aware of his/her interdependence to identify to whom he/she needs to communicate the results of specific actions. The KW's perception of the work status, expertise, and responsibilities of others will provide context to his/her actions and what results are relevant to whom.

The second activity in the *value contribution* group is *share knowledge acquired while executing actions*. By sharing knowledge, the KW contributes to the learning systems of the organization or of other groups and communities in his/her social system. It depends on the type of knowledge and what methods of sharing are appropriate. Knowledge that is personal and context dependent, tacit knowledge, needs conversations in a climate of supportiveness, belongingness, and mutual trust, while explicit knowledge can be easily codified and entered into ICT systems to be stored and managed. Until KWs share both their tacit and explicit knowledge within the organization or their social system, it is the individual's capital and is, therefore, an unvalued asset by the organization or others in the social system.

The last activity in the *value contribution* group is *evaluate whether actions created value*. Continuous self-reflection and being open to feedback from the environment promote new knowledge creation and increase the quality of the knowledge created. This kind of evaluation can be performed through monitoring or by inquiry. Monitoring is when

the KW attends to naturally occurring information cues, while inquiry is when the KW actively generates the information cues by asking questions or initiating conversations. By evaluating whether actions created value, the KW can fine-tune his/her appreciation of what is value in the *awareness* group, which should lead to increasing effectiveness in the selection of actions to execute.

4. Discussions and Conclusions

This research used the soft systems methodology (SSM) to explore knowlegde worker productivity (KWP) and formulated a purposeful activity model of the system from the viewpoint of the individual knowledge worker (KW). The objective was to find and define holistic systems that affect the productivity of the KW to increase our understanding of KWP, so applicable frameworks and methods can be found in future research to manage, measure, and improve it holistically. The knowledge gained from a literature review of *what is value*, competencies, knowledge, and personal resources was used to develop the purposeful activity model of the system from the viewpoint of the individual. The purposeful activity model is not an accurate representation of the real world, as models built for simulation, but a model of the process of how we explore the world. The purposeful activity model gives a holistic foundation to facilitate structured debates on KWP from the viewpoint of the individual, which is often overlooked in research on KWP. Most research on KWs and KWP is from the viewpoint of the organization.

The purposeful activity model views the KW's work as a process, a process where the KW uses resources (input) to execute actions to create tangible or intangible artifacts (output) with the intention of generating value (outcome). As mentioned in the Introduction, KWP can be viewed as the ratio of value created to effort exerted by the KW while executing the actions to create the value. From that proposition, it can be presumed that KWP can be improved by maximizing value creation while minimizing the effort exerted by the KW to create that value. In other words, KWP can be improved by making the transformation process more efficient. However, because of the subjective nature of both value and effort, it is not enough to focus on efficiency to improve KWP. Effectiveness, doing things right, is just as important.

Figure 11 shows an overview of the identified activities mapped to the transformation process and the implications they have for managing and improving KWP.

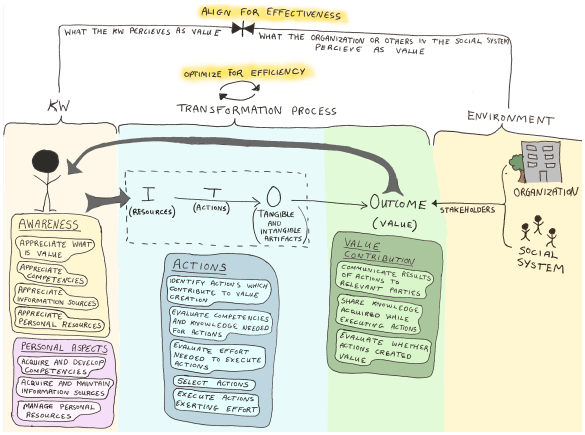

Figure 11. Transformation process of a system for the individual knowledge worker (KW).

To be effective when creating value for others, *what the KW perceives as value needs to be aligned with what the organization or others in the social system perceive as value*. The KW interprets what is valuable to the organization from the organizational culture, environment, and leadership. Furthermore, he/she interprets what is valuable to others in his/her social system through their behaviors, actions, and attitudes. If there is a mismatch between the KW's interpretation and what others perceive as value, the KW might not create the value he/she intends. In other words, he/she will not be effective. The KW can fine-tune his/her appreciation of what is value by evaluating whether his/her actions created value using self-reflection and being open to feedback.

The KW identifies his/her own needs and what he/she finds valuable through self-awareness. The KW intrinsically gravitates towards actions that fulfill his/her own needs and elicit well-being. However, the organization and others in his/her social system are stakeholders of the generated target outcome, that is the value created. The organization needs to motivate their KWs to create value for them. It is, therefore, important for organizations to understand their KW's and invest in getting to know them. Subsequently, they can design the actions needed to fulfill their organizational objectives in a way that they fulfill the needs of their KW's as well.

There can also be a conflict between what others in the social system and the organization perceive as value. This conflict covers subjects such as work–family balance, the management principle of unity of command, corporate social responsibility, and so on. This will be explored further in future research where a purposeful activity model for the organization will be formulated.

The KW can be efficient by optimizing the transformation process. That includes choosing actions that maximize value creation and/or minimize effort exerted. The KW can, for example, minimize effort exerted by managing his/her personal resources. He/she can choose and sequence actions strategically to positively impact his/her personal resource levels. His/her personal resource levels affect how much effort is exerted when executing actions. The KW, therefore, needs to have the autonomy to manage the timing and sequencing of his/her own work.

Efficiency improvements can be found in most activities in the purposeful activity model, but certain actions to improve efficiency in one activity may be at the cost of the functioning of other activities or effectiveness. It is not advisable to focus too heavily on efficiency improvements. This might create a bias for choosing actions that create known value immediately or require the least amount of effort.

Sometimes, the KW can create more value down the road by investing in self-development, by choosing actions that require new knowledge or competencies, in other words choosing actions that require more effort now for value gain later. This also applies to choosing innovative actions that might or might not create value. Innovative actions, although risky, are important for human progress and the survival of organizations in the long run. Collaboration, which provides a platform for sharing knowledge and ideas, can be imperative for innovation.

KWs are interdependent, which makes it difficult to contribute specific value to specific organizational members. Value is often created by helping others, sharing knowledge, and delivering results in a timely manner so that others can use them to generate value. Helping others not only has the potential to contribute to value creation for the organization, but builds relationships and trust as well. Relationships can be a source of well-being and give the KW access to information and knowledge.

It is important that KWs share knowledge to contribute to the learning systems of the organization, which are the basis of the organizational knowledge base. The organizational knowledge base can give the organization a competitive advantage. Organizations need to have a climate of supportiveness, belongingness, and mutual trust for their KW's to be able to create a shared cognitive frame, which is necessary for knowledge transfer. It is beneficial to the organization to encourage knowledge sharing and helping behaviors.

Table 2 shows an overview of the key takeaways of this paper that have implications for managing and improving KWP.

There is a need for further research before applicable frameworks and methods can be found to manage, measure, and improve KWP holistically. It is apparent, from the interdependence of KWs, the subjectivity of value and effort, as well as the latency of some value, that measuring KWP is a challenge. It is difficult to know if initiatives or methods used to manage KWP are successful if KWP cannot be measured effectively. Therefore, there is a need to define and develop ways to measure KWP that consider this subjectivity and latency.

It would be interesting in future research to fully explore the *how* of the system and create an applicable framework that can be tested. Mapping popular management strategies to the purposeful activity model, to analyze what activities they are targeting and how, would give insight into how they could be combined to create a holistic strategy to manage and improve KWP.

Table 2. Key takeaways.

Key Takeaways
The KW might not create the value he/she intends if there is a mismatch between the KW's interpretation and what others perceive as value. - **Organizations** need to make sure the organizational culture, environment, and leadership reflect what is value to the organization. - **KWs** need to integrate successfully into the organization by observing, imitating, and building relationships with successful and competent insiders.
The KW intrinsically gravitates towards actions that fulfill his/her own needs. - **Organizations** need to design the actions, required to fulfill organizational objectives, to fulfill the needs of KWs, as well and use incentives to align the value of the KW and the organization. - **KWs** need to use self-awareness to identify their needs and communicate them.
The KW's personal resource levels affect how much effort is exerted when executing actions. - **Organizations** need to give KWs the autonomy to manage the timing and sequencing of their own work. - **KWs** need to strategically sequence and time their sources of restoration to offset their sources of depletion for high performance.
Focusing too heavily on efficiency improvements might create a bias for choosing actions that create known value immediately or require the least amount of effort. - **Organizations** need to encourage and support innovative actions that might or might not create value, to maintain their competitive advantage. - **KWs** need to invest in self-development, by choosing actions that require new knowledge or competencies, so that they can create more value down the road.
KW's are interdependent, so value is often created by helping others, sharing knowledge, and delivering results in a timely manner so that others can use them to generate value. - **Organizations** need to have a climate of supportiveness, belongingness, and mutual trust for their KWs to be able to create a shared cognitive frame, as well as encourage knowledge sharing and helping behaviors. - **KWs** need to engage in helping behaviors, share their knowledge, and build relationships to access information and knowledge.

Another idea for future research is to map different KW behaviors to the purposeful activity model and analyze what activities are omitted and why. For example, a common behavior pattern of a KW is that of withholding knowledge to make themselves indispensable. Those who partake in that behavior are not executing the activities *communicate results of actions to relevant parties* or *share knowledge acquired while executing actions*. These individuals might seem very productive, that is they probably generate many artifacts. However, value is not created unless these artifacts are delivered to someone who then utilizes them. These kinds of behaviors are often the result of the cultural environment in

the organization where, for example, competition between workers is intensified through badly designed bonus programs. This is an example of how the KW is confined and influenced by the systems in his/her environment. It stresses the importance of looking at both problem owners, the individual and the organization, when exploring how to manage and improve KWP.

According to the path set by Óskarsdóttir and Oddsson (2017), the next step in this research is to formulate a purposeful activity model of the system owned by the organization. Only after both of these viewpoints have been explored can the situation be debated and actions for improvement identified. These are the last two activities in the SSM. Hopefully, applicable frameworks and methods can then be created from the identified actions for improvement and knowledge gained from this research.

The vastness of current research and the level of detail, which touch on factors that influence KWP, had a limiting effect on this research, making it difficult to obtain a complete holistic view. The results of the first paper, which analyzed the problem situation, were used to limit the scope. The purposeful activity model was formulated from interpretations and inferences made from the literature review.

Managing and improving KWP are complicated by the fact that knowledge resides in the minds of KWs and cannot easily be assimilated into the organization's process. Any approach, framework, or method to manage and improve KWP needs to give consideration to the human nature of KWs, which influences their productivity. This paper highlighted the individual KW's role in managing and improving KWP by exploring the process in which he/she creates value.

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Abbreviations

The following abbreviations are used in this manuscript:

KW	Knowledge worker
KWP	Knowledge Worker productivity
SSM	Soft systems methodology
IT	Information technology
ICT	Information and communication technology
KM	Knowledge management
KMS	Knowledge management system

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Paper III

Towards a Holistic Framework of Knowledge Worker Productivity.

Helga Guðrún Óskarsdóttir, Guðmundur Valur Oddsson, Jón Þór Sturluson, Rögnvaldur Jóhann Sæmundsson

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Helga Guðrún Óskarsdóttir and Guðmundur Valur Oddsson conceived of, designed the research and created the model; Helga Guðrún Óskarsdóttir performed the literature review and wrote the paper. Jón Þór Sturluson and Rögnvaldur Jóhann Sæmundsson reviewed the paper.

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Towards a Holistic Framework of Knowledge Worker Productivity

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Abstract: Many jobs today are predominantly knowledge work. This makes organizations dependent on value created by knowledge workers (KWs). Many of the initiatives to improve and manage knowledge worker productivity (KWP) give unpredictable results depending on factors that are often hidden and unknown. It is important to find a holistic approach to improve and manage KWP that gives consistent results across many different organizations. This paper takes us a step closer towards that objective by mapping insights gained from a systematic literature review to activities in a purposeful activity model of the individual KW at work and, based on the findings, proposing a draft of a holistic KWP framework. The main components of the framework are the state of the individual KW, work done and outcome. The systematic literature review searched for papers with topics that touched on approaches, frameworks, tools, or models which aim to tackle the productivity, performance, effectiveness, efficiency, or management of KWs. Relevant concepts were extracted from each paper and categorized into groups. Twelve groups were formed of which six consisted of concepts relevant to individual KWs and their work: organizational commitment and engagement, communication and relationships, personal characteristics and development, personal knowledge management, well-being and job satisfaction and task approach.

Keywords: knowledge worker; productivity; job satisfaction; personal knowledge management; task; organizational commitment; engagement; well-being; communication; relationships

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1. Introduction

At the brink of the fourth industrial revolution, knowledge work has become increasingly more important. Knowledge is the basis of innovation, which is needed to solve problems, seize opportunities and face the challenges that arise during the disruption of a revolution. As automation substitutes manual and routine labor, the productivity of our knowledge work becomes a limiting factor in our economies. Knowledge work is performed by knowledge workers (KWs) which "have high degrees of expertise, education, or experience and use this to acquire, create, share, or apply knowledge in their jobs" (Óskarsdóttir et al. 2021, p. 1).

Drucker (1999) stated over twenty years ago that knowledge worker productivity (KWP) was in a similar condition as manual worker productivity was in the beginning of the 20th century, before Taylor revolutionized it with scientific management. We have made some progress since, but the various frameworks, approaches and methods that have been developed to improve and manage KWP do not show consistent results or only tackle a part of the problem. There is a need for a holistic approach to a theory of KWP that considers the different facets of KWP and their interactions. There is an extensive amount of research in various fields that explore relevant factors to KWP, making this a difficult endeavor.

Óskarsdóttir and Oddsson (2017) and Óskarsdóttir et al. (2021) suggest a holistic approach to KWP using soft systems methodology (SSM) to aid in descriptive theory building. According to Carlile and Christensen (2005), descriptive theory building consists of three steps: observation, categorization and association, which are iterated to formulate a theory that can be applied and improved in normative theory building. SSM has tools that are useful in these three steps when dealing with wicked problems. Wicked problems have many competing viewpoints, which change depending on new experiences or knowledge of individuals or groups. SSM was formulated by Checkland (2011) to explore these kinds of problems in industry, but Óskarsdóttir and Oddsson (2017) and Óskarsdóttir et al. (2021) are attempting to use the methodology to explore the problem situation of managing and improving KWP based on findings from previous research.

SSM consists of four activities: (1) finding out about a problem situation, (2) formulating purposeful activity models (PAMs), (3) debating the situation and (4) taking action for improvement. Óskarsdóttir and Oddsson (2017) executed the first activity and analyzed the problem situation of managing and improving KWP using extensive literature reviews on KWP challenges from both the perspective of the organization and the individual KW. Based on the review, they identified four problems from the perspective of the organization: information needs and knowledge interdependence; motivation, work engagement and health; organizational structure and changes; the nature of knowledge work. They also found that individual KWs experience the following problems as influential to their productivity: too much demand and insufficient resources, choosing what to do and how to do it, self-development, self-awareness, achieving and/or setting goals, performing to full potential, making thinking more productive, successful relationships, collaborations and motivation. The results were abstracted into simple rich pictures and specific root definitions of relevant systems. Building on the results of Óskarsdóttir and Oddsson (2017), Óskarsdóttir et al. (2021) executed the second activity in the SSM and formulated a PAM of the system from the perspective of the individual KW. A PAM is a conceptual model which is used to explore what activities need to be performed to achieve the purpose of the system by looking at it as a process (Checkland 2011). The PAM in Óskarsdóttir et al. (2021, p. 4) was built by assembling and linking the activities relevant to "the process in which the KW uses resources to execute actions to create tangible or intangible artifacts with the intention of generating value".

This paper executes the third activity in SSM, debating the situation, as well as using the findings to draft a descriptive theory of KWP. The purpose of the third activity in SSM, debating the situation, is to compare the PAMs created in the second activity with how others perceive the problem situation to initiate a discussion that highlights assumptions about the problem situation, finds accommodations among conflicting views and identifies actions for improvement (Checkland 2011). There are multiple roles in SSM that can be invited to debate the situation, such as clients (those who initiate the study of the problem situation), problem owners (who give different perspectives of the problem situation) and problem solvers (those who want to do something about the situation) (Checkland 1993). In this paper the PAM presented in Óskarsdóttir and Oddsson (2017) is debated from the perspective of the problem solvers using insights from a systematic literature review. The focus is on factors that are directly relevant to individuals and their work according to the PAM presented in Óskarsdóttir et al. (2021) but limited to the perspective of the individual KW.

This paper takes us a step closer towards a holistic theory of KWP by describing some of the factors and measures that an operationalized model of KWP should include regarding individual KWs and their work (see Section 5). The draft of a descriptive theory of KWP is based on the results of the third SSM activity, debating the situation, where the insights from the systematic literature review are mapped to the activities in the PAM of the individual presented in Óskarsdóttir et al. (2021) (see Section 4). The design of the research and execution of the literature review are detailed in Section 2 below. Section 3 highlights

the discussions in each concept group which lead to the insights which are mapped to the PAM.

2. Methodology

The main purpose of this research is to contribute towards a theory of knowledge worker productivity (KWP). Theories provide a base which can be built upon. When it comes to KWP, there is no single integrated body of knowledge which can be used for analytical and empirical testing and applied to real-world problems. Knowledge and research relevant to KWP is distributed through multiple fields of study and at a high level of detail. There is a vast amount of existing literature that touches on factors that influence KWP. The first step towards a theory of KWP should, therefore, utilize the existing literature, extract the fundamental elements that affect KWP and explore how they work together from a high level of abstraction using a holistic approach.

This research uses soft systems methodology (SSM) to aid in the theory-building process proposed by Carlile and Christensen (2005). They split the theory-building process into two stages which are iterated through and build theories cumulatively: the descriptive stage and the normative stage. The descriptive stage is preliminary because researchers need to move through it to develop a normative theory which is based on careful field-based research. The descriptive stage consists of three steps: (1) observation, (2) categorization and (3) association.

Checkland (2011) developed the SSM to deal holistically with wicked problems using systems thinking. It has four main activities which are iterated, each with its own set of tools to guide the inquiry into a problem situation towards an acceptable solution that is aligned with all viewpoints and does not intensify competing interests. The four main activities are: (1) finding out about a problem situation, (2) formulating purposeful activity models (PAMs), (3) debating the situation and (4) taking action for improvement. This paper builds on the results of Óskarsdóttir and Oddsson (2017) and Óskarsdóttir et al. (2021), which execute the first two activities of SSM when executing the third activity debating the situation. Figure 1 shows the phases of this research in relation to the three steps of descriptive theory building and in which subsections they are discussed.

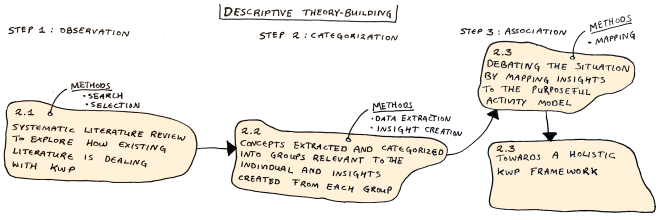

Figure 1. Phases of this research (Section 2.1) systematic literature review, (Section 2.2) data extraction and insight creation, (Section 2.3) debating the situation towards a holistic framework.

In the observation step of descriptive theory building, this research utilizes a systematic literature review to explore how the existing literature deals with KWP (see Section 2.1). In the categorization step, concepts are extracted and categorized into groups relevant to the individual and insights created from each group (see Section 2.2). To aid in the association step of descriptive theory building, the third activity in SSM is executed: debating the situation (see Section 2.3).

2.1. Systematic Literature Review

A systematic literature review search was executed on the Web of Science in May 2021. It searched for papers with a topic that touched on approaches, frameworks, tools,

or models which aim to tackle the productivity, performance, effectiveness, efficiency, or management of knowledge workers (KWs). The search resulted in four hundred and seventeen papers, of which one hundred and fifteen papers were selected by title and abstract review. If the title and abstract was relevant to knowledge worker productivity (KWP) and not too focused on one profession, the paper was included. Case studies were excluded, even though they give good insights, to limit the scope to a more general discussion on KWP. Seventeen papers were not available, so ninety-seven papers were read to extract information about approaches, frameworks, tools, or models relevant to KWP. The search term can be found in Table 1. The search term is in the advanced search query format used in the web of science.

Table 1. Search term in the advanced search query format used in the web of science.

Literature Review Search Terms
(TS = (((productiv* OR perform* OR effectiv* OR effici* OR manag*) NEAR (((knowledg* OR profession* OR information*) NEAR/1 worker*) OR (white NEAR/1 collar*) OR (specialist*)) NEAR (approach* OR method* OR framework* OR tool* OR model*) AND (organization* OR compan* OR (public NEAR/1 (service* OR enterprise*)))))) AND LANGUAGE: (English)

Each paper was read by one researcher who filled out a data extraction spreadsheet where the main theme of each paper was identified and concepts relevant to the productivity, performance, effectiveness, efficiency, or management of KWs extracted. These concepts in the data extraction spreadsheet were then grouped together by theme. Twelve groups were formed. Six groups contain concepts that are directly relevant to individual KWs and their work: organizational commitment and engagement, communication and relationships, personal characteristics and development, personal knowledge management, well-being and job satisfaction and task approach. Six groups contain concepts relevant to the structure, initiatives and environment of the organization in which the KW works: internal marketing, job design, knowledge management, management approach, work climate and measuring productivity. This paper only moves forward with the six concept groups directly relevant to the individual KW and his/her work. Figure 2 shows the main themes identified in the ninety-seven papers. To simplify, each paper was only allowed one main theme.

Figure 2. Main themes of the papers.

Around 40% of the papers, in total 38 papers, had the main theme innovation and working with knowledge. Older papers were more focused on knowledge management and information communication technology (ICT), while newer papers shifted their focus more to personal knowledge management and innovation performance. Even though

human resource management practices was the second most popular theme, only 13 papers discussed this theme. These papers detailed, for example, studies on what human resource management practices were being used in some specific context, how specific strategies affect performance or how different strategies work with different job characteristics or in different work climates. The third and fourth most popular themes were management strategies and retaining workers, commitment and engagement, with 12 and 10 papers focusing on these themes, respectively. Other themes, which fewer than ten papers address, are measuring productivity, organizational performance, task approach, work climate, health and well-being and decision making.

Seventy-eight of the ninety-seven papers in the literature review touched on concepts grouped into the six concept groups directly relevant to individuals and their work: organizational commitment and engagement, communication and relationships, personal characteristics and development, personal knowledge management, well-being and job satisfaction and task approach. Table 2 shows these groups and some examples of concepts from the papers in each group. The list of concepts in Table 2 is not exhaustive but does give an idea of how the groups were formed.

Table 2. Groups and Concepts.

Group	Concepts
Communication and Relationships	social and network support, mutual acceptance, cooperation, mutual understanding, timely communication, conflict resolution skills, define forms of communication, functional communication, continuous communication, internal communication, teams, teamwork
Personal Characteristics and Development	resiliency, learning orientation, goal orientation, prove orientation, avoid orientation, self-development, sensation seeking personality, individual characteristics, coping strategies/behaviors, diffuse vs. specific orientation, expectations, experiences, backgrounds, competencies, organizational citizenship behavior, internal motivation, self-efficacy, initiative, self-determination, workplace boredom relief strategies, self-regulation theory
Well-being and Job Satisfaction	role stress, conservation of resources theory, theory of frustration, stress, burnout, well-being, job satisfaction, recognition, Herzberg's theory (hygiene factors and motivating factors), knowledge sharing leads to job satisfaction
Organizational Commitment and Engagement	work engagement, psychological empowerment, meaning, purpose, competence, have impact, organizational commitment, flow
Personal Knowledge Management	absorptive capacity, personal knowledge management, knowledge building, shadow IT, knowledge reuse, social learning, social networking, expanding horizons, personal competitiveness
Internal Marketing	internal marketing, communicating organizational goals, training and development, initiatives, internal communication, interrelations, motivating workers, rewards, work support, motivation programs, social exchange theory
Task Approach	time-chunking, switching tasks, hyper-refocusing, interruptions, time management skills, IT use, multitasking behavior, timing of email processing, task effectiveness, task interdependence, complexity theory

Figure 3 shows how many papers addressed concepts in each group.

Most papers discussed concepts belonging to more than one group. The most popular group was communication and relationships. Forty-eight papers discussed concepts from that group. A close second was the group personal characteristics and development, which was discussed in forty-six papers.

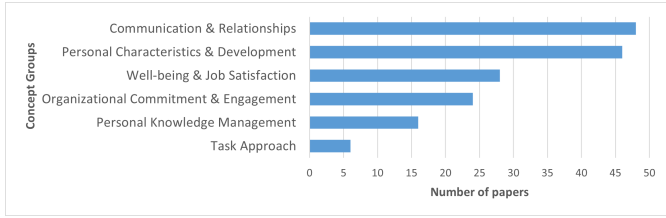

Figure 3. Number of papers which discussed each concept group.

2.2. Data Extraction and Insight Creation

The papers that addressed concepts in each group were read again to extract the main ideas relevant to the group's theme and concepts and explore the association between the concepts within the group and how they influence the productivity of the individual KW according to the papers. This resulted in a summary of the main ideas relevant to the productivity of the individual KW for each group. From each summary, key insights were formulated from inferences made from the literature in each group. The key insights attempt to combine and abstract the main ideas to simplify and highlight associations that are likely important for the management and improvement of KWP. The results of this work are presented in Section 3.

2.3. Debating the Situation Towards a Holistic Framework

Óskarsdóttir et al. (2021) explored the problem situation of managing and improving KWP by executing the second activity in the soft systems methodology (SSM). They formulated a purposeful activity model (PAM) of the system for the individual KW defined in the first activity in SSM, analyzing the problem situation, which was performed in Óskarsdóttir and Oddsson (2017). The PAM proposed by Óskarsdóttir et al. (2021, p. 4) describes the activities that the individual knowledge worker (KW) engages in when using "resources to execute actions to create tangible or intangible artifacts with the intention of generating value". These are the activities needed for the system to achieve its purpose of generating value for the individual himself/herself, the organization he/she works for and the community at large.

The third activity in SSM, debating the situation, compares how others view the problem situation with that captured in the PAM. To debate the situation, the insights gained in the literature review are mapped to the PAM presented in Óskarsdóttir et al. (2021). Debating the situation provides opportunities to rethink a situation, identify actions that can be taken to improve it and highlight assumptions about the situation. The mapping highlights what factors affect which activities and how. Therefore, it gives an idea of why these factors are important, how they affect the activities and where further study is needed to support the worker in his/her activities.

The insights from the literature review and the activities from the PAM are then used as building blocks in a draft of a holistic KWP framework as a step towards a descriptive theory of KWP. Keywords are extracted from the mapped PAM and grouped together to formulate a holistic KWP framework with factors relevant to the individual KW. The next section discusses the results of the data extraction and insight creation, followed by the sections which present the mapped PAM and the draft of a descriptive theory in the form of a holistic KWP framework.

3. Insights from the Systematic Literature Review

This section lists the summaries of the main ideas relevant to the productivity of the individual knowledge worker (KW) and presents the key insights inferred from each

group. The first subsection looks at what the literature goes into regarding communication and relationships.

3.1. Communication and Relationships

A KW's feelings, perceptions and behaviors are affected by their interactions with others (Meneghel et al. 2016). Ozbas (2005) highlights that the organization needs to be aware of the intent and quality of communication. The organization needs to encourage workers to be truthful in their communication by reducing potential gain from exaggeration and reward workers for disclosing unfavorable information. Individual motivation to learn and improve is linked to the desire to use knowledge honestly, knowledge sharing and collaboration (Machuca and Costa 2012). Hitka et al. (2019) found that communication in the workplace was one of the most highly valued motivation factors, and Paros (2021) found that timely communication influenced productivity. Imani et al. (2020) and Huber (2017) state that relationships and communication play a critical role in organizational innovation.

It is important that managers have the ability to interact and communicate with people (Druteikiene et al. 2013; Quinn 2005; Vlasenko et al. 2019). Managers should promote cooperation, sharing and strong and stable interactions within the group and ensure feelings of belonging and trust to improve the perceptions of relationships among colleagues (Meneghel et al. 2016). Solomonidou and Katsounari (2020) found that being heard and acknowledged through feedback, support, encouragement and constructive communication was a motivating factor and improved performance. They found that it is important to maintain functional relationships and communicate effectively with both superiors and colleagues. Training in how to give social support as well as in conflict resolution skills is important for the performance of KWs (Orgambidez and Benitez 2021).

Social exchange theory suggests that workers would rather invest in mutually rewarding relationships where they get more from an interaction than they give (Amar and Hlupic 2016; Kehoe and Collins 2017). Kehoe and Collins (2017) explored the effectiveness of a human resources system which includes practices which aim to support employees in building relationships with colleagues. Such practices include training and feedback on professional network development, frequent social functions and formal mechanisms for knowledge sharing. They found that a relationship-oriented human resources system had positive effects on KWs' collective access to knowledge (Kehoe and Collins 2017). Organizations need to build deep, meaningful and amicable relationships with their internal stakeholders to create a favorable social climate that encourages workers and co-aligns their intentions with organizational purposes (Ahmadi et al. 2018; Imani et al. 2020). Workers are as a whole exposed to the same work climate leading to a common interpretation, understanding and attitudinal evaluation of the job experience (Meneghel et al. 2016). The organizational climate should, therefore, focus on strengthening human relationships for effective knowledge utilization, transfer and acquisition (Igielski 2017).

Ramezan (2016) studied the impact of organizational culture on social capital, which originates from an individual's relations network. According to Nahapiet and Ghoshal's model, social capital consists of structural, relational and cognitive aspects. The structural aspect includes the social system and networks, such as which members have access to which people, how they can access them, strength of ties, hierarchy and utilization of networks. The relational aspect considers the type and nature of relationships as well as what assets and resources the relationships create and foster. The cognitive aspect refers to the shared cognitive frame that is needed to transfer knowledge, history and shared values of an organization to new members. Social capital impacts competitive advantage, performance, innovation and knowledge processes within knowledge-intensive organizations. Ramezan (2016) states that social capital can be improved by using organizational culture to synchronize values and norms of workers with organizational values and norms.

The existence of positive relationships, which create trust and communication opportunities, are fundamental for knowledge sharing (Hortovanyi and Ferincz 2015). Knowledge sharing is a process that transfers knowledge to contribute to organizational goals via

communication channels between individuals (Castaneda and Toulson 2020). Information communication technologies (ICT) support real-time synchronous and asynchronous communication through for example video conferencing, social media and messaging tools and can be used to remove communication barriers such as geographical distance and time differences (Aral et al. 2012; Castaneda and Toulson 2020; Gupta et al. 2011; Hortovanyi and Ferincz 2015). As Yang and Ho (2007, p. 420) states, "to support collaborative design, information technology must not only augment the capabilities of the individual specialists, but also enhance the communications and collaborative resources of collaborators". Even though ICT tools can make work easier, they can cause communication overload with increased access to workers both inside and outside of work (Moussa et al. 2017; Gupta et al. 2011).

Top management should communicate a clear mission and integrate groups within the organization as well as convey fairness, transparency, impartiality and trust (Lee and Kim 2001; Meneghel et al. 2016). Machuca and Costa (2012) found that reliable and transparent communication through teamwork is an important factor for sustaining competitive advantage in knowledge-intensive organizations. Working in teams allows workers to learn from colleagues and create new ideas through dialogues and discussions (Janz and Prasarnphanich 2003). Teams form a communication channel for knowledge seekers and knowledge senders to exchange their knowledge to improve performance (Janz and Prasarnphanich 2003). According to cooperative learning theory, teams need to have positive interdependence, promotive interaction and group processes to share and develop tacit knowledge while completing their work. A team has positive interdependence if the members are linked through a shared group goal that each member identifies with and feels that he/she cannot be successful unless all other members of the group are successful. Positive interdependence is associated with strengthened mutual relationships, which lead to mutual aid and exchange of knowledge (Lin 2010). Promotive interaction refers to the extent to which members of a group interact to develop the skills necessary within the group to accomplish tasks and support the success of each team member. Group process refers to the concerted effort to evaluate the performance implications of group behaviors and norms (Janz and Prasarnphanich 2003). Solomonidou and Katsounari (2020) found that factors such as common understanding, mutual acceptance, positive communication, collaboration and support promoted group work, facilitated resolution of conflicts and facilitated the discharge of work-related anxiety and emotional fatigue.

These three characteristics of teams, positive interdependence, promotive interaction and group process to share and develop tacit knowledge, allow the teams to create shared mental models, which include interaction patterns, responsibilities, communication channels, role interdependences and an understanding of each other's knowledge, skills, attitudes, preferences and tendencies (Guiette and Vandenbempt 2013). Transactive memory theory states that individual members of a team can serve as external memory aids to each other, allowing members to specialize in different areas (Yang and Ho 2007). This reduces the cognitive load of each individual but enlarges the memory capacity of the group and gives them access to information across various domains (Yang and Ho 2007).

Team mental models can give teams an advantage in coordinating, interpreting and processing complex and unpredictable situations but can become a liability in novel situations where the existing team mental model is inadequate (Guiette and Vandenbempt 2013). Team mental model content becomes embodied in organizational routines and beliefs, making them hard to change. This is the reason for inertia when it comes to strategic change. It is important realign team mental models to the vision, mission and strategic changes of the organization by communicating expectations clearly so that rumors and gossip do not dominate the sensemaking process. It is also important to align different and potentially disconnected team mental models to develop an understanding of each other's mental models so that conversations between different groups can be meaningful with mutual understanding and empathy (Guiette and Vandenbempt 2013).

Autonomy has a positive effect on knowledge sharing if the social and network support is sufficient (Shujahat et al. 2021). When workers can self-organize their knowledge and communication networks they can better utilize them to develop solutions to problems, generate knowledge and share it (Janz and Prasarnphanich 2003). Team effectiveness is dependent on the helping behaviors of team members (Lin 2010; Lyons and Bandura 2016). Activities that individuals engage in to enhance work relationships, assist others and take initiatives are perhaps more important than an individual's performance on task requirements (Lyons and Bandura 2016). As Dooley and O'Sullivan (2000, p. 375) states "it is through communication that a holistic perspective of the organization can be achieved and revolutionary ideas for innovation captured."

Table 3 shows the two key insights extracted from the literature in the concept group communication and relationships.

Table 3. Communication and Relationships (CR) —Key Insights.

	Key Insights
CR1	Shared experiences create shared mental models which are necessary for the transfer of knowledge. Relationships are built on shared experiences and foster feelings of belonging and trust, which aids in the creation of mental models and the willingness to engage in organizational citizenship behaviors.
CR2	The intent of communication depends on the interplay of the level of personal gain of the communication and the level of organizational gain of the same communication. Organizational culture and reward systems impact the alignment of these two aspects.

These insights are mapped to the PAM for individuals proposed by Óskarsdóttir et al. (2021) in Section 4. The next subsection analyzes the main themes found in the literature on personal characteristics and development.

3.2. Personal Characteristics and Development

Human resources are integral to an organization's competitive advantage. It is important to develop the people who make up the human resources of organizations to empower them and increase their sustainability (Tazakori et al. 2019). Pickett (1998) states that organizations need to analyze the knowledge and skills required to perform a particular job to establish an effective individual developmental plan. These personal characteristics are identified as valuable capabilities for the job market and can be developed through interventions: self-efficacy, creativity, information literacy, communication, self-esteem, motivation and personal growth (Tazakori et al. 2019). Ahmadiyeh et al. (2020) propose that managers encourage workers to take responsibility for their own personal improvement and identify their own improvement needs, which can be used to create specific developmental and improvement strategies. This is especially important for contingent workers so as not to limit career development and work opportunities (Redpath et al. 2009). Finding ways to incorporate the personal and career developmental needs of individuals into the organizational resourcing decision-making process is fundamental to enhance workers' contributions to the organization and retain workers (Dainty et al. 2009; Fischer and de Albuquerque 2005; Horwitz et al. 2006).

Meneghel et al. (2016, p. 2051) emphasized the importance of resilience in workers as it "helps the employee to face the demand for flexibility, adaptation and improvisation in situations characterized by change and uncertainty" and it requires workers "to find unknown inner strengths and resources to cope effectively". They state that high quality relationships, that reinforce feelings of belonging, support and trust, foster resilience. Some of the characteristics mentioned above are grouped together under the concept of psychological capital, which "represents an individual's state of development of the combined positive psychological resources of hope, efficacy, resilience and optimism" (Alessandri et al. 2018, p. 33). Psychological capital is associated with job performance, organizational citizenship behaviors, job satisfaction and commitment. These four characteristics allow an individual to

have confidence and the willingness to succeed at challenging tasks (efficacy), make positive attributions (optimism) allowing them to persist in the face of adversity and bounce back (resilience) to attain success and redirecting paths to goals (hope) to succeed. Psychological capital can be developed through targeted training interventions (Alessandri et al. 2018).

Organizational citizenship behavior is "a voluntary individual behavior that helps the organization most efficiently function as a whole without taking into consideration a structured reward system" (Zehir et al. 2019, p. 6). It encompasses behaviors such as when workers help others without expecting anything in return, treat others around them with respect, carry out their tasks well beyond the minimum required levels, voluntarily participate in the organization's politics and have positive attitudes (Bhatnagar 2014; Lyons and Bandura 2016; Zehir et al. 2019). Organizational citizenship behaviors minimize individual opportunistic behaviors, increase innovative behaviors such as participating in discussions and being active in the implementation of changes and help to cultivate a climate of cooperation, collaboration, innovation and positivity (Lyons and Bandura 2016; Zehir et al. 2019). Social identity theory claims that individuals have a tendency to categorize themselves as members of certain groups which enhances their self-esteem, sense of unity with the group and belongingness (Kunda et al. 2019). Employees that identify with their organizations are more likely to engage in more organizational citizenship behavior out of loyalty and pride (Kunda et al. 2019). Joo and Lee (2017) found that engaged individuals with affective commitment were more likely to show organizational citizenship behavior.

Motives are elements of personality that are a driving force behind behaviors and express the psychological causes or reasons for that behavior (Hitka et al. 2019). Motivation is a dynamic process that considers both personal and sociopsychological factors that interact with one another. Therefore, motivators can change with experiences, environment, context, knowledge and so on (Hitka et al. 2019). Hitka et al. (2019, p. 5498) states that "employee motivation can work effectively only if it is based on adequate knowledge and understanding of motivation factors and their differentiation in relation to certain types of employees". Tampoe (1993) presented a model for motivating KWs which describes how personal motivation influenced by the expectation and perceived value of rewards is translated into task-motivated energy through task- and domain-relevant skills and personal effectiveness, which can be directed towards attaining work goals if the organization is enabling and there is both role and goal clarity. He identified four key motivators—personal growth (the opportunity for individuals to realize their potential), operational autonomy (the discretion to achieve assigned tasks within the boundaries of strategic direction and self-measurement indices), task achievement (being able to produce quality work relevant to the organization that the individual can be proud of) and money (earning a just income for the contribution made and share in the wealth created through incentive schemes). The organization can encourage their workers using activities such as motivating programs, rewards, work support, directing worker performance behaviors through worker involvement and identification with the organization (Krausert 2014).

Steward et al. (2009) explored how role identities affected the performance of salespeople. The specific role identity that individuals have draws them to specific information congruent with how they see themselves and prompts them to select behaviors that are consistent with their role identity. Role identities can influence the attributions of workers, that is how they perceive causation. Attribution theory explores what factors are involved in how individuals perceive causation, which in turn affects intentions for future behavior. Different attributions manifest from different orientations. For example, those with a growth orientation or mindset are more likely to attribute failure to a lack of knowledge and focus on learning from the experience, while those with a fixed orientation might attribute failure to external factors beyond their control. Workers often make self-enhancing attributions that support their role identities: how they see themselves (Steward et al. 2009).

The literature mentions different types of orientations that affect how different individuals perceive and behave in their jobs, work climates and organizations. Raina et al.

(2020) explore how diffusion specificity, which is the level of particularity a culture uses to define different constructs, affects the interface between work and family life. They found that individuals with a diffuse orientation perceive work and family as overlapping and are more likely to experience work–family enrichment by integrating their work and personal lives. Work–family enrichment is the extent to which experiences or resources from one role improve the performance and quality in another role. Meanwhile, van der Heijden et al. (2012) explored the effect of a worker's proactive orientation on their relief strategies to workplace boredom. Proactive orientation describes how much an individual acts on their environment in a self-directed way with the aim to change or improve the current work circumstances (van der Heijden et al. 2012). An individual's proactive orientation can be influenced by interventions such as training in proactiveness and assertiveness. van der Heijden et al. (2012) found that workers with a high proactive orientation found it easier to remain involved with their job despite high levels of boredom and a lack of challenges.

Yildiz et al. (2021) found that an individual's learning and prove orientations were important predictors of their capacity to recognize, understand and utilize new knowledge (i.e., their absorptive capacity). Learning orientation is an individual's "willingness to seek challenges and opportunities for improving knowledge and skills in order to accomplish mastery over task" (Yildiz et al. 2021, p. 2). Prove orientation is how much an individual focuses on demonstrating performance and competence to obtain favorable judgments from others. These two types of orientations are extracted from goal orientation theory, which focuses on different types of motivational orientations driving individuals' actions (Yildiz et al. 2021). Shujahat et al. (2021) found three benefits of a lifelong learning orientation in regards to personal knowledge management: lifelong learners were more likely to share their knowledge, to develop knowledge and skills for themselves and others and challenge themselves, increasing the quantity and quality of their job goals.

Alkhatib (2017) explored moral judgment when dealing with ethical dilemmas in the construction industry and proposed a moral decision-making model. His personal moral framework consists of an individual's personal value system and moral reasoning process. An individual's personal value system develops gradually through interactions with different social groups and authoritative figures. Every individual brings these personal values into their professional life, where they affect their decisions, experiences and behaviors. Alkhatib (2017) included some common personal values that influence moral attributes in their framework such as: honesty, integrity, trustworthiness, reliability, dignity, caring, discipline, fairness, justice, duty, respect, friendship, patience, enthusiasm, sincerity, kindness, appreciations, forgiveness and equality. Hernaus and Vokic (2014) and Duxbury and Ormsbee (2020) argued that job design needs to take into account the different personal values and preferences of different generations of workers and tailor the jobs to them to improve KWP.

Table 4 shows the four key insights extracted from the literature in the concept group personal characteristics and development.

These insights are mapped to the purposeful activity model (PAM) for the individual proposed by Óskarsdóttir et al. (2021) in Section 4. The next subsection discusses the highlights found in the literature on well-being and job satisfaction.

Table 4. Personal Characteristics and Development (PCD) —Key Insights.

	Key Insights
PCD1	Preferred behavior leads to the willingness to succeed at challenging tasks, help others without expecting anything in return and make positive attributions to attain success without succumbing to adversity and giving up. This state is attributed to psychological capital and engaging in organizational citizenship behaviors. Role identity, how the individual sees himself/herself in work, affects how they perceive causations, which in turn affects intentions for future behavior. The individual's social identity, whether the worker has a sense of unity, trust and belongingness within the organization, can positively impact these preferred behaviors.
PCD2	The level of motivation towards engaging in preferred behaviors is influenced by an individual's motives, which are elements of personality that drives behaviors shown and motivators such as personal growth, operational autonomy, task achievement and financial incentives.
PCD3	There are many spectra of orientations influenced by cultures, experiences, personality and personal value systems of individual workers, which affect behaviors shown. The organization needs to find KWs with the appropriate orientation combination that takes into account the person–job–environment fit, which leads to preferred behaviors.
PCD4	To drive KWs towards engaging in preferred behaviors, organizations should be aware of the motivators of individual workers to motivate them towards organizational goals and support the workers in personal development.

3.3. Well-Being and Job Satisfaction

Well-being at work depends on satisfaction with the environment, leadership, career development and job characteristics (Joo and Lee 2017). Well-being, therefore, is influenced by a worker's person–environment fit. When an individual perceives a predominance of positive feelings over negative feelings, he/she experiences not only well-being but happiness. Happy workers are more likely to be active, approach oriented, energetic, interested in their work, sympathetic to others and persistent when facing challenges or difficulties (Joo and Lee 2017).

The dynamic equilibrium theory of stress states that "stress results from a broad system of variables that include personality and environmental characteristics, coping processes, positive and negative experiences, and various indices of psychological well-being" (Solomonidou and Katsounari 2020, p. 2). According to this theory, both individual and organizational factors influence a worker's well-being. Organizational factors include both the aspects of an organizational climate as well as the worker's subjective experience of that climate. Meanwhile, individual factors refer to individual attitudes, behaviors, personalities and coping processes. Expectancy is the belief in the relationship between the effort exerted and the performance obtained (Orgambidez and Benitez 2021). If the worker believes that an increase in effort is followed by an increase in performance, his/her expectancy is higher (Orgambidez and Benitez 2021). Expectancy depends both on internal factors, such as the psychological state of the individual and external factors, such as task difficulty and uncertainty about roles and tasks (Orgambidez and Benitez 2021). An imbalance between effort and rewards is known to cause stress, emotional distress and increase the risk of coronary heart disease and depression (Spanier et al. 2014). What is a reward differs between individuals and context, it is not only wages but can also be, for example, esteem, recognition, job security and the possibility of promotion (Spanier et al. 2014). Performance appraisals, which are necessary to determine rewards, can be conducted more effectively if the job definition and its strategic purposes are clear (Tamasevicius et al. 2020).

Solomonidou and Katsounari (2020) found that excessive workload, working overtime, role ambiguity, role conflict, ethical dilemmas, unmet personal expectations and a negative public perception of the profession were sources of stress among social workers. They also found that if these stressors were combined with insufficient support and understanding by supervisors and colleagues it could lead to burnout symptoms. Burnout "is a psychological response to exposure to chronic stressors at work and is characterized by high levels of emotional exhaustion, depersonalization, and reduced personal accomplishment" (Solomonidou and Katsounari 2020, p. 2). Other factors that increase the likelihood of burnout that were identified are: hardiness, locus of control, personality characteristics,

attitudes, perfectionism, a need to please others, complexity of client problems, absence of autonomy, lack of feedback on work performance, lack of meaningful rewards and lack of job security (Solomonidou and Katsounari 2020).

Joo and Lee (2017) found that workers felt a greater sense of well-being when they perceived more organizational support and had more psychological capital. Perceived organizational support describes the general belief of how much the organization values their workers' contributions and cares about their well-being, while psychological capital is an individual's positive psychological state of development (Joo and Lee 2017). According to the norm of reciprocity, a worker who perceives a high level of organizational support is likely to repay in turn by contributing more to the organizational objectives (Joo and Lee 2017; Vora 2004). For example, if an organization does not look after the well-being of their workers through trust and care, they cannot expect their workers to help customers with trust and care (Vora 2004). Therefore, a KW's job satisfaction and well-being are necessary to achieve customer satisfaction (Vora 2004). Organizations can improve perceived organizational support and the psychological capital of their workers through interventions such as growth opportunities, performance management, compensation systems and training and development (Joo and Lee 2017).

Job satisfaction is positively related to high performance (Lee et al. 2019). Job satisfaction describes an alignment between KWs' personal interests or needs and what the organization provides (Kucharska and Erickson 2020). It refers to a pleasurable emotional state which results from the perception of achievement or fulfillment in one's job (Lee et al. 2019). A KW with a preferred balance of motivational and reward factors that are of importance to them has a high level of job satisfaction (Tampoe 1993). Machuca and Costa (2012) found that trust, transparency, flexibility, collaboration, commitment, honesty and professionalism were factors that generally have a positive effect on job satisfaction. Meneghel et al. (2016), likewise, found that job satisfaction as well as work resilience and performance could be increased by interventions on collective perceptions of social context, such as training supervisors in a supportive management style, promoting cooperativeness and developing stable within-group interactions to ensure feelings of belonging and trust. Perceptions of social context are "the set of positive perceptions by employees of the behaviors enacted by the most relevant social constituents within the organization" (Meneghel et al. 2016, p. 2048).

Palvalin et al. (2018, p. 4) states that "enhanced knowledge transfer may promote job satisfaction, which again is linked to better productivity". Knowledge transfer gives KWs greater access to knowledge, builds relationships and promotes a more positive work climate, which enriches the job experience and, therefore, increases job satisfaction (Janz and Prasarnphanich 2003; Kucharska and Erickson 2020). Lee et al. (2019) found that workers with high levels of job satisfaction were more likely to engage in informal learning at work, enhancing knowledge transfer. Knowledge transfer and job satisfaction, therefore, can reinforce each other. Kucharska and Erickson (2020) studied the mutual relationship between knowledge transfer and job satisfaction in the context of an organizations information technology competency. They found that an organization's information technology competency influenced job satisfaction and knowledge transfer more in KWs in the IT industry than for other industries. This verified their hypothesis that factors that influence job satisfaction vary for different industries.

Sahibzada et al. (2020) states that not only knowledge transfer but all knowledge management processes improve job satisfaction through the implementation of motivating factors, while adjusting hygiene elements. According to Herzberg's two-factor theory, motivating factors, such as personal growth, achievement and recognition, increase job satisfaction, while the presence of hygiene factors, such as salary, physical environment and support from supervisors, prevent job dissatisfaction. Knowledge management processes increase job satisfaction by confirming rewards, providing work support, supporting training and development, providing authority to perform allotted jobs, building a collaborative culture and supporting a learning and knowledge-based environment that allows KW's

to positively interact arousing intrinsic motivation for knowledge creation (Cai et al. 2020; Razzaq et al. 2019; Sahibzada et al. 2020).

Table 5 shows the three key insights extracted from the literature in the concept group well-being and job satisfaction.

Table 5. Well-being and Job Satisfaction (WJS)—Key Insights.

	Key Insights
WJS1	The level of well-being, in the form of emotional and physical state, can range from happy, with predominantly positive feelings, through neutral to burnout, with high levels of emotional exhaustion and health problems. The level is influenced by the person–environment fit, individual factors, such as attitudes, behaviors, personalities and coping processes and organizational factors including the person's subjective experience of the organizational environment and expectancy.
WJS2	The level of job satisfaction is a subset of well-being, where the emotional state results from the perception of fulfillment in one's job where an individual's interests and needs are aligned with what the organization provides. The level is influenced by motivating factors, such as personal growth, achievement and recognition and the presence of hygiene factors, such as salary, physical environment and support.
WJS3	To influence the level of well-being and job satisfaction, the organization should ensure perception of organizational support, ensure feelings of belonging and trust and cultivate a culture of transparency, collaboration, honesty, flexibility, commitment and professionalism.

These insights are mapped to the PAM for the individual proposed by Óskarsdóttir et al. (2021) in Section 4. The next subsection looks at personal knowledge management.

3.4. Personal Knowledge Management

Personal knowledge management is a key competence in modern workplaces which allows individuals to perform effectively within the organization (Ahmadiyeh et al. 2020). Personal knowledge management is a concept that describes how KWs manage, organize and develop their organizational knowledge at the individual level (Grundspenkis 2007; Jarrahi et al. 2021; Shujahat et al. 2021). It represents a bottom-up approach to traditional knowledge management (Chatti 2012; Shujahat et al. 2021). Grundspenkis (2007) states that personal knowledge is the combination of an individual's own knowledge, experience and skills, while organizational knowledge is the sum of individuals' knowledge utilized by the organization and the knowledge that exists in organizational systems, processes, products, rules and culture. Meanwhile, Kotis and Vouros (2006) states that personal knowledge is created through practice, while organizational knowledge is created through the interaction between organizational members.

KWs need autonomy to manage and exchange personal knowledge and coordinate with each other to generate organizational knowledge (Pirro et al. 2010). Pirro et al. (2010, p. 48) found that "enabling the autonomy of KWs and coordinating their knowledge is more effective than superimposing predefined knowledge organization procedures". Yildiz et al. (2021) found that an individual's absorptive capacity cannot be translated into high innovation performance unless the work environment is coordinated. The concept of absorptive capacity describes a KW's ability to identify, assimilate and exploit knowledge from the environment (Yildiz et al. 2021).

Most personal knowledge management models deal with knowledge locating/capturing, knowledge sharing/transferring, knowledge creation and knowledge application processes. For example, Chatti (2012) set forth a personal knowledge network model which views knowledge as a personal network and represents a knowledge ecological approach to knowledge management. Meanwhile, Schmitt (2020) proposed a decentralized personal knowledge management system based on Popper's three world perspective, Briscoe's digital ecosystems modified with Gibson's theory of affordances and Nonaka's model of dynamic knowledge creation. These different perspectives of personal knowledge management both fulfill the objective of making KWs better at capturing, sharing,

creating and using knowledge while maximizing effectiveness in relationship building and socializing (Grundspenkis 2007).

Jarrahi et al. (2021) identified four personal knowledge management practices common to KWs—knowledge reuse, social learning, social networking and expanding horizons. Knowledge reuse is when a KW finds a codified piece of information and reuses it in relation to new situations, projects or problems. Knowledge repositories, which are common in traditional knowledge management, play a key role in supporting knowledge reuse. Formal learning, such as workshops, courses and training, fosters knowledge reuse practices by providing information and allowing KWs to practice in reusing it. Vogel et al. (2011) and Wang et al. (2011) developed a performance-oriented approach to learning on the job using e-learning by translating the organizational mission and vision into goals that drive the learning. Social learning is when a KW finds a person, within or outside the organization, with relevant expertise to share needed knowledge for a knowledge problem. This practice is inherently social and relies on both strong and weak relational ties. While knowledge reuse utilizes explicit knowledge (knowledge that can be codified), social learning utilizes tacit knowledge (knowledge based on personal experiences, insights and judgments which are difficult to articulate by codification). Social networking is the long-term and purposeful practice of developing and maintaining social infrastructures, which influences the KW's identity and provides social capital that can be tapped for social learning. Expanding horizons is the practice of constantly researching about the future of the KW's work and career so the KW can better predict and adapt to changes. The tacit knowledge from this practice drives self-development (Jarrahi et al. 2021).

Personal knowledge management can be said to consist of three building blocks: personal knowledge practices, informal social relationships and ICT. There has been a shift of responsibility for personal learning and knowledge management from the organization to the individual (Jarrahi et al. 2021). The majority of knowledge gained at work is through the KW's own experiences and social relationships, in other words through informal learning (Lee et al. 2019). KWs rely, therefore, more on shadow IT for information when organizational IT is insufficient or ineffective. Shadow IT are informal IT systems used for and at work but not necessarily endorsed by the organization, such as social media, personal cloud services, communication technologies and personal devices (Jarrahi et al. 2021).

Personal information management is a subset of personal knowledge management and refers to an individual's activities related to the acquisition, usage and maintenance of information (Hwang et al. 2015), such as the managing of documents, files, emails, messages and other forms of information that KWs need to deal with every day. Makinen (2012) studied personal information management in mobile work where the mobile workers perceived less support from the organization in their personal information management. The mobile workers found it important to secure records, utilize technical solutions and centralize their information (Makinen 2012).

KWP should improve if an individual utilizes their resources, such as time, energy and attention, better by managing their information. Hwang et al. (2015) proposed that personal information management effectiveness consists of two underlying dimensions: personal information management motivation and personal information management capability. Personal information management motivation is influenced by four information behaviors (Hwang et al. 2015):

- Information proactiveness, which is a worker's willingness to actively seek out information and improve the use of it with respect to his/her job;
- Information sharing, which is a worker's willingness to distribute information to collaborate with others;
- Information transparency, which is a worker's willingness to disclose negative information about his/her experience to others to build relationships and teach others;
- Information formality, which is a worker's willingness to use formal patterns of information communication such as policies, manuals, reports and document archives.

Meanwhile, personal information capability consists of five abilities (Hwang et al. 2015):

- Sensing information, which is a worker's ability to actively detect and identify information in the environment;
- Collecting information, which is a worker's ability to gather relevant information;
- Organizing information, which is a worker's ability to arrange information;
- Processing information, which is a worker's ability to translate information into specific knowledge for the job;
- Maintaining information, which is a worker's ability to accurately discern the future value of processed information.

Table 6 shows the four key insights extracted from the literature in the concept group personal knowledge management.

Table 6. Personal Knowledge Management (PKM)—Key Insights.

	Key Insights
PKM1	Absorptive capacity in the form of sensing, collecting, organizing, processing and maintaining information; dictates the individual's ability to work with knowledge.
PKM2	A combination of the following attitudes towards working with knowledge influences personal knowledge management: proactiveness, sharing, transparency, formality and expanding horizons.
PKM3	The KW engages in the practices of knowledge reuse and social learning to appreciate and utilize information sources.
PKM4	The KW engages in the practice of social networking to acquire and maintain his/her information sources.

These insights are mapped to the PAM for the individual proposed by Óskarsdóttir et al. (2021) in Section 4. The next subsection discusses what the literature focuses on regarding task approach.

3.5. Task Approach

There have been changes in KWs' work environment due to digitization, which affect his/her task approach (Gaskin and Skousen 2016). A task is a goal-oriented activity that has a beginning and an end. Digitization has increased numbers of interruptions and fragmented work into tiny chunks, which has led to frequent task switching and an increase in multitasking behavior (Appelbaum et al. 2008; Gaskin and Skousen 2016). Even though digitization provides new pathways for interruptions, it also provides workers with ways to isolate themselves from interruptions, such as silencing notifications, turning off email clients, etc. Such isolation though could have social implications or affect task effectiveness if the task is interdependent (Aral et al. 2012; Lin 2010). Interruptions are unscheduled synchronous interactions that are not initiated by the recipient and result in bringing the recipient's task to a temporary halt (Gaskin and Skousen 2016; Gupta et al. 2011). Task switching requires a rearranging of physical or cognitive resources in order to assist the switch from focusing on one set of stimuli to another, often called task reconfiguration (Appelbaum et al. 2008; Gaskin and Skousen 2016). Pausing after one task to allow for successful task reconfiguration reduces ramp-up time and errors for the subsequent task (Gaskin and Skousen 2016). Even though digitization has led to more fragmented work, it also retains the exact state of the KW's work intact between interruptions, decreasing task reconfiguration costs. Multitasking is the process of performing two or more simultaneous tasks (Appelbaum et al. 2008). Multitasking is known to increase task completion time, reduce reaction times and increase error rates (Aral et al. 2012). However, multitasking also allows KWs to increase efficiency by smoothing their time over tasks when facing bursty work requirements. This means that some multitasking leads to productivity gains but beyond a certain point it reduces productivity (Aral et al. 2012).

Digitization also increased access to information, which can lead to information overload (Gaskin and Skousen 2016; Gupta et al. 2011). For example, KWs are spending more time processing emails than before, which leads to a perception of a shortage of time, resulting in information overload (Gupta et al. 2011). Too many emails are vying for the

KW's attention, which can result in the KW making decisions that are just good enough instead of the best possible decision (bounded rationality), as the KWs have limited time and resources available to make decisions and complete tasks (Gupta et al. 2011). However, the asynchronous nature of information and communications technology (ICTs), such as email, allows the KW to seek information and knowledge without the constraints of coordinating the availability of information sources, increasing their efficiency (Aral et al. 2012).

The KW needs to adapt to the changes in his/her work environment due to digitization to utilize it to improve his/her productivity, rather than allowing it to be a potential inhibitor (Gaskin and Skousen 2016). Task approach strategies were identified that individual KWs can use to deal with these changes, such as time management, task prioritization and hyper-refocusing (Gaskin and Skousen 2016; van der Heijden et al. 2012). Time management refers to the KW's ability to set goals, prioritize tasks, plan tasks and monitor the progress of his/her work. van der Heijden et al. (2012) found that KWs who are proficient in time management are less vulnerable to workplace boredom and engage in less distraction behavior. Time chunking is a method which can be used in time management. It refers to allocating blocks of time to specific tasks. Gaskin and Skousen (2016) proposed three mutually exclusive options for allocation of time: (1) blocking out the full estimated time needed to fulfill a task, (2) intentionally fragment the estimated time into more manageable chunks and (3) allowing the task to be elastic, where it pauses and recommences depending on context and environment. For example, Aral et al. (2012) found that by allocating specific email processing slots during the workday, KWs could more effectively allocate their attention and minimize interruptions caused by emails.

Task prioritization consists of a strategy guiding the position placement of tasks into the queue of things to accomplish (Gaskin and Skousen 2016). Innately, workers are driven by heuristics to minimize danger and maximize pleasure when prioritizing tasks. Unfamiliar tasks can be perceived as threats resulting in procrastination. Interruptions also pose more serious threats in unfamiliar tasks. When a task is unfamiliar, it requires more cognitive resources, which makes task reconfiguration harder, leading to a larger cognitive expense or performance cost. Task reconfiguration costs are higher when switching between two similar tasks than when switching between two very different types of tasks. Hyper-refocusing refers to the ability to switch between tasks without incurring substantive task reconfiguration costs. That is, focus is not lost but jumps from one set of stimuli to another. Even though it is unlikely that it is humanly possible to hyper-refocus perfectly, there is a moderate variance of this ability across individuals. It would be beneficial if this ability could be trained (Gaskin and Skousen 2016).

Table 7 shows the two key insights extracted from the literature in the concept group task approach.

Table 7. Task Approach (TA)—Key Insights.

	Key Insights
TA1	Innately, KWs are driven by heuristics to manage risk/reward when prioritizing tasks and getting things done.
TA2	Time management skills should be used to minimize task reconfiguration costs by arranging tasks and creating strategies to deal with interruptions.

These insights are mapped to the PAM for individuals proposed by Óskarsdóttir et al. (2021) in Section 4. The next subsection investigates the main themes in the literature regarding organizational commitment and engagement.

3.6. Organizational Commitment and Engagement

Organizational commitment refers to an individual's attachment to the organization (Razzaq et al. 2019; Snape and Redman 2003). It is reflected in the behavior of the worker towards enhancing the organization's interests, in the worker's emotional attachment with the organization, identification with the organization and internalization of the organiza-

tion's goals, norms and values (Koch and Schermuly 2021). Organizational commitment is connected to behaviors such as withdrawal intentions, performance, informal learning, organizational citizenship behaviors, absenteeism and presenteeism (Cohen 1993; Dhaini et al. 2016; Lee et al. 2019; Orgambidez and Benitez 2021).

The leading model of organizational commitment is Mayer and Allen's three-component model which splits organizational commitment into three components: affective commitment that is value-based, normative commitment that is obligation-based and continuance commitment which is based on an assessment of costs and benefits (Razzaq et al. 2019; Snape and Redman 2003). Affective commitment results in a stronger attachment to the organization than normative or continuance commitment as it is based on a desire to remain with the organization and act in ways that make the individual belong. Meanwhile, if an individual has normative commitment, he/she only focuses on fulfilling the obligation and then moves on. A continuance commitment can also be fleeting, since an individual would be quick to jump ship if an opportunity with better benefits or fewer costs arises (Snape and Redman 2003).

Many of the papers looked at organizational commitment as a mediator and at factors that affected the organizational commitment levels of workers. For example, Razzaq et al. (2019) studied the mediating role of organizational commitment in the relationship between knowledge management practices and performance. They found that a collaborative and supportive organizational culture, which provides opportunity for learning and knowledge acquisition, has a positive effect on organizational commitment. Kunda et al. (2019) found that a worker's perception of the corporate social responsibility activities of an organization can have an effect on his/her organizational commitment through variables such as ethical leadership, organizational pride and trust. Koch and Schermuly (2021) found that the commitment of workers in a project-based organization was higher in projects which adhered to agile project management values and principles compared with traditional project management values and principles. Kehoe and Collins (2017), Ahmadiyeh et al. (2020) and Imani et al. (2020) explored high-commitment human resources systems and practices that fostered an environment of overinvestment in employees that resulted in increased affective commitment.

Worker's with a high level of commitment are more likely to be personally invested in their work and be more engaged (Orgambidez and Benitez 2021). Engaged workers are more motivated, productive and involved in their organizations and willing to go above and beyond what is expected (Gupta 2019; Joo and Lee 2017). Most papers use Schaufeli's definition of work engagement, which stresses three dimensions of engagement: vigor, absorption and dedication. Alessandri et al. (2018, p. 35) describes these three dimensions as "vigor (the willingness to invest energy and effort into the work), dedication (experiencing a sense of significance and pride) and absorption (a state of mind characterized by full concentration and immersion in the work)". Meanwhile, Joo and Lee (2017, p. 209) describes the dimensions in this way: "work engagement is regarded as an intentional and thoughtful pursuit of work (i.e., dedication or cognitive engagement); as absorbing and interesting (i.e., absorption or emotional engagement); and as inspiring and energetic that they are willing to devote themselves with passion (i.e., vigor or physical/behavioral engagement)".

Joo and Lee (2017), Alessandri et al. (2018) and Gupta (2019) found that workers were more engaged in their work when they had higher perceived organizational support, perceived career support and psychological capital. Psychological capital is an individual's positive psychological state of development, for example hope, efficacy, resilience and optimism, while perceived organizational support is an individual's beliefs concerning how much the organization values them (Alessandri et al. 2018; Joo and Lee 2017). Psychological capital can be increased through targeted training interventions (Alessandri et al. 2018).

Work engagement is not a constant, it fluctuates over time depending on situational factors and the availability of job and personal resources (Alessandri et al. 2018). Job and personal resources foster work engagement (Gupta 2019). They can be physical, social, psychological or organizational and help in achieving work goals, deal with job demands

and encourage personal growth, learning and development (Gupta 2019). Orgambidez and Benitez (2021) found that role ambiguity and role conflict have a negative effect on the commitment and engagement of workers by draining job and personal resources. Role ambiguity is when the expectations regarding a role are not clear and role conflict is when there are incompatible demands, requests or information (Orgambidez and Benitez 2021). Psychological capital, autonomy, career opportunities, social support, a positive organizational climate and situation awareness are examples of important job and personal resources that satisfy the human needs of autonomy, competence and belonging (Gupta 2019).

Situation awareness is the perception of elements in the environment, which allows for the comprehension of their meaning, the projection of their status in the future, whether a response is needed and what that response should be (Quinn 2005). Situation awareness with simultaneous automatic application of relevant knowledge and skills can move situations to a desired state by responding to tacit and unconscious standards of appropriateness. These standards of appropriateness are learned in practice but not explicitly articulated (Quinn 2005). This series of micro-wins towards small unconscious tacit goals allows workers to perceive themselves to be succeeding in real time, which gives a feeling of flow (Quinn 2005). Flow is a high-performance experience which can lead to improved KWP if the worker has difficult and specific goals that give him/her a direction to exert his/her effort on behalf of the organization (Quinn 2005). A worker in flow has high levels of work engagement.

Table 8 shows the four key insights extracted from the literature in the concept group organizational commitment and engagement.

Table 8. Organizational Commitment and Engagement (OCE)—Key Insights.

	Key Insights
OCE1	An optimized commitment level (continuance, normative or affective) manifests in workers engaging in more preferred behaviors (in the form of psychological capital) enhancing the organization's interests and does not overexpend the personal resources of the worker.
OCE2	To not overexpend the personal resources of the worker, the organization should invest in their workers, design jobs sufficiently to reduce role ambiguity and conflict and cultivate a collaborative learning environment where the worker perceives support.
OCE3	Engagement describes the level of vigor, absorption and dedication of the worker, which impacts work done, motivation and behavior in the workplace.
OCE4	Engagement level fluctuates depending on situational factors and personal resources.

These insights are mapped to the PAM for the individual proposed by Óskarsdóttir et al. (2021) in the next section.

4. Debating the Situation

To debate the situation, the insights gained in the literature review above were mapped to the PAM presented in Óskarsdóttir et al. (2021). The aim of mapping the insights from the systematic literature review was to take a step closer to a holistic and operationalized model of KWP. The mapping highlights what factors affect which activities and how. Figure 4 below shows the insights mapped to the PAM, but first let us start with a walkthrough of the figure by discussing the insights from each group and to which activities they are mapped.

There were four insights gained from the concept group personal characteristics and development (PCD). PCD1 describes the intended outcome of preferred behaviors of workers. It is less clear what these preferred behaviors are, but the literature agrees that they should lead to the willingness to succeed at challenging tasks, helping others without expecting anything in return and making positive attributions to attain success without overcoming adversity and giving up. PCD1 also mentions some factors that influence these preferred behaviors such as psychological capital, which consists of efficacy, resilience, hope

and optimism and engaging in organizational citizenship behaviors. Role identity, how the individual sees himself/herself in work, affects how they perceive causations, which in turn affects intentions for future behavior. The individual's social identity, whether the worker has a sense of unity, trust and belongingness within the organization, can positively impact these preferred behaviors. PCD1 is, therefore, mapped to both actions and awareness because it touches both how the worker sees himself/herself in work through appreciating personal resources, competences and what is value for himself/herself and the organization, which affects how he behaves and identifies actions which contribute to value creation, evaluates what he needs for those actions, selects them and executes the actions.

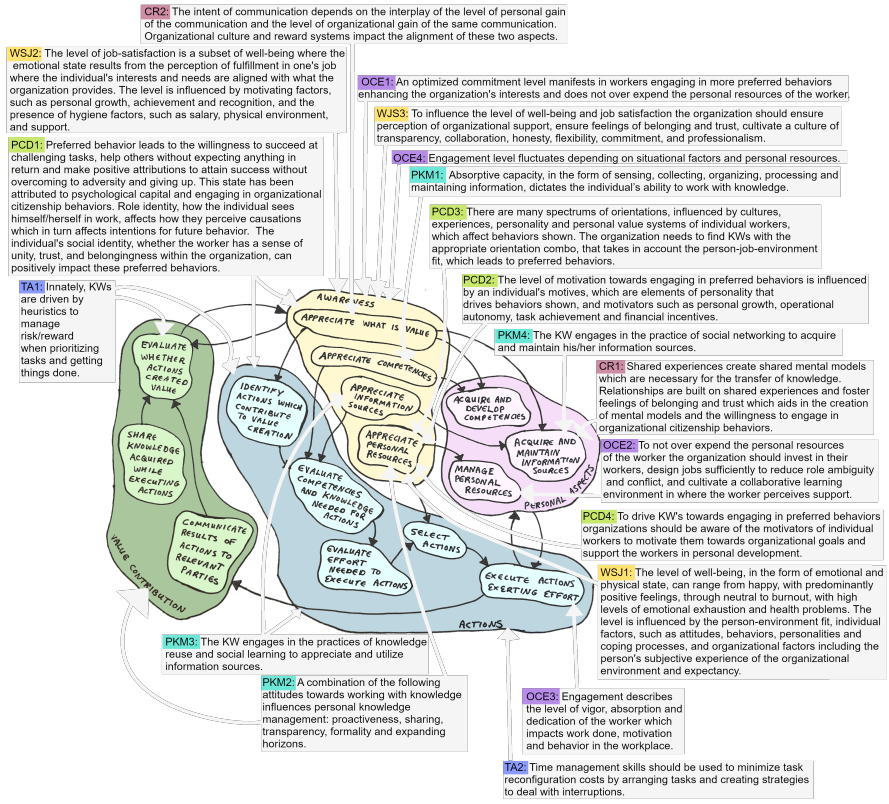

Figure 4. Insights mapped to the PAM of a KWP System for the Individual (Reprinted with permission from Óskarsdóttir et al. (2021). © 2021 by Óskarsdóttir et al.).

PCD2, PCD3 and PCD4 are all mapped to appreciate personal resources. PCD2 is about motivation towards engaging in preferred behaviors, which are influenced by an individual's motives and motivators. Motives are elements of personality that drive the behavior shown, while motivators can both be internal and external, such as personal

growth, operational autonomy, task achievement and financial incentives. PCD3 describes how the different spectra of orientations, influenced by cultures, experiences, personality and personal value systems of individuals, affect behaviors shown. The organization needs to find the appropriate orientation combination that takes into account the person–job–environment fit, which leads to preferred behaviors. When appreciating personal resources, the worker can gauge his/her level of motivation, motives, motivators and orientations using self-awareness, which helps him/her recognize whether there is a person–job–environment fit. PCD4 states that to drive KWs towards engaging in preferred behaviors, organizations should be aware of the motivators of individual workers to motivate them towards organizational goals and support the workers in personal development.

There were three insights gained from the concept group well-being and job satisfaction (WJS). WJS1 describes the level of well-being in the form of emotional and physical state and feeds directly into appreciate personal resources in the PAM. The level of well-being can range from happy, with predominantly positive feelings, through neutral to burnout, with high levels of emotional exhaustion and health problems. By appreciating personal resources, KWs become more aware of their level of well-being and the influence of the person–environment fit, individual factors such as attitudes, behaviors, personalities and coping processes and organizational factors including how he/she perceives them. WJS2 describes the level of job satisfaction, which is a subset of well-being where the emotional state results from the perception of fulfillment in one's job, where the individual's interests and needs are aligned with what the organization provides. The level of job satisfaction is influenced by motivating factors, such as personal growth, achievement and recognition and the presence of hygiene factors, such as salary, physical environment and support. Because of this alignment with what the organization provides and influence by the presence of hygiene factors, the level of job satisfaction is mapped to awareness and not just appreciate personal resource, such as well-being. The KW needs not only to appreciate his/her personal resources but also what is value for the KW himself/herself to identify his/her interests and needs to align with what the organization provides, as well as appreciate what is value for the organization, appreciate competences and appreciate information sources to be able to contribute to organizational goals and fulfill that need of achievement and recognition. The last insight in the well-being and job satisfaction concept group, WJS3, goes into what the organization can do to influence the level of well-being and job satisfaction of their workers. These are interventions such as ensuring a perception of organizational support, ensure feelings of belonging and trust and cultivating a culture of transparency, collaboration, honesty, flexibility, commitment and professionalism. It is also mapped to awareness because the KW experiences these interventions through their appreciation of what they perceive as valuable to the organization and their appreciation of the availability of information sources through, for example, the collaboration and helpful behaviors of colleagues.

There were two insights gained from the concept group communication and relationships (CR). CR1 is about relationships which are built on shared experiences and foster feelings of belonging and trust, which aids in the creation of mental models and the willingness to engage in organizational citizenship behaviors. Shared mental models based on shared experiences are necessary for knowledge transfer. CR1 is, therefore, mapped to acquire and maintain information sources. Building relationships are a way to acquire and maintain information sources. CR2 is about how the intent of communication depends on the interplay of the level of personal gain of the communication and the level of organizational gain of the same communication. CR2 is, therefore, mapped to appreciate what is value. What the KW experiences as value for himself/herself gives the KW an idea of the level of personal gain of the communication and the KW's interpretation of what the organization perceives as value gives him/her an idea of the level of organizational gain of the same communication. Organizational culture and reward systems impact the alignment of these two aspects.

There were four insights gained from the concept group personal knowledge management (PKM). PKM1 is mapped to appreciate competences as it describes absorptive capacity, which is a competence that dictates an individual's ability to work with knowledge. It is the KW's capacity to sense, collect, organize, process and maintain information. PKM2 describes a combination of attitudes that influence personal knowledge management: proactiveness, sharing, transparency, formality and expanding horizons. PKM2 is mapped to both appreciate personal resources and value contribution. The KW needs to appreciate his/her personal resources to identify his/her attitude towards working with knowledge and be aware of how it affects his/her behavior. A KW's willingness to actively seek out knowledge, utilize it and distribute it to collaborate with others (proactiveness and sharing) as well as a KW's willingness to use formal patterns of communication, such as policies, manuals, reports and document archives and disclose negative information to build relationships and teach others (formality and transparency) are crucial for the activities communicate results of actions to relevant parties and share knowledge acquired while executing actions in value contribution. The attitude of expanding horizons, constantly researching about the future of the KW's work and career so that the KW can better predict and adapt to changes, is part of evaluating whether actions created value.

PKM3 states that the KW engages in the practices of knowledge reuse and social learning to appreciate and utilize information sources. It is mapped to appreciate information sources and actions. Knowledge reuse and social learning is used in the activities evaluating competences and knowledge needed for actions, evaluate effort needed to execute actions, select actions and executing actions exerting effort in actions. Reusing knowledge in new situations, projects, or problems usually takes more effort than using previous knowledge, so it affects the evaluation process when selecting actions. Knowledge reuse is then used when executing the actions that require the codified information to be reused. Social learning is inherently social and relies on both strong and weak relational ties. So, it also affects the evaluation of knowledge needed and effort, because for social learning to occur, it requires access to the person, within or outside the organization, with the relevant expertise. The activity of appreciate information sources is important to recognize where codified information can be accessed and what strong and weak social ties the KW has access to for information and relevant knowledge. PKM4 states that the KW engages in the practice of social networking to acquire and maintain his/her information sources. Social networking is the long-term and purposeful practice of building and maintaining social infrastructures, which gives a KW a sense of identity and social capital that can be tapped for social learning.

There were three insights gained from the concept group task approach. TA1 is about the inherent drive of KWs by heuristics to manage risk/reward when prioritizing tasks and getting things done. This inherent drive affects the evaluation of effort needed, decision making regarding actions and how the KW perceives the value created by his/her actions. It is, therefore, mapped to both evaluate whether actions created value and the activity group actions. TA2 is also mapped to the activity group actions. TA2 is about time management skills and how they should be used to minimize task reconfiguration costs by arranging tasks and creating strategies to deal with interruptions.

There were four insights gained from the concept group organizational commitment and engagement (OCE). Two of them can be mapped to the activities grouped under awareness, OCE1 and OCE4. OCE1 is about optimized commitment and requires the KW to internalize organizational goals, norms and values to get a sense of belonging and identify with the organization so that the KW can exhibit preferred behaviors that enhance the organization's interests. The KW does this through the activity of appreciating what is value, both for himself/herself and the organization. OCE1 also emphasizes that it is imperative to find an optimized commitment level where it does not overexpend the personal resources of the worker. Too much affective commitment in an environment that does not meet the needs of the KW can lead to an imbalance between effort and rewards. An imbalance between effort and rewards can cause emotional exhaustion or distress and

health problems. The KW needs to appreciate his/her personal resources to set boundaries and communicate his/her needs so his/her personal resources are not overexpended by his commitment to the organization. OCE4 highlights that a KW's engagement level fluctuates depending on situational factors and personal resources, which the KW needs to be aware of to utilize engagement to complete work. OCE2 brings attention to what the organization can do to support KWs in managing their personal resources. Organizations should invest in their workers, design jobs sufficiently to reduce role ambiguity and conflict and cultivate a collaborative learning environment in where the worker perceives support. OCE3 describes how the KW experiences engagement through his/her level of vigor, absorption and dedication, which impact his/her experience and the quality of the work performed when executing actions exerting effort. Figure 4 shows all these insights mapped to the PAM.

From the mapping, it seems that there are some gaps in the literature found in the systematic literature review. Most of the insights tackle activities related to acquiring the input, which are listed under awareness and personal aspects. Very few insights target the activities used in the transformation process, which are grouped into actions. Only two of those activities are about practices or skills that the KW utilizes when getting things done, PKM3 (practices of knowledge reuse and social learning) and TA2 (time management skills). The other three insights that target actions describe attributes or states of individuals which affect how they accomplish things. Only one insight, OCE3, targets a specific activity within actions. OCE3 describes the engagement level of the individual which directly affects execute actions exerting effort.

Even fewer insights were mapped to the activities relevant to generating target outcomes, which are grouped under value contribution. PKM2 is mapped to value contribution because it describes attitudes towards working with knowledge, which include the willingness to be proactive, share, be transparent, follow formal processes and expand horizons. These attitudes should have a positive influence on behaviors such as communicating results of actions to relevant parties, share knowledge acquired while executing actions and evaluate whether actions created value. TA2 is directly mapped to evaluate whether actions created value because it describes the natural heuristics to manage risk and rewards, which can drive an evaluation of whether an action was worth taking and whether it is worth taking again. Even though most of the insights are mapped to activities grouped in awareness and personal aspects, there is one activity that no insight is mapped to: the activity acquire and develop competencies. The literature found in this systematic literature review focused on problem solvers did not tackle the acquisition and development of competencies.

The next section takes the insights from the literature review and the activities from the PAM and uses them as building blocks in a draft of a holistic KWP framework as a step towards a descriptive theory of KWP.

5. Towards a Holistic Knowledge Worker Productivity Framework

Keywords were extracted from the mapped purposeful activity model and grouped together to take a step towards a holistic knowledge worker productivity (KWP) framework. Most of the keywords were connected to the state of the individual knowledge worker (KW), while the rest of the keywords were related to the work done by the KW. The proposed holistic KWP framework therefore consists of the state of the individual KW, the work done and how they influence outcome. Before presenting the proposed KWP framework, let us dive deeper into the components of the framework, starting with the state of the individual (see Figure 5).

The literature review showed that there were eight important levels that make up the state of the individual KW relevant to KWP. Level of well-being, personal resources (physical, psychological, cognitive and social), engagement, motivation, absorptive capacity (sensing, collecting, organizing, processing and maintaining information), willingness (proactiveness, sharing, transparency, formality and expanding horizons), job commitment and job satisfaction. Figure 5 shows these levels as axes in a radar chart. The red area shows

the undesirable state of each level, while the green area shows the desirable state. In most of these levels it is desirable to maximize them, but for job commitment and willingness, it is rather desirable to find an optimal level. Too much job commitment can make a worker more hesitant to set boundaries, which can lead to a worker draining his/her personal resources. Low levels of personal resources can lead to exhaustion and other health problems dragging the level of well-being down, which also affects engagement and job satisfaction. In the level of willingness, which consists of the attitudes of proactiveness, sharing, transparency, formality and expanding horizons, it is also important to find the optimal level. For example, it is important that a worker is proactive and finds novel solutions to old problems, but sometimes it is more important that the worker does what is expected of him/her.

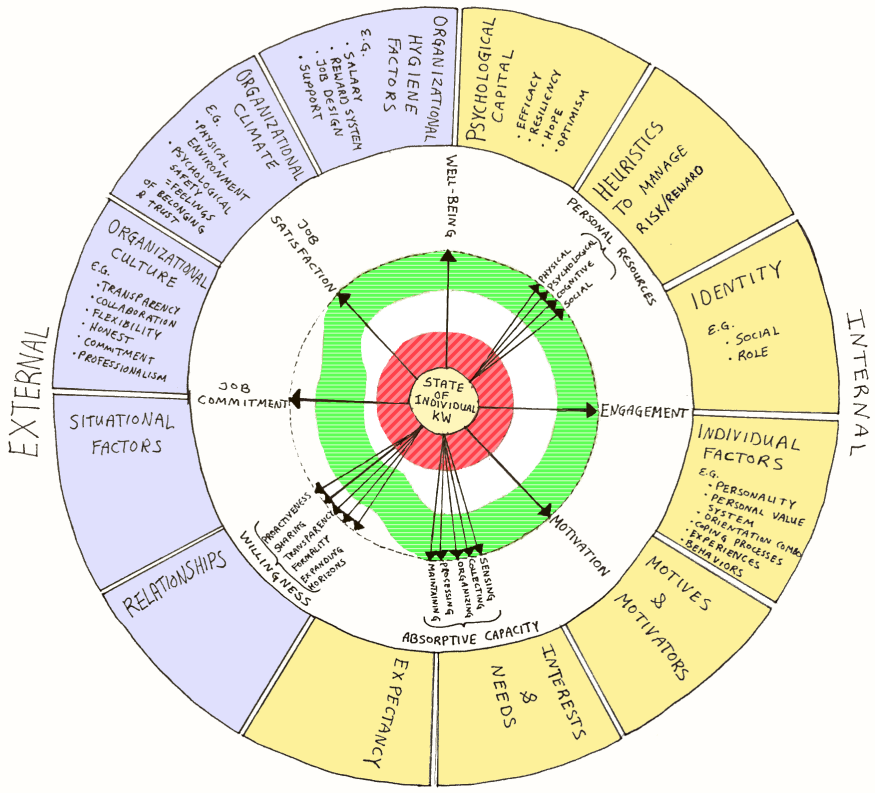

Figure 5. The state of the individual component in the proposed KWP framework. In the middle, it shows eight important levels that make up the state of the individual KW relevant to KWP as axes in a radar chart. Around the radar chart are the internal and external factors that influence these levels and the state of the individual KW.

Around the radar chart are some of the factors identified that influence these levels and the state of the individual KW. Seven of these factors are internal: psychological capital (efficacy, resiliency, hope and optimism), heuristics to manage risk/reward, identity (social and role), individual factors (e.g., personality, personal value system, orientation combo, coping processes, experiences and behaviors), motives and motivators, interests and needs and expectancy. These are yellow in Figure 5 and are factors pertaining to the individual himself/herself. Five factors are external and influence the state of the individual KW through interactions and how the KW perceives his/her environment and others around him/her. These are blue in Figure 5. The external factors are organizational hygiene factors (e.g., salary, reward system, job design and support), organizational climate (e.g., physical environment and psychological safety giving feelings of belonging and trust), organizational culture (e.g., transparency, collaboration, flexibility, honest, commitment and professionalism), situational factors and relationships. Figure 5 shows the state of the individual component.

Now, let us look at the work done component of the framework (see Figure 6). In the middle, there is a flowchart with the main activities the KW engages in to completing work: identify actions, evaluate competencies and knowledge needed, evaluate effort needed, select actions and execute actions. Around this process are factors that influence it. There are six internal factors pertaining to the KW himself/herself: personal knowledge management, absorptive capacity, time management skills, evaluation of personal gain, awareness (appreciate value, personal resources, information sources and competencies) and personal development. There are three external factors that influence the KW in completing work: job design, relationships and networks and communication.

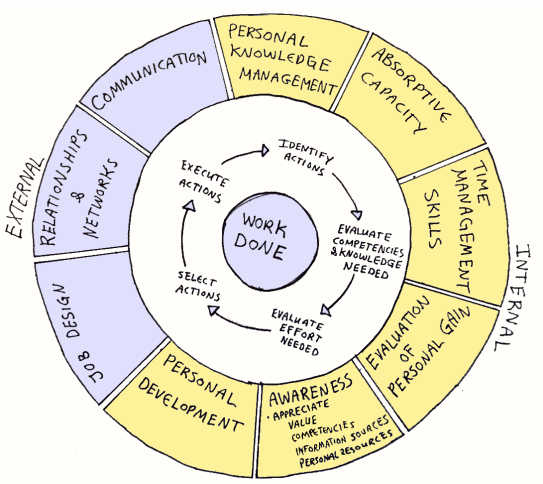

Figure 6. The work done component in the proposed framework. It shows a simplified process of completing work in the middle. Around the process are internal and external factors that influence work done through decision making, evaluations and resources used.

Figure 7 shows these two components, how they interact, how they are connected to the organization and how they influence outcome. The state of the individual KW is at the top of the framework and interacts with all the other components. From the state of the individual KW, intuition for decisions and evaluations flows to the work done component

(the yellow arrow). The state of the individual KW affects how the KW evaluates effort and competences and knowledge needed for actions and makes decisions on what actions to execute. The state of the individual KW component touches on factors such as how the KW perceives the organizational climate and culture, identifies with his/her role within the organization and whether what the organization provides fulfills his/her needs and perceived expectancy, which dictates the person–job–environment fit of the KW within his/her organization (the blue arrow leading towards the organization component). The state of the individual KW also influences whether the KW engages in preferred behaviors, including organizational citizenship behaviors (the green arrow leading to outcome).

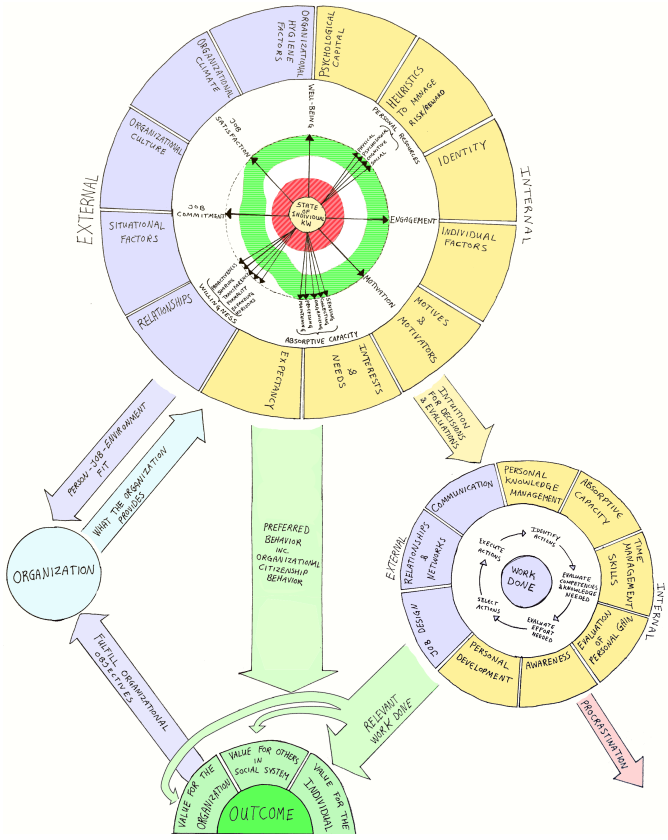

Figure 7. The proposed draft of a holistic KWP framework. It includes the state of the individual component and the work done component as well as two new components outcome and organization. The arrows between the components show a simplified flow of inputs/outputs from each component.

There are two arrows flowing from the work done component, procrastination (pink arrow) and relevant work done (green arrow). There is always some work that does not

create any value which flows out in the procrastination arrow, but the relevant work done arrow splits into three depending on whom it creates value for. The arrow is widest towards value for the individual but becomes thinner when flowing to value for others in the social system and the organization. This is because most of the relevant work done creates value for the individual, while some of the relevant work done creates value for others in the social system and the organization. This highlights the need for the organization to align what they perceive as value with what the individual perceives as value to maximize their benefit of the work performed by the KW. The value created for the organization should fulfill organizational objectives (the blue arrow flowing to the organization component).

Since this research has just looked at the literature regarding individual KWs, the organization component does not have any detail. A next step in the research should be to look at KWP from the perspective of the organization and identify factors that influence KWP. The limitations of this research as well as possible future research are discussed in the next section.

6. Discussion and Conclusions

This research resulted in a draft of a holistic KWP framework describing components and factors that influence knowledge worker productivity (KWP) relevant to individual KWs and their work. The framework was developed from interpretations and inferences made from a systematic literature review and the purposeful activity model proposed by Óskarsdóttir et al. (2021). The main components of the conceptual framework were the state of the individual knowledge worker (KW), work done and outcome. Outcome of relevant work can be value for the individual KW, others in the social system and the organization. It is human nature to gravitate towards creating value for oneself, therefore, the organization needs to align their needs with what creates value for the individual KW to maximize value contribution towards their organizational goals and objectives. This can be conducted by influencing the state of the individual KW, through external factors such as reward systems, culture, support and relationships to guide the KW towards engaging in preferred behaviors such as organizational citizenship behavior. The state of the individual KW also affects the KW's intuition when evaluating work and making decisions.

The state of an individual KW in the conceptual framework was indicated by eight levels: level of well-being, personal resources, engagement, motivation, absorptive capacity, willingness, job commitment and job satisfaction. There were seven internal factors identified that influence this state and five external factors. They were psychological capital, heuristics to manage risk/reward, identity, individual factors, motives and motivators, interests and needs, expectancy, organizational hygiene factors, organizational climate, organizational culture, situational factors and relationships. The work done component included the main activities the KW engages in to completing work as well as six internal factors and three external factors that influence the KW's work. These factors are personal knowledge management, absorptive capacity, time management skills, evaluation of personal gain, awareness, personal development, job design, relationships and networks and communication.

The hope was to draw up a draft of an operationalizable model of KWP concerning the individual that could be tested. However, the systematic literature review resulted mostly in more what factors that influence KWP. The search term used filtered for approaches, methods, frameworks, tools, or models which aim to tackle the productivity, performance, effectiveness, efficiency, or management of KWs. The expectation was to extract how the existing literature is dealing with KWP from the perspective of the individual. The lack of operationalizable how elements extracted from the literature means that more steps need to be taken before an operationalizable model of KWP can be proposed. Therefore, a draft of a holistic KWP framework was drawn up instead as a step towards a holistic operationalizable model of KWP. The framework highlights indicators and activities that are connected to the productivity and performance of the individual KW as well as identifying factors that influence these indicators and activities. This gives an idea of what an operationalizable

model should consider. Additional study is needed into how each factor influences the state of the individual KW and work done as well as the interactions between the factors and the different levels of the state of the individual. This could be carried out by executing more specific literature reviews on these factors and utilizing causal diagrams to explore the interactions.

For example, the systematic literature review did not catch important literature regarding well-being, ergonomics, the influence of the physical environment and stress. Only two papers had the theme of health and well-being in the ninety-seven resulting papers in the literature review. In the seventy-eight papers that touched on concepts relevant to individual KWs and their work, there were twenty-eight that discussed concepts in the group well-being and job satisfaction. However, only sixteen of these papers mention well-being or stress and most of them only once. It seems that research on these topics is not connected to approaches, methods, frameworks, tools or models regarding performance and productivity.

The problem situation of managing and improving KWP, as captured by the purposeful activity model (PAM) of a system for the individual KW in Óskarsdóttir et al. (2021), was debated by mapping the key insights from the systematic literature review to the PAM. Debating the situation is the third activity in the soft systems methodology (SSM). The mapping highlighted what factors affect which activities in the KW's process of transforming resources to tangible and intangible artifacts with the intention of generating value. It also indicated the different associations between the factors and the activities. It was clear from the mapping that there are gaps in the literature found in the systematic literature review. As mentioned above, there was a lack of practical approaches that could be applied directly to the management and improvement of KWP. Few of the insights tackled how an individual KW would carry out an activity even though the systematic literature review was designed to target problem solvers. Very few insights mapped to the activities connected to the transformation process itself. It seems that very few researchers are tackling how because they are still making sense of what influences KWP.

Most of the insights focused on the state of the individual KW and how that state influences work done through the activities required to acquire the input (resources) used in the transformation process. Such resources include an appreciation of what is value, personal resources, information sources and competencies. It was curious that none of the insights mapped to the activity acquire and develop competencies, even though it is part of the activities required to acquire the input. It causes one to think whether research that tackles in some way the acquisition and development of competencies of the individual KW is not connected to productivity, effectiveness, efficiency, management, or performance or whether that kind of research does not result in approaches, methods, frameworks, tools, or models. It also seems that discussions about concepts regarding individual KWs and their work do not focus much on the activities required to generate the target outcome (value). From the findings in this systematic literature review, it seems that the focus is more on the efficiency of the KW rather than on the effectiveness. Finding and maintaining the optimal state of individuals so that they can get more done and engage in more preferred behaviors does not necessary lead to more value contribution but probably leads to more efficiency in accomplishing things.

The next step in this research should be to explore the problem situation from the perspective of the organization as a problem owner by creating a PAM of a KWP system for the organization and debating it by mapping key insights from the six groups identified in this systematic literature review relevant to the structure, initiatives and environment of the organization. The observations, categorizations and associations gained from applying the SSM to another problem owner should result in more building blocks for a theory of KWP. The draft of a holistic KWP framework could then be expanded by the insights and activities identified in the SSM process for the organization. When both perspectives of the organization and the individual KW are accommodated in the draft of a holistic KWP framework, the next steps towards an operationalizable holistic KWP model can be taken.

There is a need to delve deeper into the many levels, factors and associations in the draft of a holistic KWP framework to figure out how to measure and manage them. Being able to measure progress towards a targeted outcome is imperative when attempting to improve a problem situation.

Many jobs today are predominantly knowledge work. This makes organizations dependent on value created by KWs. There are approaches, frameworks and methods being used to manage and improve KWP. Most of these approaches have been developed by the organizations themselves to solve numerous problems they face regarding KWP. These approaches cannot, therefore, be found in the literature on current research. It would be pertinent to enhance this research by studying the approaches being used in varying organizations to expand a theory of KWP with insights from the industry. Many of the initiatives taken to improve and manage KWP give unpredictable results and depend on factors that are often hidden and unknown. It is important to find a holistic approach to improve and manage KWP that gives consistent results across many different organizations. The objective of this research was to shed light on these factors and draw up a holistic view of the individual KW at work to expand our understanding of why these initiatives give unpredictable results and take a step towards consistent KWP.

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Abbreviations

The following abbreviations are used in this manuscript:

KW	Knowledge worker
KWP	Knowledge worker productivity
SSM	Soft systems methodology
PAM	Purposeful activity model
ICT	Information communications technology
PCD	Personal characteristics and development
WJS	Well-being and job satisfaction
CR	Communication and relationships
PKM	Personal knowledge management
TA	Task approach
OCE	Organizational commitment and engagement

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