LUT University

HR PROCESSES INNOVATION WITH DIGITAL TECHNOLOGIES

External knowledge as a source for new knowledge creation in innovation process

Lappeenranta–Lahti University of Technology LUT

Master’s Programme in Knowledge Management and Leadership

2023

Päivi Laitala

Examiner(s): Postdoctoral Researcher, Argyro Almpanopoulou

Professor Aino Kianto

ABSTRACT

Lappeenranta–Lahti University of Technology LUT

LUT School of Business and Management

Business Administration

Päivi Laitala

HR processes innovation with digital technologies

– external knowledge as a source for new knowledge creation in innovation process

Master's thesis

2023

97 pages, 15 figures and 6 tables

Examiner(s): Professor Aino Kianto and D.Sc. Argyro Almpanopoulou

Keywords: HR digitalisation, new knowledge acquisition & creation, HR processes, HR technology, digital technologies, innovation

HR processes enablement with digital technologies give opportunities to impact on company performance through increased efficiency, reduced costs and productivity. HR processes innovation with digital technologies require new knowledge acquisition and its integration to old knowledge in order to create new knowledge. New knowledge can be acquired externally in inter-organisational context and internally within a company. The focus in this study is on understanding how new external knowledge is acquired and how it is utilized in new knowledge creation in HR process innovation with digital technologies. This new knowledge acquisition and new knowledge creation is described through four phases, sensing, seizing, transformation and routinization.

The results of this study indicate that the decision to take digital technologies in use for HR purposes is part of strategic planning and decision making but also a constant priorization and operative management. In HR processes innovation process the new external knowledge acquisition is most intense in the idea identification and opportunities scouting phase. After this first phase, the new knowledge acquisition reduces and is mainly done with selected vendors during seizing, transformation and routinization. The outside in knowledge flows and its combination to new knowledge in innovation process is constant, which is aligned with the continuous development thinking. In summary, external knowledge, when combined with existing internal knowledge during innovation process helps in making right choices for digital technologies investment and their configuration in order to meet the set requirements for HR processes to meet strategic and operational targets.

TIIVISTELMÄ

Lappeenrannan–Lahden teknillinen yliopisto LUT

LUT-kauppakorkeakoulu

Kauppatieteet

Päivi Laitala

HR prosessien innovaatio digitaalisten työkalujen avulla

– ulkoinen tieto uuden tiedon luomisen lähteenä innovaatioprosessissa

Kauppatieteiden pro gradu -tutkielma

2023

97 sivua, 15 kuvaa ja 6 taulukkoa

Tarkastaja(t): Professori Aino Kianto ja tutkijatohtori Argyro Almpanopoulou

Avainsanat: HR digitalisaatio, uuden tiedon luominen, digitaaliset ja HR teknologiat, HR prosessit, innovaatio

HR prosessien mahdollistaminen digitaalisten teknologioiden avulla antaa mahdollisuuden vaikuttaa yrityksen suorituskykyyn lisäämällä tehokkuutta, alentamalla kustannuksia ja tuottavuutta. HR prosessien innovaatiot digitaalisilla teknologioilla edellyttävät uuden tiedon hankintaa ja sen yhdistämistä vanhaan tietoon uuden tiedon luomiseksi. Uutta tietoa voidaan hankkia ulkoa ja yrityksen sisällä. Tässä tutkimuksessa keskitytään ymmärtämään, miten uutta ulkopuolista tietoa hankitaan ja miten sitä hyödynnetään uuden tiedon luomisessa HR-prosessi-innovaatioissa digitaalisten teknologioiden avulla. Tätä uuden tiedon hankintaa ja uuden tiedon luomista kuvataan neljän vaiheen kautta; mahdollisuuksien kartoittaminen, aloitteiden tunnistaminen ja priorisointi, muutosvaihe, ylläpito ja uuden toimintatavan rutinoituminen ja vakiintuminen.

Tämän tutkimuksen tulokset osoittavat, että päätös ottaa digitaaliset teknologiat käyttöön HR tarkoituksiin on osa strategista päätöksentekoa, mutta myös jatkuvaa priorisointia ja operatiivista johtamista. HR prosessien innovaatioprosessissa uuden ulkoisen tiedon hankinta on intensiivisintä ideoiden tunnistamisen ja mahdollisuuksien kartoitusvaiheessa. Tämän jälkeen uuden tiedon hankinta vähenee, ja se tapahtuu pääasiassa yhteistyössä valittujen toimittajien kanssa. Ulkoisen tiedon hankinta ja yhdistäminen uuden tiedon tuottamiseen innovaatioprosessissa on jatkuvaa. Yhteenvetona voidaan todeta, että ulkoinen tieto yhdistettynä olemassa olevaan sisäiseen tietoon innovaatioprosessissa auttaa tekemään oikeita valintoja digiteknologiainvestoinneille ja niiden konfiguroinnille, jotta HR-prosesseille asetetut strategiset ja operatiiviset vaatimukset täyttyvät tavoitteiden saavuttamiseksi.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to Patrik, my son. Thank you for your understanding and patience during the past two years. There is enormous strength and power in you!

To my mother, sister and aunt, I know it might be challenging to comprehend why I find spending days studying so inspiring, but your belief in me has meant everything. I would also like to pay tribute to my late father, whose life wisdoms continue living on me. Your influence has shaped my character, and I am forever grateful.

To my brilliant fellow students, Minna, Riina and Satu, you have enriched my learning experience.

To my friends, your encouragement during the thesis writing process has been a driving force, and I cannot thank enough for being there for me.

Lastly, I extend my thanks to everyone else who supported me along this academic journey.

Thank you!

Table of contents

Appendices

Appendix 1: Interview guide

Appendix 2: NVivo themes at the end of the coding in alphabetical order

Figures

Tables

1 Introduction

This introduction chapter provides and overall description and structure of this study. At first, background describes the relevant information for the study. This is followed by introducing the research gap, which leads to the description of the main objectives and further to the introduction of the research questions. Definition of the main concepts focus on key themes and terminology used in the study. Further at last, theoretical framework and structure of the thesis complements the introduction.

1.1 Background

Human Resources (HR) function has transformed with digitalisation (Manuti & De Palma, 2018, 64). The driving factors behind this development can be found from rapid external environment changes especially due to technology and related digitalisation development (Ulrich & Yeung, 2019, 166), but also due to globalization and changing labour markets (Vandarlier, 2020, 260). The recent study from 2023 by Gartner for top strategic imperatives for HR technology 2023 indicates that the most important priority for HR technology is to support in improving the business performance, growth in headcount and skills as well as cost optimization. On the other hand, in the same study it is said that due to the current priorities the specific focus at the moment is on making sure HR technology is well adapted by the company internal stakeholders, justification of the technology investments and maintaining the strategic roadmaps for HR technology. (Baker & Zuech, 2023).

It is the cloud computing and business intelligence evolution which paved the way to digital technology based solutions in HR (Marler & Fisher, 2017, 3; Jemine & Guillaume, 2021, 2418, 2420). These solutions are adapted as a result of interaction and collaboration between companies using the digital technology, technology vendors and implementation consulting partners (Jemine & Guillaume, 2021, 2433). Companies, who have a need to transform HR functions, can innovate HR processes with digital technologies. In this innovation process there is an opportunity to acquire appropriate external knowledge, integrate this knowledge within own company and create new knowledge. As the innovation process takes place with external stakeholders, it has transformed from company internal closed innovation towards open innovation kind of practices where knowledge is sought outside of the company boundaries. Further, due to the nature of the cloud computing applications, HR processes innovation is essential to avoid cloning what other companies do with the same digital technologies and applications. Finally, it is worth recognizing that the constant development of digital technologies challenge companies to consider right timing for the adoption of these technologies (Marler & Fisher, 2017, 3).

Knowledge management and innovation are in close interaction with each other. (Grimsdottir E. & Edvardsson I., 2018, 1). During innovation process both internal and external knowledge need to be integrated in a company. External knowledge transfer cross-organisations have its challenges, which require attention during the innovation process. (Ritala & Stefan, 2021, 281)

1.2 Research gap and main objective

The knowledge residing in people in a company and externally outside of a company can help to be successful (Chesbrough, 2003, xxvi). The required and necessary, experienced based subject matter expertise knowledge can be acquired and maintained through outside-in knowledge transfer for HR digitalisation. As most of the digital technology innovations are results from the technical vendors development efforts (Jemine & Guillaume, 2021, 2421) it challenges and give an opportunity to companies, who have a need to transform HR function and develop HR processes with digital technologies, to acquire appropriate knowledge outside of their own organisation, integrate the knowledge within own organisation and create new knowledge in innovation process for new or improved digital technology enabled HR processes. The success of HR process innovation is important from entire company perspective as the expected positive performance impact can be increased by ensuring HR involvement in strategic management and business operations as well as maturing the HR applications via HR digitalisation (Yu, Guangjian, Xiaoxi & Lijun, 2021, 20).

There seems to be a gap in the research of how companies manage the innovation process from knowledge management perspective for HR process development when the processes are enabled by digital technologies. This study participates to the discussion with the objective to increase understanding on how external knowledge is acquired, absorbed and integrated to existing knowledge during innovation process for HR function transformation through HR digitalisation. In this study, the scope of the innovation process discussion covers phases from strategic planning through sensing and seizing the ideas and priorities to technical maintenance and process routinization.

1.3 Research questions

The objectives introduced in the previous chapter are responded through four research questions, one main question and three sub-questions. The main research question is answered by first answering the sub research questions. Main research questions of the study is

- How do globally operating companies enable and develop HR processes with digital technologies through innovation process?

The sub research questions are

- What are digital technologies for HR?
- How do organisations make decisions for digital technologies adoption?
- How does companies acquire external knowledge and create new knowledge in innovation process?

This study aim to answer these research questions by both the literature review and empirical qualitative inquiry. The first sub-question focusing on digital technologies and related HR processes are studied through literature review. During the empirical study participants are asked to evaluate the use of these technologies based on their digitalisation experiences. The second sub-question focuses on the decision making on strategic level and understanding the framework for the digitalisation decision making. This question is similar to the first sub-question where the frameworks are studied via literature study while the empirical study aims to understand whether those models and frameworks are in use for HR digitalisation. The third sub-question is the key focus in the empirical study. The third sub-questions focuses on understanding acquisition of the external knowledge and its absorption in companies during HR digitalisation innovation process. The literature study gives insights which is used to answer the research question by the empirical part of the study. The main question of the study is answered by formulating cohesive answer from the sub-questions. The empirical part of the study is conducted as qualitative inquiry through semi-structured interviews with ten (=10) participants having experience working in globally operating companies in leadership positions for HR technology focused sub-function or team.

1.4 Definition of main concepts

The main concepts in the study are digital human resources management, digitalisation and digital transformation, new knowledge creation and open innovation outside-in knowledge transfer. At the end of this chapter the use of terms used in this study are explained.

Digital Human Resources Management

Human resources management can be defined through set of policies, procedures and practices for managing human resources in a company (Alhan, 2023, 16). Digital human resource management refers to human resources management which is executed by using digital technologies to manage the HR processes (Vardarlier, 2020, 239). Digital human resources management distributes the process execution to employees, managers and human resources, who all execute them via digital technologies through computers, mobile and tablets (Lv, Tan, Wang & Yang, 2018, 1294) in their own role. Digital technologies also enable human resources management to collect, store and process data related to people in a company (Vardarlier, 2020, 241) and acts as a source for related reports and analytics for decision making (Hussain, Wallace & Cornelius, 2007, 74-75).

Digitalisation and digital transformation

Digitalisation refers to the adoption of the digital technologies, but it is also seen as a process for building capabilities in a company. Digital transformation is a continuous journey requiring strategic agility in changing the operations of an organisation. (Warner & Wäger, 2019, 336)

New knowledge creation

Knowledge is dynamic and created in social context between individuals. Knowledge is time and space specific and thus contextual and at the same time knowledge is relational. Tacit and explicit knowledge area the two types of knowledge, they complement each other and are both needed in knowledge creation. Knowledge process is a continuous process in which individual and environment impacts to each other. One of the models introduced for the knowledge creation is SECI process. SECI steps are socialization, externalization, combination and internalization. (Nonaka, Toyama & Konno, 2000, 7-9)

Open innovation outside-in knowledge flows

Open innovation has changed the thinking of innovation from company internal closed innovation to open innovation changing the knowledge landscape. In addition to internal knowledge, external knowledge, acquired as outside-in knowledge flow, is valuable for innovation. Multiple external sources are available for acquiring and new external knowledge for the benefit of a company (Chesborough, 2003, 43-44, 52).

Terminology variations

In addition to the main concepts, it is important to understand the various terms used for the studied topics. Various research introduces several terms and definitions like HR, HRM, HR processes, people processes or HR management. In this study, the term HR or HR processes are used to indicate the end-to-end process and services enabled by digital technologies for human resources management purposes. Similarly, technology has been introduced with various terms and definitions. This is due to the technological development over time. Terms like eHRM (Electronic Human Resources Management), HRIS (Human Resources Information Systems), HRMS (Human Resources management Systems) or HCM (Human Capital Management) and talent applications refer to technologies and applications used to enable HR processes digitally. In this study the term used to cover all technologies is digital technologies. This covers applications enabled by cloud and mobile but also social media, automation and analytics used to enable HR processes. Further, terms HR digitalisation, HR processes innovation with digital technologies and solutions refer to the same.

1.5 Theoretical framework

The theoretical background is derived from digitalisation, digital technologies, HR processes, innovation and knowledge management related literature. Together they form a broader whole of the theoretical background in this study (figure 1).

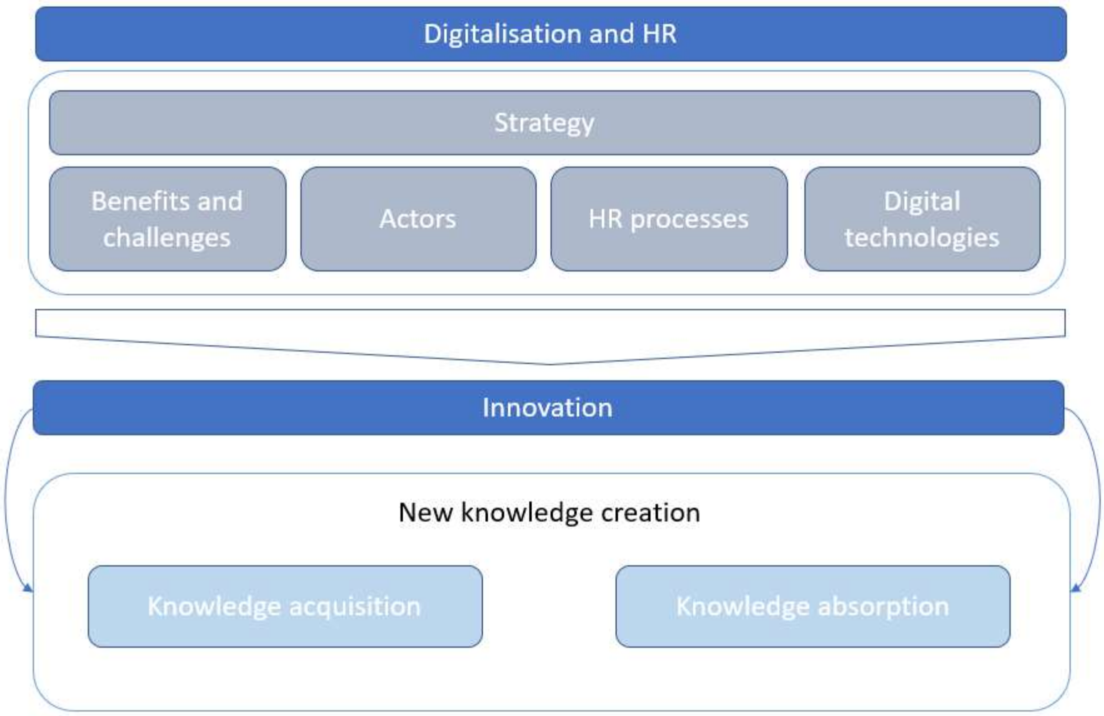

Figure 1. Theoretical framework of the study

The literature review and earlier research derived for digitalisation, HR technology and HR processes provides the framework in which innovation is studied. Innovation focuses on understanding innovation process and especially digitalisation related innovation. Knowledge management literature provides understanding of how innovation and knowledge processes are tight together, and further how new external knowledge is acquired and absorbed.

1.6 Structure of the thesis

This study is divided into six main chapters (figure 2). The first chapter covers the background and objectives of the study complemented with research questions, main concepts, framework of the study and the structure of this thesis. The next two chapters are reserved for the theoretical background, digitalisation and HR as well as innovation. The empirical study is introduced in its own chapter, followed by results, discussion and conclusions.

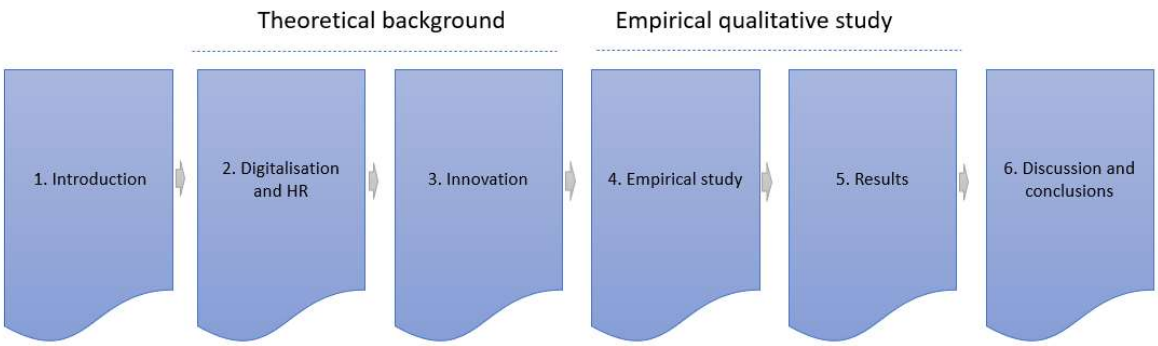

Figure 2. Structure of the study

The introduction chapter is followed by theoretical background. The second chapter focuses on digitalisation and HR. The digitalisation context is built from digitalisation strategies through digital technologies to introduction of HR processes which can be enabled by digital technologies. The third chapter introduces innovation and digital innovation in cloud computing SaaS environment. New knowledge creation based on external knowledge acquisition and absorption complements the innovation chapter. The theoretical background gives a framework, which is adapted in the empirical research to understand how new knowledge acquisition and its exchange occurs in innovation process for HR digitalisation.

Empirical research and its results are introduced in two chapters, first the empirical study followed by the description of the results. Discussion and conclusions complements the study. Discussion and conclusions chapter is a dialogue between the theoretical background and empirical research summarizing the study on each research questions and introducing the key findings.

2 Digitalisation and HR

HR process innovation is made possible due to digital technologies and innovations made by technology vendors. The adoption of the digital technologies takes place at different pace with the aim to gain efficiency, effectiveness and to meet the constantly changing business needs (Chapano, Mey & Werner, 2022, 1). In this chapter, as the first part of the theoretical background, digitalisation and digital technologies, their advantages and application to HR processes are introduced in light of the earlier research. Digital technologies impact how HR processes are delivered, and therefore it is also relevant to introduce the HR processes which can be digitalised. In digitalisation both digital technologies and HR processes are objects for innovation.

2.1 HR Digitalisation overview

HR digitalisation can have a significant impact on a company performance (Yu et al., 2021, 20). The aim of digitalisation is to reach improved processes and re-shape the business models in order to stay competitive as an organisation (Morsch, 2021, 160). Digitalisation is enabled by digital technologies and as such those technologies enable new type of transformation (Gobble, 2018, 56). Further, digitalisation has become an essential, must-to-have way of managing the business in organisations (Kupilas, Rodriguez, Diaz & Alonso, 2022, 153).

HR has used technology to enable its HR processes and practices already for decades (Johnson, Lukaszewski & Stone, 2016, 535-537; Florkowski, 2021, 1372) but the evolution of new digital technologies and the current speed of technology change challenges HR. The aforementioned digital transformation occur also in HR (Chapano et al., 2022, 1,10). Digitalisation of HR processes can be realized with various web-based, digital technologies (Zhang & Chen, 2023, 1, 4-5), which, as a result, are subject to constant incremental changes as the technology evolves and enables the change (Florkowski, 2021, 1387). Digitalisation is more of a continuous development than one time effort, and it is a unique path in various companies and organisations. Each company should aim to find the best way to prioritize and adapt to HR digitalisation (Vanderlier, 2020. 261; Tursunbayeva, 2019, 7).

Digital technologies transform organisations, how they operate and add value, and therefore the entire HR function transforms with digitalisation. HR, especially the world-class HRs, has an early adapter, leadership role in the digital transformation. It is studied that those HRs employ and spend less per employee compared to their peers and they also know how to benefit from digital technologies. (El-Khoury, 2017, 86-87) HR digitalisation brings competitive advantage by improving the performance of the organisation (Sengupta, Lalwani, Goswami & Srivastava, 2021, 10169).

Johnson, Lukaszewski & Stone Johnson et al. (2016, 535-537, 541-543) describe continuous HR technology evolution through four eras from mainframe computing to cloud-based applications, where the latest era is the one which is dominant at this moment in time (figure 3). HR applications have moved to cloud since 2010 and as a result companies have been able to invest in SaaS applications, which can be configured to the needs of a company HR processes. As a conclusion it can be noted that both move to the cloud and the configurability of the applications enable the innovation of HR processes. Cloud computing is in the core of digital technologies for contemporary HR process innovation.

Figure 3. Four main phases of HR Technology development (Johnson et al., 2016, 537-542)

In addition to the cloud computing based solutions, the use of mobile has started to increase due to mobile technology development (Shankar, 2022, 146). Move to the cloud have opened up the market to several new HR applications and many of these applications start to be mobile native. Further, during this contemporary cloud based applications era, the use of social media in HR processes, especially in recruitment, has started to increase. Both cloud computing and mobile technology have changed the way HR processes are managed in companies. (Johnson et al., 2016, 541-543) Digitalisation materialize through these technologies in HR.

2.2 Strategic approach for digitalisation

Digitalisation strategy can be developed with various different maturity models (Kupilas et al., 2022, 152-153, 155; Thordsen, Murawski & Bick, 2020, 360; Menchini, Russo, Slavov & Souza, 2022, 6) and those can be applied not only to entire company but also to selected areas in a company (Kupilas et al., 2022, 152-153, 155). Thordsen et al. (2020, 363-364) identified 17 various digital maturity models in between 2011-2019, which were all introduced by consultancy business. According to study by Pierenkemper & Gausemeier (2021, 108-121) different maturity models exists to support in the current and target state analysis as well as action identification for the recognized potential development areas. The development potentials need to be further prioritized and placed to a roadmap to complement the digitalisation strategy. Digitalisation strategy is also evaluated against the external environment in order to understand the impact of the digital trends to a company. Digital maturity models are recommended to be applied, instead of used as such, for the best result in a company.

The realization of HR digitalisation requires strategic interest and targets in a company. Companies operate in different business environments, where exploration and exploitation differ and as a result the HR process and application architecture must support companies to adapt to varying requirements based on their specific needs in competition (Hansen, Güttel & Swart, 2017, 648-650). Strategy is not only a result of internal influences, but it is also impacted by external environment through various stakeholders. It is also good to recognize that HR digitalisation efforts have an impact to how strategically HR is perceived. (Marler & Parry, 2016, 2246, 2250)

Maturity models help defining the digitalisation strategy. Based on the literature review, there are no specific HR digitalisation maturity models easily available. For this reason, the next two chapters introduce two models, which can be considered for HR digitalisation as a strategic approach. First model is an introduction of a conceptual co-operative model, which gives a view of how process development, digitalisation and innovation can be strategically developed together whereas the second model, digital HR strategy framework, introduces strategic approach for HR digitalisation.

2.2.1 Digitalisation conceptual co-operative model

Company strategy and its digital strategy are the basis for digital innovations. Digital innovation can be delivered as co-creation process by engaging with various internal and external stakeholders. Intra-organisational innovation takes place in organisation's internal processes while in inter-organisational innovation focus is on relations between organisations and how innovation process between organisations can be of a benefit for a company (Holmström, Magnusson & Mähring, 2021, 249-250). Sehlin, Truedsson & Cronemyr (2019, 518-521) have developed a framework where process development, innovation and digitalisation form a co-operative model to support the digitalisation (figure 4). In this model the digital solutions implementation, for the strategy execution, is reached by first defining the current state based on which the priorization is completed and a digital roadmap is developed. Maturity level of processes is a critical factor in how the digitalisation can be realised. Priorization for process development can be done in various different ways, but it should support the set digitalisation strategy. Priorization is the starting point for the digitalisation, but before implementation a roadmap is developed to to identify the potential digital solutions. This step is considered as a pre-condition for innovation. This identification can be supported by digital strategy, management, and vision as well as with open organisation culture. The model highlights the visualisation while moving through four digitalisation steps for the strategy execution.

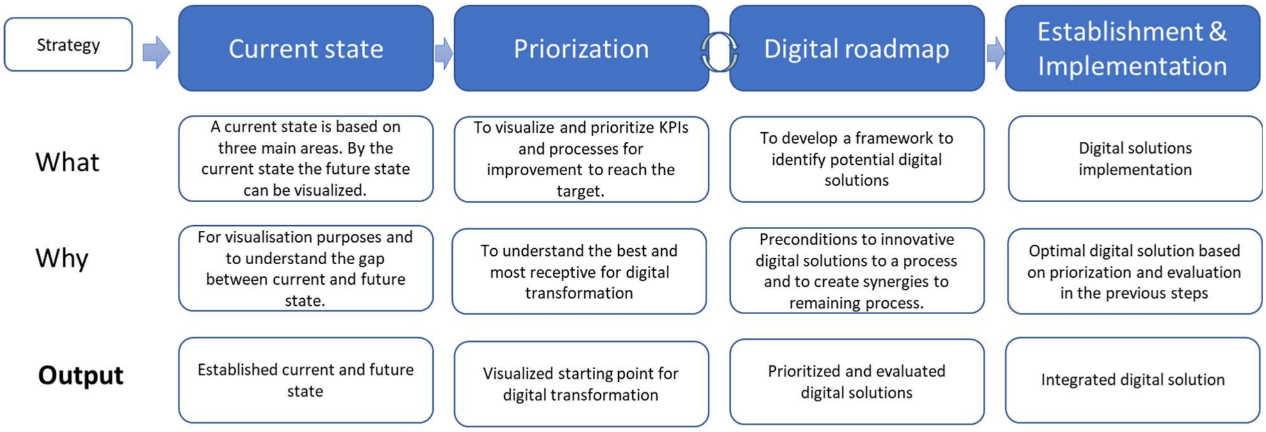

Figure 4. Conceptual cooperative model (adapted from Sehlin et al., 2019, 518)

This co-operative model is a sequential model. The understanding of the current and future stated is used to determine the areas for improvement priorization. This priorization effort determines the starting point for the digitalisation needs. The development of the digital roadmap in the next phase acts like a pre-set map with what solutions the digitalisation will take place. At the last phase the digital solutions are implemented to execute the set strategy. The co-operative model for digitalisation determines an overview for digitalisation choices decision making and implementation. (Sehlin et al., 2019, 518)

2.2.1 Digital HR strategy

Thite (2022, 94) has applied aforementioned type of principles for HR. In Thite's model (figure 5) the current state is defined by evaluating the internal capabilities and external demands. The current state is further complemented with the target state and in between these two there is an overview of how to make the transformation. The horizontal and vertical alignment of digital HR strategy fit is required towards business strategy and HR strategy as well as the external and internal environments.

Figure 5. Digital HR strategy framework (Thite, 2022, 94)

Thite's (2022, 94) model for HR digital strategy framework creation was one of the rare models found in the literature review for HR. This finding is in line with the study done by Florkowski & Olivas-Lujan (2006, 701) who found that majority of the companies did not have HR Technology strategy and the ones who had, had superior advantages compared to the ones, who had not created one. Thite (2022, 94-96), in his digital HR strategy framework, highlights the need for optimal focus on people, processes and technology in the implementation. The focus needs to be in balance as the technology is, at the end, only an enabler for the HR processes execution. The importance of people empowerment and interactions in a learning organisation environment is a key to agile approach. Further the HR digital strategy is suggested to be done by looking outside-in knowledge through customers, investors and acquiring best practices and research, selecting a partner that has a culture fit in order to build partnership and customizing the right digital technologies and solutions for a company. In this model, digital workforce and digital workplace are in essential role in building the digital innovations. Furthermore, HR plays key role in developing both digital workforce and workplace and it also needs to transform itself into digitally competent HR function.

2.3 HR digitalisation benefits and challenges

The digitalisation benefits are perceived to be somewhat different between the core business and support functions. Cost advantage is a specifically considered benefit for support function cloud computing based SaaS technology adoption. (Cho & Chan, 2013, 641) In HR the cost advantage is sought through operational performance and efficiency (Chapano et al., 2022, 1,10). Further and in line with the aforementioned, according to Marler & Fisher (2017, 18) the most wanted benefits are efficiency improvements and reduced transactions costs. Cost advantages can be reached through reduced transaction costs, but also through automation which results to headcount reduction. Moussa & Arbi (2020, 22-23), are in line with the above mentioned research results, introducing that the cost advantage can be reached by automating tasks and shortening the leads times with digital technologies. Further, improved productivity can be reached by minimizing bureaucracy and enabling the HR process with digital technologies which reduces the use of paper and removes routine steps or even full administrative processes (Vardarlier, 2020, 242).

Hussain, Wallace & Cornelius (2007, 85) states that accurate and timely available data for decision making, also on the strategic level, is an important benefit. This, as the strategic level benefit, increases the importance of digital HR processes as the added value for a company improves. Surprisingly also innovativeness are claimed to increase with the use of digital technologies in HR (Martins, Oliveira & Thomas, 2016, 28).

In addition to the introduced benefits, HR digitalisation face challenges. Globalisation and fast development of technology has made the HR digitalisation a need and an opportunity. Globally operating companies need to be considerate that the level of technology use and maturity is not the same cross the continents and countries and as a result the adoption readiness varies cross countries. Regulations and legislation in the areas of information security and data privacy differs from country to another and has direct impact on the possibility to innovate digital HR processes as the legal aspects must be fulfilled. At the same time when the size of organisation in globally operating companies brings benefits, it also brings challenges as the legacy may hinder the technology adoption. The over-use of digital technology may, in turn, lead to too impersonal HR service delivery as the HR processes might be too reliant on technology or too technology centric. (Thite, 2022, 88-90) There is not only one technology, but multiple digital technologies to choose from. This set a challenge for organisations, who need to be able to identify and initiate the right initiatives with the suitable set of technologies to a company needs. Digital technologies impact organisation culture. In order to make change, the culture need to change, which can be a challenge to overcome in the transformation. (Sivathanu & Pillai, 2018, 7)

2.4 HR digitalisation stakeholders

HR digitalisation stakeholders can be generalized to HR, employees, managers, suppliers, customers and regulators (Hendrickson, 2003, 381). The actors can be also defined as internal stakeholders holding internal knowledge from HR function and other functions, whereas the external stakeholders hold various kind of external knowledge. External stakeholders are solution vendors, consulting companies and various other resources in networks. (Querent, 2022, 8) In HR, it is typically the external stakeholders, technical vendors, who create the technical innovations and whose applications are purchased by companies (Marler & Fisher, 2017, 33, 120) and therefore the role of the vendors is essential and impacts the innovation process.

Solutions offered by technical vendors can be further configured and adopted to enable HR processes, this is often done together with vendors. Vendors can be categorized to technology vendors and implementation partners, whose services are purchased to implement, configure and adopt, the chosen solutions. Vendors actively impact to their customers' innovation process (figure 6) by participating to selection stage, scanning market, participating to the configuration of their platform to a customer company and finally being part of the support arrangements. (Jemine & Guillaume, 2022, 2428-2429) External implementation partners are also widely used in HR digitalisation efforts. At the best they share valuable external knowledge by providing new perspectives and assist in developing new, fit for purpose, solutions for HR processes for a company. (Marler & Fisher, 2017, 45-47)

	HRIS Vendors	HRIS Consultants
Knowledge	Advertising	Assessing Advising Advertising
Persuasion	Demonstrating	Case building
	Decision	
Implementation	Configuring	Configuring Accompanying
Confirmation	Sustaining	Sustaining Supporting

Customer

Figure 6. External factors and pressures from vendors and consultants on SaaS adoption to organisations (adapted from Jemine & Guillaume, 2022, 2432)

Externals vendors have a great influence on how companies adopt the digital technologies in HR field as stated above (figure 6). Vendors interact with their customer in their HR digitalisation journey from scanning the ideas to routinization of new way of working and maintenance of the solutions as support partners. Their role is deep-rooted and as such that their impact on company knowledge processes and HR process innovation when enabled with their solutions is evident.

2.5 HR processes

HR processes can be grouped to human resources sub-process groups, which can be supported by appropriate digital technologies. Management of complex business processes is possible only by technology, which applies also to digital technologies enabled HR processes (Vardarlier, 2020, 239). Similarly, Leonardi (2011, 147-149, 165) introduces a flexible interrelation in between the technology and work routines. Technology has become more flexible as applications can be configured to changing demands and the demands can be realized with short lead times. As a result of this configurability work routines are also more flexible and leads to situation where constant change in routines and processes can occur.

Numerous research papers describe HR processes which are enabled by digital technologies. While many of them focus on only few of them or introducing detailed view of how digital technologies facilitate a selected process, the figure seven (7) is drawn to provide a consolidated view for HR processes based on the research by Sengupta et al. (2021,10174), Vander (2021, 12-13), Chapano et al. (2022, 2-4) and Boroughs et al. (2008,7). The purpose of the consolidated view is to shed light to the breadth and depth of the HR processes, which can be enabled by digital technologies. While some processes are already dominantly supported by digital technologies there are others like employer branding and employee engagement which are emerging as next wave for digitalisation (Sengupta et al., 2021, 10174).

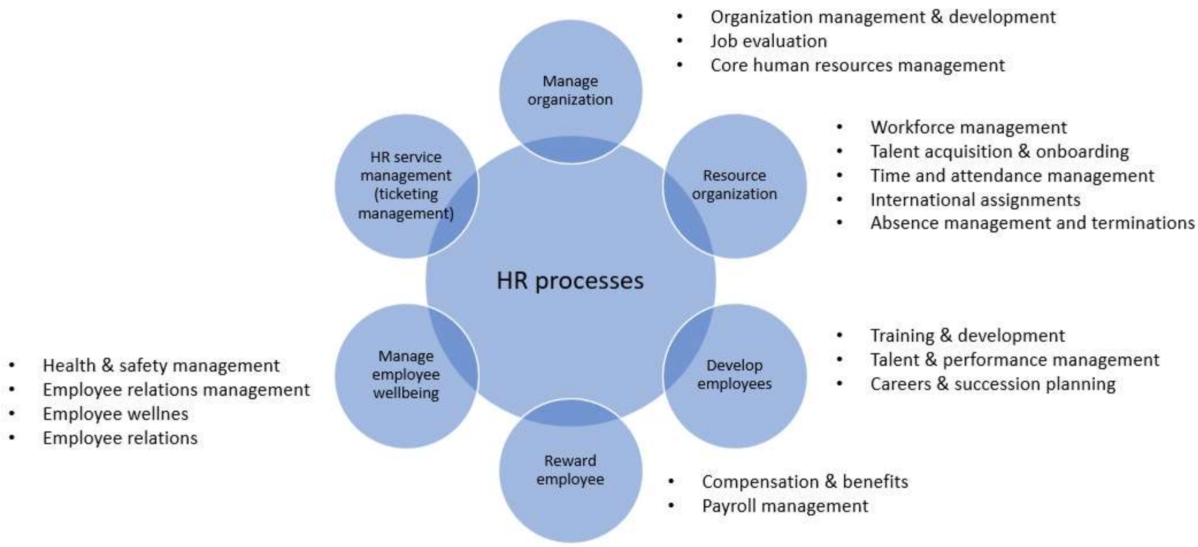

Figure 7. HR processes for digitalisation

Digital technologies are used to enable HR processes through all phases of the employee lifecycle in a company (Sharon, 2018). The potential performance impact of digitalised HR processes are transparently visible in the in the consolidated overview (figure 7) as a high number of processes, which impact day-to-day HR practices, can be enabled by digital technologies. Organisation management and resourcing processes together with the employee development and rewarding processes cover most of the employee lifecycle related processes. Employee wellbeing related processes complement the employee lifecycle processes whereas HR service management covers set of processes and practices for HR service delivery.

Alhan (2023) underlines that digitalisation has an impact on HR processes. The investment on digital technologies is a necessity for competitive HR processes. As the processes to support human resources are multiple, there is neither only one application that can fulfil all the needs and to provide sustainable competitive advantage. It is also notable that in parallel with the automation the need for more human workplaces have increased as competitive advantage (Manuti & De Palma, 2018, 68). As the processes are turning to digital, the technology enables HR to turn from transactional to transformational function as the routine and transactional HR processes can be automated. (Thite, 2013, 22-23)

2.6 Digital and other contemporary technologies

The recent move to the cloud based solutions have offered new possibilities for HR to scale HR processes (Larkin, 2017, 55). Thompson, Ghee & Sherin (2007, 57-59) identified that organisations, who decide to adapt digital technologies to HR perceive advantages for both HR and for the company. The technology should also be compatible to other IT in the organisation to reach the effect and strategic role of HR. Top management support is essential as the return of investment might not be obvious and because the adaption requires changing the processes in a company. The larger the organisation more likely it is to adopt digital technologies for HR. The size matter also in innovation as in innovation process decision making organisation size and its industry has an effect on innovation performance (Ritala, Olander, Michailova & Husted, 2015, 27; Martins et al., 2016, 23).

While move to cloud has paved the way to HR digitalisation, there are also other technologies enabling HR processes. HR processes are digitalised with various digital technologies known as SMAC (Social, Mobile, Analytics, Cloud) (Sengupta et al., 2021, 10169). Digital technologies cover solutions which provide opportunities to the utilization for big data, artificial intelligence and analytics (Thite, 2022, 88). As the technology continuously develops, employee experience and data transfer automation between digital technology based solutions are raising themes (Kilgore, Herrington & LLP, 2022, 4). Social media technologies are part of digital technologies. The use of HR processes is moving to mobile and user experience (UI) turns more to consumer style, especially in learning solutions and in HR communications solutions (Larkin, 2017, 56-57).

New technologies can also bring new negative consequences unless not well managed, a careful information security and privacy focus as well as the management of the bias in algorithms has become essential focus areas (Thite, 2022, 93). Digital technologies are enablers but while managing the innovation processes, organisations need to consider ethical and compliance issues as a boundary to follow (Tursunbayeva, 2019, 7). Further, as the adoption of the applications allows organisations to configure the applications to their specific needs to a certain level, the need for the configuration should be evaluated at the selection of technology and applications to understand which solutions best benefit the company and the HR operational model (Mauro & Borge-Andrade, 2020, 201, 211-212).

Social media, mobile, analytics and cloud computing technologies are the key enablers for innovation of HR processes. The interoperability of the applications and data transfer between processes are enabled with automation. Further virtual and augmented reality can also be used in some of the HR processes. These technologies are introduced in the next six sub-chapters to inform the use purpose and technical capabilities they bring for the innovation of HR processes.

2.6.1 Mobile

Vendors in HR technology field are increasingly developing solutions, which are mobile compatible (Johnson et al., 2016, 541) and as a result HR processes can be enabled for mobile use (Mülder, 2016, 771). This evolution is a result of the overall development of the mobile devices use in general (Shankar, 2022, 146). The use of mobile is established for HR processes for self services and talent acquisition. Various leadership needs like talent management and analytics benefit from mobile use but also learning is enabled by mobile brining aspects from gamification to HR processes. (Mülder, 2016, 773)

Employees use HR processes via mobile enabled applications. Employees intention to use mobile HR services is much dependent on the perceived quality of the offered mobile HR services. The valued aspects of the mobile services are content, navigation, privacy and security as well as the support for the use. (Shankar, 2022, 153-155) Mobile enabled applications provides potential and benefits such as lower costs, but despite of the potential, there are also views that the speed of the mobile use penetration is not yet increasing to the expected level due to the resistance by users (Shankar & Nigam, 2022, 206, 221).

2.6.2 Social media

Information technology and social media provides the innovations that companies can benefit (Vardarlier, 2020, 240). In HR processes, social media is used especially for the talent acquisition purposes (Johnson et al., 2016, 542) as it offers easy access to potential candidates with reduced cost compared to the traditional methods (Zhang & Chen, 2023,9). Social media is beneficial for employment related practices, performance management and workplace related topics (Kluemper, Mitra & Wang, 2016, 156). Social media is also used to improve the employee experience as it is used as one of the internal communication channels (Zhang & Chen, 2023, 8). As social media is available for in-house use in companies it is also an opportunity for HR processes. According to Hauptmann & Steger (2013, 29) HR benefits from social media in talent acquisition practices and for learning purposes, but social media also helps developing the organisation culture and community within a company. It is also recognizable that social media plays a role in forming relationships and building social capital in organisations (Manuti & de Palma, 2018, 59).

2.6.1 Analytics

Cloud computing and artificial intelligence bring new opportunities for HR processes and especially in workforce management reporting but also employee experience (DiClaudio, 2019, 43, 45). HR analytics has its integral position in supporting the decision making and its focus is increasing with rapid speed. The solutions providing analytics can be developed internally or they can be part of the new digital technologies. Analytics manages high volumes of real-time data, is enabled to do predictive analysis with big data and is provided as self-service. (Manuti & de Palma, 2018, 42-44) DiClaudio (2019, 43) highlight the importance of developing solutions in which aggregated data is available for insightful decision making and predicting changes. The analytics is no longer backwards looking reporting but moving into predictions and forecasts. It is not only the HR related data, but data also from other sources that can be aggregated in analytics (Torre, Sarti & Antonelli G., 2022, 8; Shet, Poddar, Samuel & Dwivedi, 2021, 320).

The digital technology choices and their innovation for analytics must be done with strategic decision making in mind as the digital technologies enabling this area are many from general analytics solutions to analytics within HR specific solutions. The global HR solutions are becoming fairly comprehensive in analytics and reporting capabilities (Di Claudio, 2019, 43; Bryce, McBride & Cunden, 2022, 491). Tursunbayeva, Di Lauro & Pagliari (2018, 224) claims that the value of advanced analytics is higher for large organisations as the traditional HR may not have adequate capabilities to support analytics. To highlight the importance of analytics Amladi (2017, 68) confirms that data analytics is becoming one of the focus areas for acceleration as HR can utilize the data for understanding the trends and patterns.

Analytics in HR is a practice where contemporary technology is used to provide analytics with visualisation tools and dashboards (Torre et al., 2022, 8; Shet et al., 2021, 320). Advanced analytics is empowered by artificial intelligence and the data sets collected in HR is expanding from traditional demographics, organisational and performance data to advanced data sets with data from employee behavior, competencies and interactions. Technology can provide the platform managing the required tasks and analysis, but as the data volume and richness grows, organisations need to start to pay attention also to data quality in order to be able to make decisions with accruate data set and support organisational agility. (Kamen, Mahoutchian & Paynter, 2023, 29-33) Data governance and recognition of the data privacy requirements are integral part in managing the analytics (Shet et al., 2021, 320). In addition to data privacy, ethical aspects require appropriate attention and management. The ethical issues raise from the data, bias in algorithms, but also how the results of the analytics impact organisation culture and employees' lives in a company. (Bryce et al., 2022, 486-487)

The promise of analytics is focused on improving organisational performance through the evidence based insights derived from the data. Also, contemporary analytics require digital technologies. These findings support the need to invest on adequate digital technologies. (McCartney & Fu, 2022, 38-39)

2.6.2 Cloud computing

Cloud computing enables the vendors to develop solutions and further to sell the subscriptions, the permissions, to use their applications as Software as a service (SaaS). Technology vendors host the applications, while the customer company use the application over internet as on-demand service. (Cho & Chan, 2013, 629) SaaS has penetrated to multiple areas, including HR (Cho & Chan, 2013, 630) and according to nature of SaaS technology it has removed the need to install HR related systems and applications into an organisation's own facilities (Hunt, 2011, 37). They can be rapidly deployed and scaled when the demand changes (Cho & Chan, 2013, 630). The cloud based applications are accessed over the internet via browsers and they are configurable for an organisation's own needs (Johnson, Lukaszewski & Stone (2016, 541). From HR process innovation perspective, it is important to recognize that vendors are also developing new features and functionalities with the aim of having frequent release cycles in order to remain competitive (Hunt, 2011, 37).

2.6.3 Automation

Manual processes automation provide cost efficiences as the work is automated rather than manned with people (Amladi, 2017, 68). According to Kilgore (2022, 4) the amount of HR applications in an organisation is increasing, which requires careful consideration of employee experience and interoperability of the applications. As a response to the interoperability need, integrations are becoming essential component of the HR technology architecture.

HR technology architecture is a combination of several digital technologies and applications enabled by interconnectivity aiming to ensure that the HR processes are well managed (Jemine & Guillaume, 2022, 2428). Integrations transfer data from application to another enabling the seamless exchange of data for each process managed in different applications within HR or in any other part of organisation (Zafar, 2013, 110). Integrations between applications and automation are an integral part of HR technology architecture and an aspect to consider in HR processes innovation in order to maximize the digital technologies benefits.

Automation is done by using many generally used, yet specific technologies, out of which the most common ones are batch-based, API and RPA based automation. Batch file-based data transfers are very common, they can be used by simple commands or scheduled to run at specific times (Tripathi, 2018, 8). API is an interface which fetches the data from an application to another or is used for various tasks and by doing so they offer productivity gains. (Robillard, 2009, 27) Further, RPA applications can be configured to do the require tasks and get connected to other applications to enable the automation (Balasundaram & Venkatagiri, 2020, 1-3). RPA refers to a mechanism in which robot mimics human behaviour in applications. Robot in RPA is a software program, which interacts with applications and by doing so it follows well defined rules-based tasks, make calculations and decisions. RPA based robots are useful to automate high volume, repetitive tasks and by doing so companies can reach higher quality, accuracy, productivity and efficiency to lower costs compared to the work done by people. (Tripathi, 2018, 7, 9-11)

Artificial Intelligence is also used to automate certain tasks to augment but not necessarily to replace work done by people (Ashwani, Khandelwal & Jayanthi, 2021, 217). Artificial intelligence also completes the tasks on behalf of people based on rules and algorithms. Machine learning is a subset of artificial intelligence, simply put, machine learning learns and thus evolves constantly from the data based on various approaches built with the algorithms. Further deep learning is a subset of machine learning and works like neural networks trying to compare new data to existing data. (Jakhar & Kaur, 2019, 131-132)

Digital technologies based HR applications are also further integrated to other applications used by employees for the improved user experience, for example chats. It starts to be also more common to integrate HR applications to case management tools, which are used to manage HR service delivery for employee and manager questions and requests for HR processes. (Grinter, Pang, Freyermuth, Hanscome, Poitevin, Chandra, Kostoulas, Chiba & Stewart, 2022)

2.6.4 Virtual and Augmented reality

Virtual reality (VR) replaces real images, sounds and tactility to virtual worlds (Bates-Brkljac, 2012) and in augmented reality (AR) the physical world is complemented with digital world (Craig, 2013). VR and AR are beneficial in employee training activities as an enhancing element and also in talent acquisition efforts for employer branding (Lalić, Bošković, Milić, Havzi, Spajić, 2020, 474, 476-477). Training with VR provides safe environment for trial and error and is examined to improve the performance in both pure VR as well as combined VR and AR trainings. The VR and AR training provides an opportunity to exercise real life scenarios without business risk. (Cooper, Millela, Cant, White, Meyer, 2021,1-2)

3 Innovation

The previous chapter introduced digitalisation, digital technologies and HR processes. As a summary, it can be concluded that HR processes innovation efforts are done by adopting digital technologies. The adoption of digital technologies impact and enable HR processes execution in a new way, which in turn impact the company performance. In this chapter, the focus is on understanding innovation, especially innovation as a process, factors impacting to innovation and new knowledge creation in innovation process. A company innovating HR process with digital technologies invest in those technologies and engage to innovation process with technical vendors and implementation partners. Vendors participate to innovation activities and benefit from their engagements with their customers for their continuous innovation, in commercial terms, as suppliers as well.

Collaboration and execution of knowledge processes play a significant role in innovation, and therefore in this study, also knowledge processes are reviewed in order to understand their role in HR digitalisation. The role of external vendors and the nature of digital technologies allows open, collaborative efforts in inter-organisational networks and use of other sources of external knowledge throughout the innovation process in a company. Due to this reason, the special focus in innovation and knowledge processes is on acquiring and integrating new external knowledge.

3.1 Innovation overview

Innovation as an outcome introduces innovation as new process, product or service while the process viewpoint to innovation gives insights to how to realize the innovation. Mindset in turn, close to adaptation, is introduced as internalization of the innovation. Kahn (2018, 453-458) Rogers (2003, 12, 18, 330-331) describe the innovation as an idea, practice or object and as a newness. The newness is evaluated from the perspective of the one, who is adopting an idea regardless of how long time the idea has been known in general. Knowledge about the innovation is shared in a specific communication set up called diffusion. In a diffusion process an innovation must exist and the knowledge about the innovation is shared in a social context from the ones who know about the innovation to the ones, who are new to it. The conditions of the relationship of the parties involved impact to the success of the knowledge transfer taking place in this diffusion. The adoption takes place in the diffusion networks, where early adopters are in dialogue with the peers, who may, through innovation process make the decision to adopt the innovation. Van de Ven (1986, 591) describes innovation as a process where new ideas are developed and deployed as a result of collaboration in an organisation. The idea refers widely to technical, product, process, or any other administrative innovation.

Rogers (2003, 420-421) has described five steps in the organisation innovation. Each step is a pre-requisite to next step. Initiation phase covers two steps, agenda setting and matching, where an innovation is identified to fit for the problem in the organisation. The initiation phase is complemented with implementation phase with three steps. During these three steps the innovation is developed to fit for the needs of the organisation and becomes an essential part of the organisation's activities. Implementation is reached through redefining, clarifying and routinizing the innovation. Jha & Bose (2015, 297-298) has described this innovation diffusion theory as cyclical, phased approach, where the first step is conceptualization followed by adaptation after which it is possible to reach diffusion and finally the impact of the innovation.

Open innovation relies on inflow and outflow of knowledge exchange cross the organisational boundaries (Wikhamn R., Styhre A. & Wikhamn W., 2022, 2) and can act as enabler for outside-in knowledge acquisition (Castro, 2015, 143, 145).

> "It basically means that innovation is generated by accessing, harnessing, and absorbing flows of knowledge across the firm's boundaries". (Chesbrough, 2017,35)

Since the launch of open innovation theory, it has been applied to various new and related concepts. Open innovation has evolved from company-to-company collaboration to larger group of stakeholder collaboration through phases. This, and its further extension, is also seen as the future of the open innovation. (Chesbrough, 2017, 37)

Innovation can also be considered from its closeness or openness. Earlier the innovation was mainly seen as a process and outcome in an organisation while the open innovation has led the innovation to become process and outcome cross organisational boundaries. Innovations are not either-or but rather somewhere in between the closed and open innovation. (Bellantuono N., Pontrandolfo P. & Scozzi B., 2013, 558) Digital innovation can be delivered as co-creation process by engaging with various internal and external stakeholders. Focus on intra-organisational innovation is in organisation's internal processes while inter-organisational innovation provides answers to how relations between organisations can be a benefit for innovation for an organisation (Holmström, Magnusson & Mähring, 2021, 249-250).

Innovation has transformed to digital innovation. Digital innovation requires management with practices, processes, and principles with which the innovation is used to scale the business. Digital innovation, new logic of innovation, focus on dynamic problem-solving, socio-cognitive sensemaking and technology affordances and constrains and orchestration. Additionally, digital innovation requires re-framing the knowledge in a social context. (Nambisan, Lyytinen, Majchrzak & Song, 2017, 224, 227, 229)

3.2 Innovation climate

Organisation culture describes the accumulated and shared learning of a specific group in which common beliefs, values and behavioural norms exists. This learning is acquired from experiences when the group has sought valid solutions for external adaptation and internal integration. (Schein & Schein, 2016, 6) Organisation culture is in constant motion and development and as a result organisation's innovation and adaptability capabilities can be impacted (Kruft & Gamber, 2021, 74-175, 177).

Companies that are agile, adaptable and allow re-invention have better opportunities to mature digitally (Thite, 2022, 90). Digitalisation has led to a need to move towards digital organisation culture. Digital organisation culture defines how organisations operate with shared assumptions in its digital context. Digital culture supports business digitalisation as well as digital technology value development, and in situations where both are fostered parallelly, the benefits for improved performance can be maximized. (Martinez-Caro, Cegerra-Navarro & Alfonso-Ruiz, 2020, 2, 5-7)

Digital technology mediate the cultural renewal and digital transformation and as a result generate innovation climate. Innovation climate has effect on employees' innovation behaviour which need to be maintained by appropriate management practices. (Shanker, Bhanugopan, Van Der Heijden & Farrell, 2017, 74; Ye, Liu & Tan, 2022, 1104-1105)

Innovation climate fosters digital adaption (Kruft et al., 2021, 184). Innovation climate has direct impact on HR digitalisation as it changes the knowledge requirements and HR service delivery practices. The satisfaction to HR service delivery is also positively impacted by innovation climate, and further the intense innovation climate impacts to the capabilities to develop and implement digital technologies for HR processes. (Florkowski, 2021, 1387)

3.3 Dynamic capabilities as source for innovation

Management and leadership practices impact both digitalisation and innovation. Innovation has become essential part of management focus and as such innovation capability is an essential dynamic capability for an organisation (Breznik & Hisrich, 2014, 379). Dynamic capabilities have raised popularity as a response to ever increasing turbulence in external environment. The level of speed and change in environment forces organisations to change its operations, and in this change dynamic capabilities bring opportunities for companies to stay competitive regardless of the level of the change in its environment. Dynamic capabilities have been initially seen as an organisation entity level management factor, but nowadays it is admitted that they are also relevant for all levels of management. (Pavlou & El Sawy, 2011, 260-261) Dynamic capabilities can be defined

> "As capacities to sense and shape opportunities and threats, to seize opportunities, and to maintain competetiveness through enhancing, combining, protecting, and when necessary, reconfiguring the business enterprise's intangible and tangible assets." (Teece, 2009, 4)

Dynamic capabilities can be developed through a process (figure 8). In this process digital sensing represents the first step where the mindset and culture development towards digitalisation is initiated. During this period networking is essential element to the strategy development process. Digital seizing builds on the capabilities built during the sensing phase. Digital seizing focuses on fast understanding of the opportunities of digitalisation. During this phase rapid scaling and open innovation practices amongst others help in keeping the required pace. The strategic continuous re-direction becomes a necessity. The last phase is to build the transformational capabilities, which requires transformational leadership and collaborative approach for innovative development to change the business model. (Warner & Wäger, 2019,335-338)

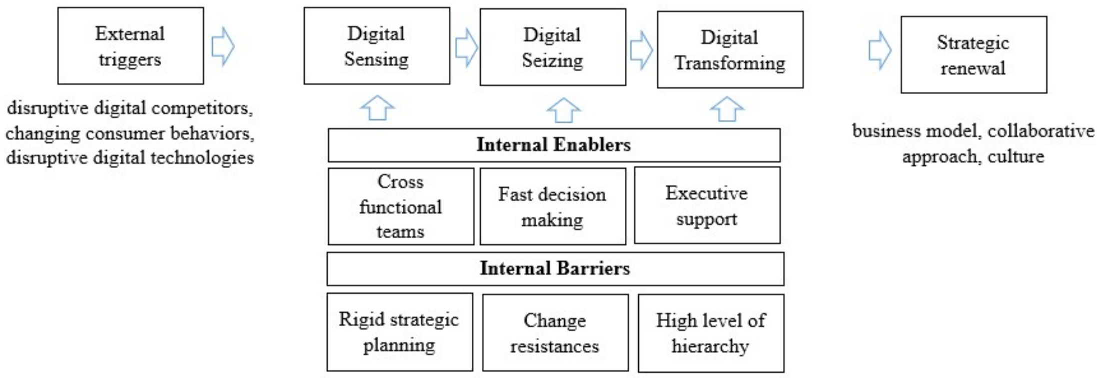

Figure 8. Process for dynamic capabilities development for digital transformation (adapted from Warner & Wäger, 2019, 336)

As a summary digital transformation is

> "Digital transformation is an ongoing process of strategic renewal that uses advances in digital technologies to build capabilities that refresh or replace an organisation's business model, collaborative approach, and culture." (Warner & Wäger, 2019, 344)

Dynamic capabilities are important to innovation. Breznik & Hisrich (2014, 374) states that dynamic capabilities and innovation capabilities have relationship with each other as innovation capabilities complement dynamic capabilities. Dynamic capabilities and innovation capabilities are close to each other (table 1) as they are strategy oriented, specific to a company, highlight the continuous sensing and seizing as well as the continuous development in a company.

Table 1. Commonalities between dynamic and innovation capabilities (based on the literature review) (Breznik & Hisrich, 2014, 374)

	Dynamic capabilities	Innovation capabilities
Central role of learning	Dominant source shape the creation	Dominant source shape main goal
Strategic orientation	Continuously sense, seize, constantly search, scan, explore for opportunities	Constantly search, scan, explore new opportunities
Main characteristics	Firm-specific heterogenous	Firm-specific heterogenous
Role of management	Key role, essential	Key responsibility, crucial
Nature of development	Change, configure, improve new, different	Change, configure, improve new, different

The introduced theories (figure 8 and table 1) are also in line with the views by Tajudeen, Nadarajah, Jaafar & Sulaiman (2022, 620) whose research identified that strategic vision on digitalization has impact on process innovation capabilities. They have also introduced that the use of digital technologies has similar positive impact on the same.

One view to the digitalisation is cloud-computing based SaaS innovation adaption model, which is introduced in the next chapter. This framework and the impacting factors utilize diffusion of innovation as a basis for the digital innovation adoption as a process. It is relevant for innovation for HR processes as the digital technologies for HR are largely based on cloud computing. Digital dynamic capabilities and related continuous management efforts as described in this chapter are enablers for successful digital innovation adaption.

3.4 Cloud computing-based SaaS innovation adaption model

Innovation climate is seen as pre-requisite for innovation whereas dynamic capabilities are seen as a strategic capability to enable digitalisation. Innovation for HR digitalisation is adoption of the digital technologies for HR processes in a company. In this transformation cloud computing based applications, amongst other SMAC technologies, are in focus for HR process innovation.

Diffusion of innovation, as introduced in the chapter 3.1. is used to understand and describe the cloud computing adaptation. Intention, adaptation and routinization are generally used three phases from diffusion of innovation, and applicable to describe the cloud computing based solutions adaption. The steps and factors (figure 9) impacting the adoption are derived from technology-organisation-environment (TOE) model and institutional theory in addition to the diffusion of innovation based on the study concluded by Martins et al. (2016, 21, 28-30).

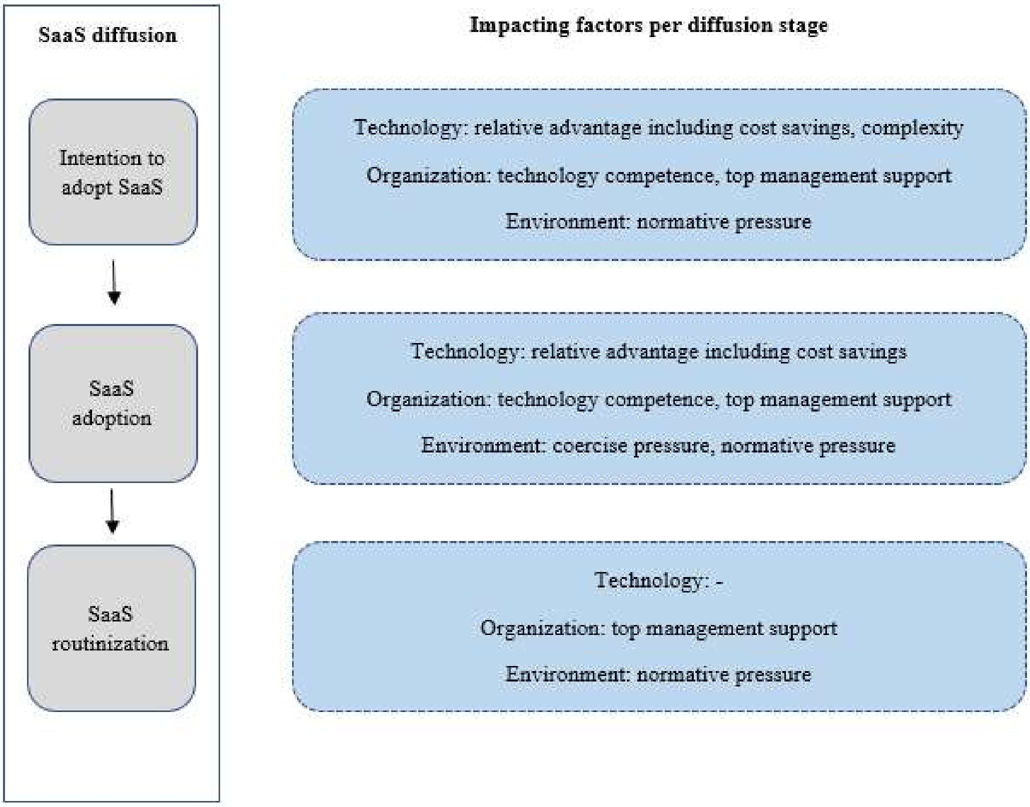

Figure 9. Impacting factors per diffusion stage summary based on Martins et al. (2016, 21, 28-30) findings

According to Martins et al. (2016, 28-30) there are technology, organisation and environment factors impacting the adoption. Based on the technology context, the relative advantages of SaaS adoption must bring organisation advantages like efficiency and shorter lead times to task execution or productivity. Cost savings together with other relative advantages have significant impact on the decisions to initiation and adoption of the SaaS innovation in an organisation while interoperability with other IT solutions and security concerns are not significant factors. Complexity can slow down the initiation phase due to the consequences of missing knowledge in the organisation. Technology competence and top management support in organisational context impacts the diffusion. Technology competence determines the likelihood of intention and adoption but not in routinization bit instead top management support is seen as important factor throughout the entire diffusion process. Environmental factors have been found to impact the diffusion process. Regulatory or other pressures are essential to recognise during the adoption. Normative pressures instead have impact on all stages and mimetic effect does not have any effect.

Diffusion of innovation can be viewed from adoption rate perspective. Adoption rate describes the pace in which innovation is adopted by an entity through different attributes (Rogers, 2003, 221). The studies by Marler & Fisher (2016, 115-118) confirm that the diffusion of innovation can be applied for HR digital technologies adoption. They have concluded the adoption rate for HR technologies through diffusion of innovation adoption rate attributes. In short companies, who have adopted HR technology have reached relative advantage for processes and data compared to the situation prior to adoption. Triability, instead, is low as the testing for cloud based SaaS applications is not possible before investment decisions. Similarly, observability is low. This is due to lack of transparency of how other companies have adopted digital technologies. New digital technologies are easy-to-use, which has reduced the complexity, but on the other hand they can be expensive and thus only large companies can afford to invest on HR digital technologies, but the one who can, are adopting them with fast pace. As a conclusion it can be summarized that the diffusion of HR digital technologies have both advantages and barriers for adoption.

Innovation is based on creating new knowledge and its utilization in a company. Next chapters describe the innovation from knowledge processes point of view. The purpose is to understand specific perspectives of how external knowledge acquisition and integration advances the innovation diffusion for HR digitalisation in a company. These aspects of knowledge processes are also further studied in the empirical research of this study.

3.5 Innovation and knowledge management

Knowledge management impacts innovation also in process and technology innovation (Arif, Nunes & Kanwal, 2021,15, 17). Incremental innovation is based on existing knowledge while radical innovation relies on acquiring new knowledge. The focus should be in both, acquiring knowledge and building positive innovation climate. (Benner & Tushman, 2003, 243; Gemünden, Leker, Salomo, Schewe & Talke, 2014, 8-9) Radical and incremental innovations are complementary and follow each other as the radical innovation requires further development efforts to support its maintenance. Additionally incremental innovations have a role in supporting fast implementation of new ideas. (Berggren C., 2019, 462, 470)

3.6 New knowledge creation in innovation process

Innovation is a result of new knowledge creation and at the same time it is a learning process in a company (Grimsdottir & Edvardsson, 2018, 10). New knowledge creation in innovation process can be described as a process where previous knowledge and the newly acquired knowledge is integrated and recombined together in a dynamic process (figure 10). The knowledge re-combination leads to changed tacit and explicit knowledge as a result of the innovation process. (Barbaroux, Amel & Schenk, 2016, 34)

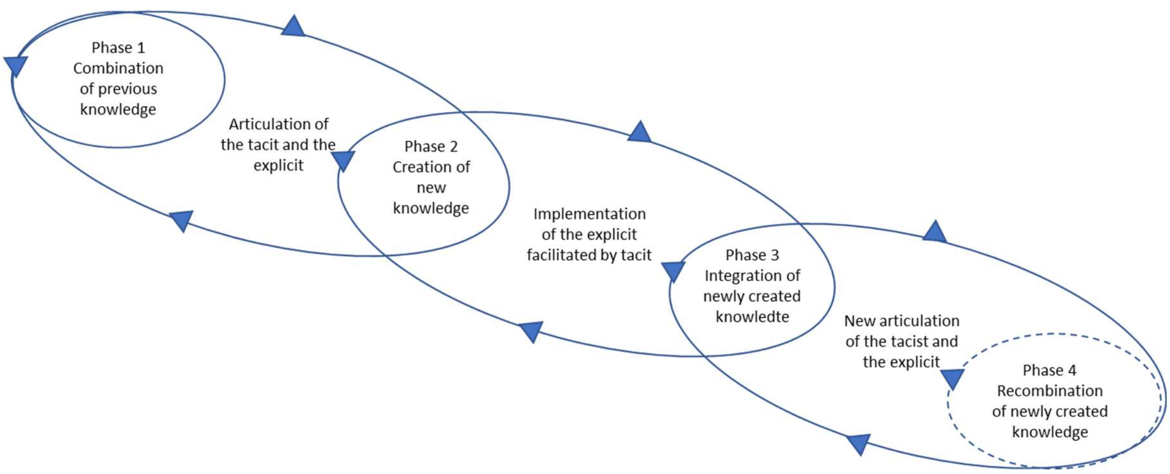

Figure 10. Knowledge creation in innovation (Barbaroux et al., 2016, 34)

The knowledge creation as a process describes the dynamic nature of the knowledge creation where the previous knowledge is articulated, new knowledge is being implemented and where the new articulation results to new knowledge in a continuum. In this knowledge creation both tacit and implicit knowledge have specific role in ensuring the success of the new knowledge creation. (Barbaroux et al., 2016, 34)

Tacit knowledge facilitates the explicit knowledge dissemenination and integration in an organisation. While the knowledge transfer takes place members of an organisation actually share specific subject matter expertise and the social practices in which their earlier knowledge acquisition and learning took place. New knowledge is always created in a social context. These social contexts are political, where diverse factors and the legacy of the participants impact on how successful the organisational knowledge processes are in innovation. (Nonaka & von Krogh, 2009, 647-648) Nowadays, it is to be recognized that technology itself can also change the role of tacit knowledge as the AI based algorithms start to provide predictive analytics (Sumbal, Tsui & See-to, 2017, 194).

Nonaka et al. (2000, 13, 15, 23, 29) emphasize that the knowledge creation requires a specific context in which the parties co-create the knowledge. Further the knowledge creation process can be supported by organising favourable conditions for the knowledge creation like stating and challenging the vision and existing knowledge, organising knowledge resources, also called as assets, and further nourish the context, *Ba*, in which the knowledge emerges. Moreover, Bhatt (2001, 74) emphasises that the new knowledge creation through knowledge processes requires changes also in the organisational culture as it helps in breaking the legacy practices to the new ones in a dynamic process. This supports the findings introduced in the chapter 3.2.

3.7 External knowledge acquisition

An organisation can benefit from external knowledge, but in order to receive external knowledge it also needs to share knowledge to other parties. In this knowledge exchange an organisation need to be considerate of what knowledge to share in the inter-company relationships. (Ritala et al., 2015, 28-29) The inflows and outflows in open innovation and their impact on the knowledge processes can be described like Barbaroux et al. (2016, 57) does it in the figure eleven (11) through three aspects for open innovation.

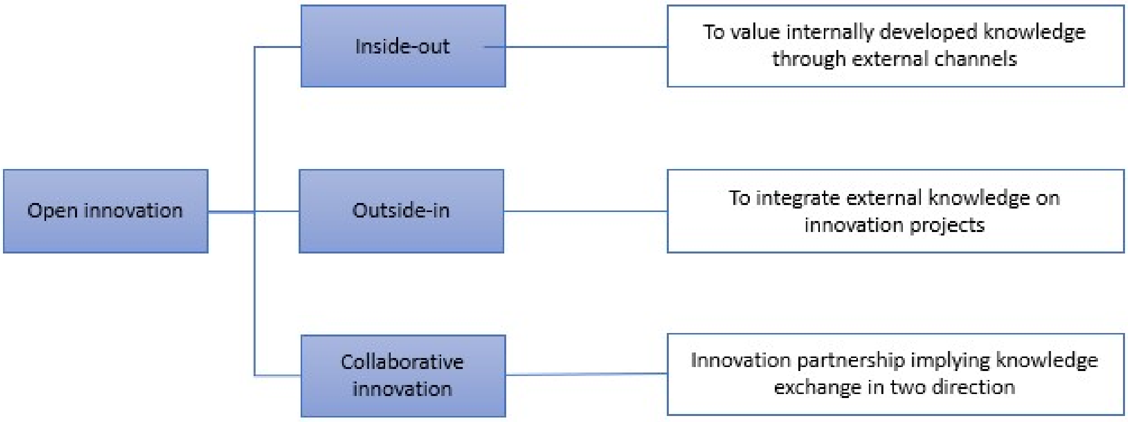

Figure 11. Three aspects of open innovation (Barbaroux et al., 2016, 57)

The inside-out knowledge flows allow gaining value when shared through external channels while the outside-in acquired knowledge is integrated within a company for its own innovations. Collaborative innovation, in turn, require innovation partnership for two-directional knowledge transfer. (Barbaroux et al., 2016, 57) External networks can cover customers, suppliers, competitors, universities (Castro, 2015, 145) or other networks and the idea is to gain new ideas (Hosseini, Kees, Manderscheid, Röglinger & Rosemann, 2017, 95). Open innovation is very generic concept which can be executed through user innovation and community or crowdsourcing to acquire outside-in knowledge (figure 12), despite of being specific methods, they overlap with each other (Barbaroux et al., 2016, 85-86).

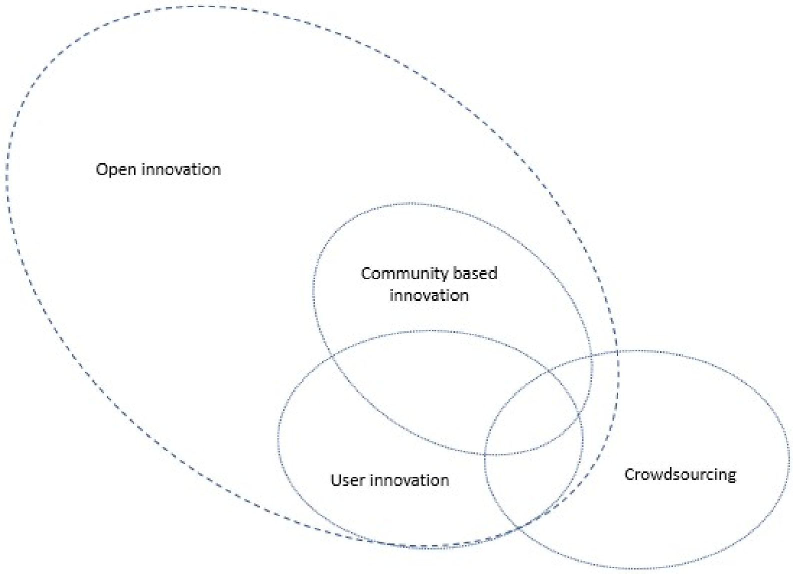

Figure 12. Open innovation types and their position with each other (Barbaroux et al., 2016, 85-86)

In HR new knowledge can be acquired from various communities established and facilitated by the vendors, organisations, or other voluntary individuals, for example in LinkedIn. Communities have a role in disseminating knowledge on innovations and due to their role extend the open innovation thinking (West & Lakhani, 2008, 223-224). The collaboration can be focused on best practice sharing, viewing the future, networking within industry or professional development and various other reasons for the benefits or all parties and individuals (Ritala & De Kort Benoit Kally, 2023, 1140, 1166).

3.8 External knowledge absorption

Organisation's ability to absorb external knowledge depends on its absorptive capacity (Ritala & Hurmelinna-Laukkanen, 2013, 154,166) which in turn is dependent on the existing, earlier acquired knowledge on the same topic (Sheng & Chien, 2016, 2302; Diaz-Diaz & Saa-Perez (2014, 430, 440-441). Internal and external knowledge are tightly linked to each other and therefore the usefulness of new externally acquired knowledge differs based on the earlier knowledge of the same topic. The impact differs based on the absorptive capacity, the higher the earlier knowledge the higher the likelihood that that the combination of the existing and new knowledge bring positive results. (Diaz-Diaz & Saa-Perez (2014, 431, 441)

According to Diaz-Diaz & Saa-Perez (2014, 430, 440-441) an organisation benefits from absorbing new knowledge from external sources up to a certain point before it reaches inertia. Absorptive capacity is a pre-requisite to innovation performance (Tajudeen et al., 2022, 608-609). It is also necessary to understand that while the knowledge processes are impacted by individual and organisational diverse factors, the knowledge creation may not be complete due to knowledge inertia and in worst situation even block the innovation. People with learning inertia contribute negatively to innovation realization while experience inertia has positive impact. (Liao, Fei & Liu, 2008, 183-184, 192-193) Innovation can take place when organisation learn, the knowledge processes should be carefully utilized to for the benefit of innovation via various activities (Jiménez-Jiménez, Sanz-Valle, 2011, 416). This is well summarized by Edmonson & Harvey (2018, 347, 356-357) who conclude that the use of diverse knowledge base does not take place without effort. The knowledge utilization requires knowledge combination or integration to the existing knowledge base, so that the knowledge can be applied in a company.

4 Empirical study

This chapter describes the details of the empirical study. The first chapter focuses on introducing research strategy, while the second and third chapter details the data collection and analysis. Finally, the last chapter is reserved for the introduction of data validity and reliability viewpoints of the empirical study.

4.1 Research strategy

This study is conducted as qualitative inquiry. The purpose was to understand and describe how HR processes are innovated through HR digitalisation in globally operating companies by interviewing subject matter experts on the topic. The aim was to explore and explain the practical experiences and form a holistic picture of what are the external sources of knowledge and how the new knowledge creation takes place throughout HR digitalisation innovation process in a globally operating company. Qualitative research was chosen as it gives flexibility in exploring the pre-defined themes but also collect additional rich data for the emerging insights during the interviews for the studied phenomenon.

4.2 Data collection

The data collection was executed through semi-structured interviews. The interviews were the primary method for gathering data on experiences and opinions. The entire process from demographic data questionnaire to data collection completion through semi-structured interviews took place in between 16 April to 12 May 2023.

Data was collected from ten (=10) subject matter experts, who were selected through purposeful sampling. The participants needed to have worked on in a managerial position for HR technology in globally operating companies and to work in HR during the interview. HR technology or HRIS is typically organised as a sub-function of HR. In this study HR technology refers to applications and related technical architecture to digitally enable and automate HR processes.

The non-probability sampling is typical in qualitative research (Merriam & Tisdell, 2016, 97) which was applied also in this study. To be specific, the sample of participants were done with purposeful sampling. Table two (2) refers to the characteristics looked after from the participants. The characteristics were defined in order to find people who can give adequate responses to the studied phenomenon. It was important to find people who are able to discuss both strategic and operational viewpoints, and to have wide enough perspective. After the characteristics were defined, people known holding these qualities were identified and contacted, and as a result ten of them accepted the invite to participate to the study. After the acceptance to participate, the participants were asked to provide the basic demographic data. This was done in order to have final validation for the background and ensure the reliability of the responses against the preliminary set characteristics. Demographic information was collected with a Microsoft Forms application. Results are available in section 4.2.1.

Table 2. Purposeful sampling criterion

Dimension	Criterion
Industries	Wide variety of industries in the participants' cumulative work
Job level	VP, Directory/Head of, Senior Manager or Manager level
Work experience	Work experience from globally operating companies
Contemporary knowledge	A position within HR technology field within recent years
Diversity	Participants from various genders, nationalities and age group

The goal for interviews was reached by interviewing experienced HRIS or HR Technology leaders, who had proven work experience working on the field on managerial roles in globally operating companies in order to be able to discuss both strategic and operational level themes including decision making. The experience from various industries was seen as a benefit. This gave an opportunity to have in-depth discussions and receive wide perspectives for HR digitalisation. The requirement for the managerial positions also gave an opportunity to discuss the development of the studied topic from longer time perspective. Further to the requirement to hold a position or have recent work experience on above mentioned level of positions was triggered due to rapid technology development. Participants needed to have knowledge from the recent technology development to ensure validity of the research results. Diversity was also considered in terms of age, nationality and gender. All interviews were conducted in English or Finnish.

As stated above, interviews were held as semi-structured interviews and altogether ten (n=10) interviews were held for the data collection. The interviews were held as one-on-one interviews with the help of interview guide (appendix 1), which covers interview structure, themes, initially considered questions and the possible probes. Interview guide or questions were not shared to participants prior to the interviews.

The participants were welcomed to the interview with the refresh of introduction and general definitions used in the study. Introduction covered overview of digital technologies definition and the focus on discussing HR processes in general. This was complemented by innovation, especially open innovation definition. Introduction was closed by introducing the interview themes. The first theme *digital technologies and HR* focused on the technologies and processes while the second theme *HR digitalisation strategy* explored the role of strategy and decision making in innovation process. The third theme *innovation and* *knowledge processes* focused on to understand how HR digitalisation innovation takes place as a process, through phases. The phases for the third theme were derived and adapted from the literature review. They were introduced to cover sensing and identifying the opportunities, seizing the initiatives, transformation and finally moving to maintenance and routinization. Transformation was discussed through the key essential factors. The interest on innovation from knowledge processes perspective focused on understanding outside-in knowledge transfer and internal integration of the acquired knowledge for the HR digitalisation. The interview ended to a closing theme, where participants were given a chance to bring up anything else they wanted to recognize or share about the discussed themes.

The selected interview type guaranteed that there was a possibility to explore the emerging topics for each theme and even new themes during the interview. This ensured that the key themes were covered and at the same time the participants were able to complement and share more rich insights during the interview. Interview length varied from 45 mins to 1 h 30 mins and were held over video call, which was recorded and transcribed. One interview took place face-to-face but was similarly recorded to ensure similar data analysis with other interviews.

4.2.1 Demographics of the participants

All participants replied to the demographic questionnaire. The demographics of the participants indicated that the job complexity varied between Manager and Vice President jobs. As all the participants hold minimum a manager position, they have exposed to organising and managing HR digitalisation in their job roles. 50% hold Director / Head of level at the moment, 20% represent Vice President level and Manager level while 10% represent Senior Manager level. As the participants represented four different job levels, it also gave a possibility to understand the perspectives from different managerial levels.

Based on the demographics it can be recognized that the participants had adequate experience from all continents (figure 13) to be able to share insights and experiences from global perspective. All continents were covered. All participants had experience from Europe reaching 100% coverage. Europe was closely followed by North America with 80%

coverage and Asia with the same 80% coverage. Oceania was covered by 50% and the rest of the continents with 30% each.

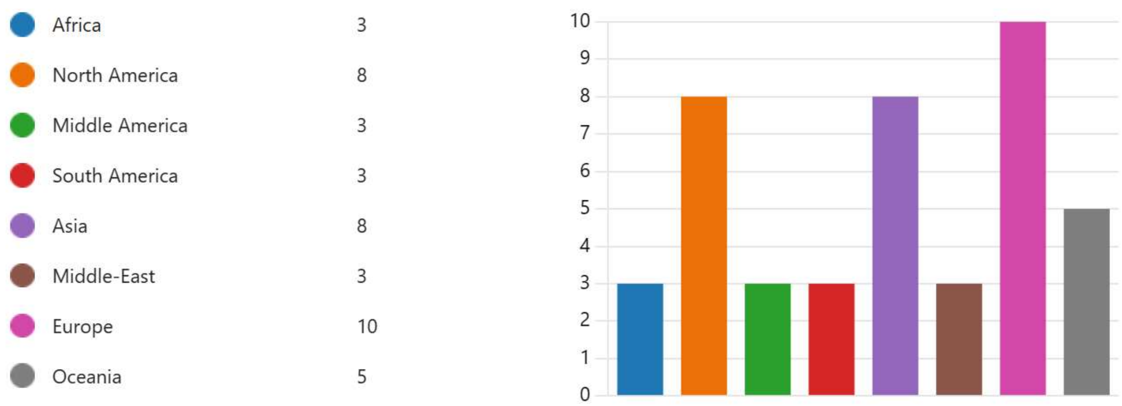

Figure 13. Work experience by geography (responses in numbers)

The experience is gained from 18 different industries (table 3). This result gave confirmation that the participants had adequate and wide industrial experience and background to describe the insights from different industry perspectives.

Table 3. Work experience from various industries

#	**Industry**
1	Airline
2	Consumer durables
3	Forest
4	Industrial goods and services
5	Business management consulting
6	Consumer goods
7	Steel & manufacturing
8	IT
9	Telecommunications
10	Manufacturing
11	Public sector
12	Machinery
13	Logistics
14	Banking
15	Media
16	Pharma
17	Biotechnology
18	Shipping

Subject matter expertise was an important factor while determining the validity of the responses in specific field. The average years of experience of the participants in HR technology field was 15.3 years whereas the highest years of experience was 30 and the lowest years of experience 7 years. The cumulative experience of all participants was 153 years.

The age range, nationality and gender indicate that the sample of interviewees was adequately diverse. The participants represented five different nationalities, Finnish, Swedish, Danish, Indian and British and both females and males were almost equally represented. 40% of the participants represented female and 60% male. The age range indicated that 50% of participants are in age group 45-54, 30% represent age group 35-44 and 20% represent age group 55-64 (figure 14).

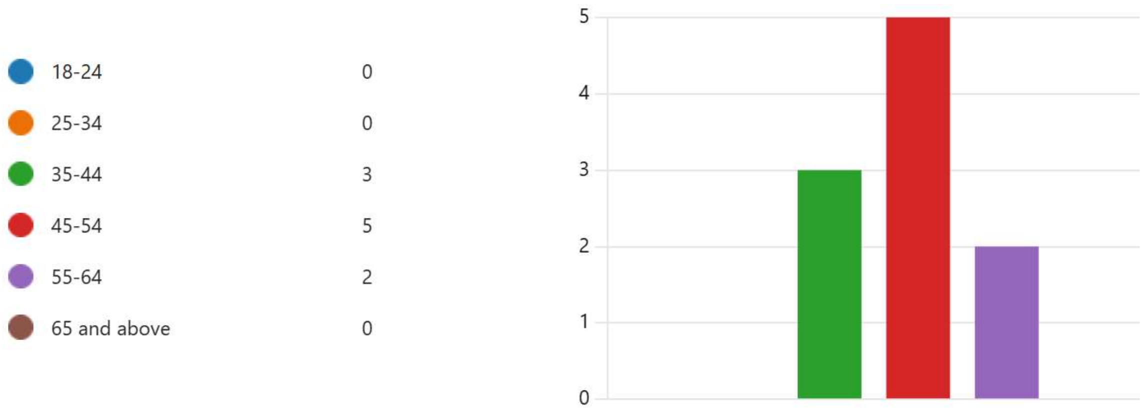

Figure 14. The age range of the participants (response in numbers)

The participants can be said representing adequate experience and background to give reliable and valid responses to the studied subject. The positive finding was the wide variety of the managerial levels hold by the participants as well as the coverage to all continents.

4.3 Data analysis

Demographic data was collected with Microsoft Forms whereas the recorded interview results were first transferred from transcript to Microsoft Word and further processed in NVivo for the analysis. Only one transcript was of poor, non-usable quality, due to the recording issues and therefore for this interview, interview notes were used for coding the responses.

NVivo was used to code the interview responses. The coding of the responses was done manually without using auto-coding in NVivo. The NVivo codes were created during the coding of the first response as a starting point to group and categorize the responses. During the coding of other responses emerging categories were added and some grouped together as the data volume increased and revealed more insights. The data from final relevant categorized codes were used to analyse the results and to respond to the research questions. The final NVivo codes are introduced in the appendix 2 in alphabetical order.

The results were concluded and written from the beginning of the interview period parallelly with the NVivo coding in order to find the essential answers to research questions through iterative analysis. During this iterative writing, the initial themes, created for interviews, grew to the theme structure introduced as a structure in chapter 5. Results. This approach helped in writing the results in a cohesive way. The results were concluded with the final interpretation and reflection of the results against the research questions and were written to chapter 6. Discussions and conclusions.

4.4 Data validity and reliability

The qualitative research provides subjective results in order to understand and describe the studied topic and phenomenon. The initial interview questions were grouped to three themes. According to the nature of semi-structured interview the interview focused on ensuring each theme was discussed. Some participants answered multiple questions with one answer, and in those situations, the already answered questions were not repeated. Also, additional questions were introduced for emerging themes for further insights. The interviews were recorded and transcribed, and in addition interview observation notes were written during the interview to ensure adequate engagement in data collection.

Purposeful sampling of interviewees was made as the participants needed to have certain specific background to qualify for the interview. This ensured appropriate demographics for from the participants to the studied topic and phenomenon. The participants were ten, but as the focus was to collect their cumulated knowledge, it was important to check the years of work experience in HR technology. Participants represent altogether 153 years of experience in the HR technology from 18 different industries and implementation experience from all continents for varying degree. The responses from the participants gave appropriate depth about the studied phenomenon in global context. The sample met the expectations set in advance.

Further the methodology used in this study has been documented for the replication of the study. This study was also done as independent study without any company requirements or other pre-set demands.

5 Results

This chapter introduces the results of the empirical research. The first chapter focuses on introducing how strategy and digitalisation adoption decisions making is organised for HR digitalisation where focus is on enabling HR processes with digital technologies. The second chapter sheds light to HR digitalisation technologies and processes. In the third chapter the focus is on explaining the challenges for HR digitalisation. The fourth chapter reports the innovation through four phases and the fifth chapter the role of external outside-in knowledge acquisition. In the last two chapters the new knowledge creation and absorption complements the study results.

The main focus is in describing HR processes development with digital technologies in innovation process and to understand how, in this context, new external knowledge is acquired and combined with existing knowledge and further re-combined to new knowledge for HR digitalisation in globally operating companies. The references to the interviews are marked with R (Reference) accompanied with the number of the reference in the results report. This approach ensures full anonymity of the participant responses.

5.1 Strategy and digitalisation adoption decisions

According to the responses HR digitalisation decisions are tight to strategic decision making. Specific HR digitalisation strategies seem not to exist, instead roadmaps are created and utilized as a method to manage decisions for digitalisation focus areas and priorities to implement digital technologies. These roadmaps support HR strategy or strategic initiatives of a company. Interestingly only two participants brought up the importance of aligning HR digitalisation to HR operating model. These responses introduced the operating model to be the trigger to innovate HR processes with digital technologies in a company. Similarly, two responses brought up a view that companies may also mimic what other companies are doing. While discussing none of the participants brought up digital maturity models as a framework to build the digitalisation strategy, but elements from maturity models like roadmaps and priorization are in use. Further other elements are for example discussions with stakeholders, creation of business cases, understand of the current state and considering what is needed in the future.

> *R1: "…a little more, faster and more often such developments are made."*
>
> *R2: "I would say constantly, and I think you need to do it constantly because of the way the market moves."*
>
> *R3: "lot of groundwork to build a business case and to convince."*

Roadmaps or continuous development was discussed by all participants. The priorization, reviews of the roadmaps and alignment is a continuous effort. The cycles seem to follow company practices and thus the experiences vary. The frequency of the roadmap reviews were mentioned to be quarterly, half a year based or yearly based and, in some cases, also tight to budgeting. In addition, company strategy process related strategic review cycles are reasons to do reviews. Despite of the introduced commonalities, each company has also its unique processes and methods to manage the strategic decision making for HR digitalisation. One response referred to a specific agile framework practice.

> *R4: "But I think normally at least when I talk to the top executives, they're more interested in what they can accomplish with these tools. And I think they need to see, they need that big picture to say we're doing this and we're trying that, and we will run this this way."*

Strategic decision making is a cross-company effort, and the nature of discussions are impacted by the overall company. HR digitalisation is seen difficult unless there is alignment on company level.

> *R5: "We cannot foster alone…if it is not strategically important for the entire organisation."*

This came through in discussion in different ways, like that the need comes from business, strategy alignment needs to exist, HR cannot drive certain IT infrastructure items alone or that there needs to be several discussions with several stakeholders during the decision making.

5.2 Digitalisation and digital technologies

HR digitalisation goals are in the enablement of improved delivery of human resources services. Four themes emerge from the responses, and they are efficiency, time savings, decision making and employee experience.

> *R6: "It's mostly been about efficiency, you know, can we be more efficient by digitalisation? Can we reduce our costs? Can we reduce the time of things? Can we save people time and money and effort? That's been the primary driver in many cases, and I think I hope that the things are shifting a little bit now to more value based that by doing these things we create more value."*

Efficiency was discussed by all participants from different perspectives. Most of the efficiency factors related to automation, time savings and costs. Some participants elaborated that the efficiency should be looked both from HR and overall company efficiency perspectives. Further, automation was also discussed separately as a vehicle for optimization and removing human manual tasks from the HR processes, also process leads times were brought up.

Various views can be grouped to the employee experience. Participants raised aspects like taking employees along to learning, allow employees to use their own language in digital tools, HR service delivery improvements, time and place detached workplace, self-services and even candidate experience. Two participants raised the view that the HR processes UI (User Interface) in digital tools should mimic be consumer applications.

> *R7:"...I mean how much work can be done so that effectiveness in employee experience and then of course also in HR themselves, HR function."*

As a summary it could be concluded that digital technologies are seen as the enablers to optimize and make the change to HR service delivery in which HR process play essential role. Responses give a view that the human resources management digitalisation also impacts the roles of managers and employees.

> *R8:"It enables people to be speedy, to be productive, to be efficient."*

> *R9:"…it's a massive openness and sort of availability and accessibility to things that you have when you are digitalized."*

The overall assumption is that there is no HR process, which could not be digitalized. This was complemented in few answers with the view that the digitalisation of processes depends on the industry and company. While processes are digitalized, it automatically impacts how employee data is managed, so while digitalizing not only the usefulness of the data produced but also the compliance and data privacy aspects are in key roles. Overall, the privacy and regulations was not largely raised in the discussions but perhaps discussed more as given aspect to be followed and considered.

> *R10:"But then when you also think about analytics, you think about social media, you think about all the processes that's within the HR."*

The HR process digitalisation covers transactional but also annual HR processes. Surveys and overall HR processes are seen at least partially digitalized. One participant brough up a view that digitalisation of the HR processes has already led to further automation from HR SaaS applications to applications used for common purposes in order to take HR processes to where managers and employees spend their time at work. Yet, another interesting aspect raised by one participant is the human aspect of the digitalisation and especially in HRD (Human Resources Development) area. According to this participant digitalisation can be done to large extent but in some HRD processes the human touch is important.

> *R11:"So it's not like you will need to always use the native application, but you can always use those applications which you use pretty much the whole day…"*

All participants concluded that digital technologies based solutions are widely utilized for various HR processes. Cloud based solutions are prevalent technology for HR applications. Mobile penetration was seen existing, but varying and perhaps not in use to extent it could be used. Mobile use seems to depend on the company and its industry. Even within a company, various employee groups can either benefit or find mobile use irrelevant based on their job roles in a company, for example factory workers do not need the mobile phone to perform their duties. When social media was discussed, it was found useful mainly in talent acquisition processes. Analytics was not brought up extensively though it is in use, but the decision making was seen as important purpose for HR digitalisation. Automation with different technologies plays integral part of HR digitalisation as the cloud based application landscape is formed by many applications within HR function. The level of automation varies. Artificial intelligence was seen as the emerging technology.

> *R12:"Generative AI that it's gonna change the world…"*

Digital applications, which improves the user or employee experience of HR processes with digital tools and have capabilities in integrating guidelines, applications for transactions and communication into one cloud based solution is also emerging and under the radar at the moment. The purpose of these emerging technologies is important as they further transform the HR service delivery and user experience in addition to HR processes.

> *R13:"But you should have like an entry point for employees. So that's a big trend as I see it."*
>
> *R14:"…if you consider your employees as your customers and you are an organisation or service provider, how you could utilize those evolving tools and support them readily and instantly…"*

Interestingly. virtual reality and augmented reality based solutions were nearly non-existent as existing or as emerging technology in the discussions.

5.3 Challenges in HR digitalisation

Various and surprisingly diverse concrete practical challenges were identified for HR digitalisation. The grouping of the challenges help to identify four distinct categories: technology, decision making, data privacy and change management.

Technology and vendors related challenges are not purely technology related but they reveal challenges in adopting the technology provided by the vendors. Companies have multiple digital technology vendors to choose from and sometimes the choices does not support the needs technically. Similarly, companies need to decide between the newest innovations and the ones, who are most established in the market with existing technology. The technical architecture may also become too scattered to serve the purpose and to be non-user friendly.

Also views whether the big players in HR applications market can keep up the pace with technical development with emerging technologies were brought up.

> *R15:"I've seen so many examples of great or potentially great tools being badly used…So there's a lot of misuse or underuse of technology."*

Decision making challenges relate to how fast the HR digitalisation decisions are made and whether the decisions are right and done with collaboration with appropriate stakeholders. Some participants also brought up the challenge to gain approval for the financials for the investments. Further some companies are falling behind in general and facing a strategic challenge. The decision making impact whether the efficiency gains are reached after all.

> *R16:"I think we still we have a lot of things to do between the business decision and IT strategies and the IT architecture I would say."*

Data privacy challenges relate to technology and vendor challenges in it. The data privacy cannot be set aside and leave unconsidered due to compliance requirements and overall trust in organisation.

Change management challenges relate to sharing the externally acquired knowledge in understandable manner, user adoption of the innovations and to the capability in keeping and setting the set HR digitalisation direction and goals in relation to organisation's digital maturity at each given time. Interestingly HR was also claimed to be both somewhat traditional and at the same time leading in digitalizing the processes in companies. This view varied between participants.

> *R17:"How are we going to sail to achieve that direction and goal is something you will need to keep mindful about when dealing with their mindsets and the other challenges. "*
>
> *R18:"And I think that's every project I think I've ever been on. That's always been the weakest spot that people have always at the end that we should have done more.*

The challenges reflect how innovation adoption challenges are faced as day-to-day management issues. The most commonly identified challenge related to technology and vendors.

5.4 Digital technologies and vendor role as technology provider for innovation

Digital technologies represent the newest era in technology development and has enabled the fast growth of SaaS application in HR field. According to the participants all digital technologies, social media, mobile, analytics and cloud computing as well as automation is used to enable the HR processes (table 4).

Technical innovations based on digital technologies are done by the technical vendors. Examples given from applications for globally operating companies were Workday, SAP SuccessFactors, Oracle and Cornerstone. Despite of the named vendors, there are a number of vendors in the HR technology field to choose for the technology partner.

> *R19:"…innovation can of course be technical, but it can also be ways of working or rethinking or reconsidering how you achieve things."*
>
> *R20:"…it's a service we buy from a provider using their technology."*

One participant referred to global large, mid-size and small vendors, who all have a varying degree of interest to respond to customer needs. According to this response the large players have less interest and agility to do so, which is interesting as it could be assumed that the large organisations have more resources to focus on customer voice based innovation. This was echoed by responses indicating the big players have hard time catching up the fast technological development. Vendors used on social media front are LinkedIn, Twitter and Facebook amongst others were mentioned as the tools for HR processes.

Table 4. Use of digital technologies to enable HR processes and examples for solutions and use scenarios based on the interview responses

Topic	**Social media**	**Mobile**	**Analytics**	**Cloud computing**	**Automation**
Used to enable HR processes (Yes/No)	Yes	Yes	Yes	Yes	Yes
Solution examples	-LinkedIn -Twitter -Facebook -TikTok -Snapchat -Yammer -Glassdoor	-Mobile use is in-built to the cloud computing applications -Mobile as infrastructure enables connectivity	-Analytics features in-built to the cloud computing applications	-Workday -SAP -SuccessFactors -Oracle -Service management /employee experience applications	-SFTP transfers -RPA -Automation scripts -Google scripts -Chrome extensions
Use scenario examples	-Branding -Talent acquisition -Recruitment	-Use of social media -Communication -Access cloud based applications through mobile to execute HR processes	-Dashboards with readily available data in the cloud based applications	-Master data and core HR cloud based applications	-Automation of workflows -Automating data flows between applications -Integrating applications for non-native application use for HR processes

The role of technical vendors in technical solution innovation is remarkable, almost dominant as only one participant referred to a company internal development for one of the tools in HR field. Even they used vendor applications in their HR technology landscape. Technical vendor and implementation partners are assumed to bring innovative thinking to their customers.

R21:"…something innovative should emerge from vendor…"
R22:"…innovates all customers forward…"

Due to the fast paced technological development, some, less than half, of the participants also had views that not all vendors cannot keep the pace and stay relevant for their customers and that the development is heavily dependent on the assigned vendor resources and their capability to innovate. One of the participants summarized the innovation to take place in a triangle between technical vendor, implementation partners and a customer through dialogue. On the other hand, one response worth mentioning, highlighted the importance of good, competent consultants by implementation partners.

HR digitalisation was found to occur as both incremental and radical innovation. The radical and incremental innovation initiatives are linked to the HR digitalisation roadmap and the amount of both depends on the digital maturity level of HR processes in a company. The first innovation adaptations and investments are considered radical but the ones following the initial change are typically managed with incremental innovative developments.

> *R23:"Ripping out the old stuff, putting a place, something modern. But from there on it was incremental, continuous journeys from there, right? And then then the foundation has been put in place and the mindset had been put in place."*
>
> *R24:"You're on a continuous innovation journey. There's always more you can do."*

The concluding view is that both innovation types are needed for HR digitalisation in the continuous change. Radical innovation represents minority of the technical innovations as technology vendors were seen the ones who does the technical innovations. Incremental innovation is seen the main type of innovation. Both types of innovations are done utilizing inter-company knowledge transfer with vendors and implementation partners.

5.5 Innovation process

Innovation can be viewed as process. This study focused on understanding innovation process through sensing the new opportunities, seizing the initiatives, transformation and routinization. These four steps were selected and combined from the process for dynamic capabilities development for digital transformation, introduced in chapter 3.3, and cloud computing based SaaS innovation, introduced in the chapter 3.4. By combining the views, it was possible to discuss the entire innovation chain of activities and understand how HR processes innovation with digital technologies is enabled through knowledge transfer and new knowledge creation from external sources. Open innovation alike outside in and inside out knowledge flows together with knowledge processes like knowledge acquisition, knowledge storing, knowledge dissemination and knowledge integration to existing knowledge was part of the discussion.

The flow of opportunities was noted to be constant both externally and internally waiting to be challenged and harnessed at the right time for the right purpose. The outside-in knowledge flow in social context is acquired via several different ways with external parties, vendors, implementers and other companies cross industries and geographies through acquisition of experience based tacit knowledge. As a contrary, the pure codified explicit knowledge acquisition seemed to play smaller role. New knowledge scouting tend to be an ongoing activity even though the intensity varies during the innovation process. One of the participants defined the external knowledge to be confirmatory in nature. According to this view an internal idea, when seen also outside the company boundaries, got strengthened and gave encouragement for further refinement.

> *R25:"…mix of letting yourself be inspired and challenged from outside and from other companies… mix of understanding what's out there, what can be done and having a constant view on how we can optimize internally."*
>
> *R26:"Information will always need to be bidirectional."*

According to participants new external knowledge acquisition from outside the company boundaries play significant role in identifying new opportunities. Intra-organisational knowledge transfer was recognized, and it takes place but considered to have smaller role in sensing the opportunities. In one response it was even found challenging as HR is not that much technology oriented in general but at the same time it was noted that this can be overcome if HR technical team facilitate the knowledge exchange. The internal ideas can come from the ones working with HR technology, the ones developing the processes, leadership or users in a company. Only one response highlighted the ideas to come primarily from company internal sources.

The forming of the ideas to initiatives has more structure compared to the opportunities identification, but the seizing still takes place on a continuous basis, in addition to company specific strategic cycles. Governance for setting and deciding the initiatives is company specific, and the volume of external knowledge acquisition via inter-organisational networks seem to reduce compared to the opportunities identification stage. The focus is on deciding the right priorities from acquired ideas to solve identified problems, analyzing and aligning them with roadmaps and company needs through intra-organisational dialogue. Interesting responses complementing the above described consensus of how new acquired knowledge is disseminated and combined with old knowledge for decision making for innovation was found. These are the decision making for initiatives to be dependent on size, culture and the landscape, investment affordability and overall capacity to move to the next stage.

> *R27:"Of course you tried to do a value proposition that this will lead to this, and this will be more valuable, or this sometimes it can just be mandatory that you have to do it."*
>
> *R28:"What are the most important topics according to HR and company strategy?"*
>
> *R29:"You know where like I said before, where the needs or the requests are being harvested through sort of a process to make sure it's structured. It comes all the way up and at the same time you have the experts knowing what's in the market and being able to bring ideas down and then in that process there was governance boards. You know what ideas to bring further up and at the end there was a board to decide."*

The most essential factors in the transformation did not cover any external knowledge transfer factors except in one response. It can be assumed that the main focus is on intra-organisational aspects in managing the change. Communication, getting people along, training and top management support were the key factors for successful transformation.

> *R30:"The hard part is to change people's behavior. Change how people think, how people work. You can of course, use the technology to drive those changes."*
>
> *R31: "How do you get people to adopt and adapt and to let go of the past and jump into a future state."*

The focus was on interactions with people, disseminating the knowledge and making sure the new knowledge is successfully translated to new behavior. New knowledge dissemination within a company takes place from the core development group to all users. The success of the initiatives rely much on this stage, whether people de-learn and learn the new way of working with digitally enabled HR processes. Change management and communication to support the new knowledge creation was seen the most important factors, followed by training and top management support (table 5). The four categories were identified by analyzing the individual responses.

> *R32:"You can push and create the technology in one dimension, and you can really go far with that. But if you don't also drive the other dimension, which is the behavior, the ways of working the culture, the attitudes, you just get a lot of technology and people still doing the same thing they always did."*

Change management focused heavily on key message "get people along" and the experiences of what to focus when considering it, even to a surprising level, but on the other hand getting people to learn the new digitalized HR process, new way of working, is a key in new knowledge combination to old knowledge.

Table 5. Most essential factors for the transformation

Communication	Change management - getting people along	Training	Top management support
• Extensive amount of communication through global and local communication channels • Transform the benefits to something valuable, pragmatic and meaningful for the users • Timing of change management activities and understanding that the core resources have well advanced knowledge and position in change compared to the users who are the target for the change and new knowledge • Start the communication early enough • Continuous innovation journey • Two-way communication • Identify the right stakeholders and get them along • Realistic communication about the change	• Reach all users • Attract users to move forward • Get all users to the journey • Timing of the change management • No underestimation of the need for change management • Project management • Get the volunteers, who have strong motivation to join the initiative • Openness • Support process in place • Letting go the past, breaking the old pattern • Use methodical change process • Valuable experiences • Get people to want it and get excited • Build the capability by taking people along the change • Be ready to adapt the decisions during the transformation • Resilience	• e-learning • Training materials available on company internal channels • Timing of the training • Webinars • Practical hands-on training	• Ambition to drive HR area digitalisation • Pragmatic support to change management • Support to entire initiative

Routinization, making new digital HR processes and way of working part of established way of working, was seen as a move to constant maintenance and incremental development with focus on technology and people. Moving to business as usual stage did not have any outside-in knowledge transfer remarks, but instead the support for people in the organisation was seen as the key focus area together with the continuous development and optimization.

> *R33:"It's embedding it in the operations team and really making them motivated and feel engaged about what they can use this for, how it will optimize their world."*
>
> *R34:"The deployment process is not a one-time thing any longer. It's very much like a continuous."*
>
> *R35:"And natural part of their job, they will not see it as a, you know, it would be part of their job to make sure that the routines are done, that the system is kept updated, that the deadlines are here to that the business processes are done in time and all of that support. In the sense that yes, there are things we need to do on a continuous basis to keep the keep the technologies or the system running, but there's also a constant evolvement of new stuff."*

The changing roles was seen to require support and follow-up or monitoring to establish the new way of working and support it after the initial transformation.

5.6 New knowledge creation in innovation

Open innovation outside-in knowledge exchange like practices, other inter-organisation networking and knowledge acquisition from other sources for the purposes of new knowledge creation is well present and highly utilized method in HR digitalisation. Based on participants the type of knowledge looked after is subject matter knowledge and practical experiences for inspirational purposes to stay in the forefront of innovations on the field and also specific functionalities for processes and technology. The responses also conveyed an idea that the amount of information and fast pace technical development set requirements for the individuals, who need to stay active in knowledge acquisition and conversion constantly. Some of the participants also brought up a change in roles. Digitalisation was seen transforming the job roles and requirements for the day-to-day duties, which would further challenge the individuals to acquire, share and integrate new knowledge during the innovation process and in the adoption.

> *R36:"Make sure that your information is stored up to date and that's giving the right set of information because the goal of the objective of storing that information is to give rights enough information to your users, to your employees, and having them updated. And staying up to date is very much relevant."*

The innovation process aim to improve the company performance; therefore, it is essential understand what the knowledge sources are, how the knowledge processes takes place via different methods, both with digital and in-person methods in inter-organisational context. Participants reported various methods in ensuring the new knowledge is acquired, created and integrated to existing knowledge. The methods used support both experience based, tacit and codified, explicit knowledge conversion. Technical vendors and implementation partners have remarkable role throughout the innovation process. Knowledge acquisition from external sources and also as intra-organisational collaboration seems to have moved increasingly online.

> *R37:"Because if you think knowledge management in the purest form, we're doing it every day, every e-mail we send, every interaction we have, every exchange and we don't capture or adjust or refine or update things based on what we're doing."*

Participants were asked to provide different methods and practices for knowledge acquisition outside-in and intra-organisational context. Further analysis (table 6) describe the full spectrum. The responses are grouped to tacit, explicit, and tacit & explicit methods in order to understand the role of knowledge types in acquisition of new knowledge. The categories describe the acquisition of experience based, non-codified knowledge, which is called tacit in the table. On the other hand, the acquisition of purely codified knowledge is described as explicit in the table. The knowledge acquisition which can be considered to have both elements is described as tacit & explicit in the table. The goal of the analysis was to understand the role of the knowledge types in the external knowledge acquisition.

Table 6. Knowledge transfer by knowledge types in inter- and intra-organisational context

Topic	Explicit codified knowledge	Tacit knowledge	Explicit and tacit knowledge
External inter-organisational knowledge transfer in an innovation process	• Articles • Analysis • Research papers • Social media • Email advertisements • Research and consulting companies • Google search • Review of applications	• External peer network • Potential vendors • Existing vendors • Partners • Benchmark calls with other companies • Discussions with known, respected subject matter experts • Communities • Customer network of the same vendor	• Virtual conference events • Face-to-face conference events • Webinars • Workshops • Demos
Intra-organisational knowledge transfer in an innovation process	• Process documents • Policy documents • Training materials • Presentation materials	• Team members • Interviews with employees • Proactive feedback from managers and employees • Collaboration and involvement of dedicated resources • Lobbying	• Surveys for employees • Project team members • Giving a demo • Internal crowdsourcing

According to the results the use of pure codified sources was mentioned less than the two other groups of methods. Experience based, more tacit knowledge represented as individual knowledge source or as combined with codified knowledge sources is the main source of acquiring new knowledge. Various types of conferences and vendor collaboration together with networks were most often mentioned knowledge transfer methods cross organisational boundaries. User innovation and user communities with other type of collaborative innovation activities are also in use.

> *R38:"What would be a what's the value we can jointly create here and more of a partnership. So hopefully that the decision making becomes more longer term and value creating for both parties over time."*
>
> *R39:" It's about bringing people together and it's about having different people share openly their views and ideas."*

User innovation within a company was seen important but not necessarily conducted in a structured way or to adequate level, but it happens, and in such ideas are acquired and integrated from peers in own function, with other functions and individuals in a company. The internal user innovation is not the only source, instead conferences, webinars and individual networks and also communities are used to participate to user innovation via external inflow knowledge acquisition in inter-organisational networks.

> *R40:"…differently thinking people are needed."*

> *R41:"It (knowledge) transfers in networks, which are established both internally and externally."*

Some vendors have established serious user communities where the innovation is co-creative with customers. When brought up, user communities was considered to be two-way collaborative innovation for example through brainstorms.

> *R42:"You know the community way of working. What would people do if they could choose to participate in the things that they cared about? What sort of energy would you unleash?"*

Other type of collaborative innovation actions as intra-organisational knowledge acquisition or as external knowledge acquisition take place. Examples shared are workshops, even hackathons or external reference calls with vendors' customers. An interesting individual response reveals the importance of the digital maturity level. According to this view the longer the journey has been and more digitally mature the organisation is also more internal ideation tend to occur.

5.7 Knowledge absorption

The practices and tools through which knowledge is integrated and new knowledge is created in intra-organisational efforts were brought up during the discussion and the following were given as examples, design thinking, agile framework models and sprints, investment and decision making process, road mapping practices, lean methods, use of virtual collaboration tools, facilitation methods and training. Further the absorption is supported by the most essential factors identified and discussed as part of transformation, which is adoption to the new, in chapter 5.5.

6 Discussion and conclusions

In this chapter the results are presented, analyzed and tied back to the research questions. At first this study focused on understanding the strategic decision making for digitalisation. Secondly there was a need to understand what digital technologies are used and what is their perceived role in HR processes innovation for digitalisation. As the technology development is fast it was also relevant to understand how HR digitalisation decisions, by utilizing knowledge, are made in innovation process. Since it is all about digital innovations, digital capabilities and digital innovation were studied as a background to understand the innovation process for digital innovations. With the help of this comprehensive understanding of the context, it is possible to discuss the acquisition of the external knowledge and the utilization of this new knowledge at different phases of the innovation process.

The first three chapters provide answers to the research sub-questions. The fourth chapter concludes to the main research question and introduces a framework of how new knowledge creation emerges from external knowledge in innovation process in a company. At the end of the of this chapter both managerial implications and limitations and future research complement the study.

6.1 Decision making for digital technologies adaptation

The first research question related to how organisations make decisions for digital technologies adaptation. Digitalisation has become an essential, inseparable part of HR. The results indicate that the transformation to digital technologies has taken place for HR processes enablement, and that the digitalisation needs to be part of the company and HR strategy. Regardless of this view, it seems that the link to specific company strategy and alignment to operating model in terms of what is tried to be achieved could be stronger and more precisely defined to maximize the benefits sought from HR digitalisation.

Further, despite of the popularity of digitalisation strategies and maturity models the results indicated that HR digitalisation is rather seen as one part of the HR strategy than an independent area. This is somewhat understandable as the targets for the HR process innovation with digital technologies are linked to how HR overall will impact organisational performance and efficiency. According to study by Pierenkemper & Gausemeier (2021, 108-121) different maturity models exists for the guidance in the analysis for current and target position and with action identification for improvement potentials. In this study none of the participants talked about the digital maturity models and using them to build the HR digitalisation journey. This is slightly surprising as the digitalisation has given rise to several different maturity models and strategic frameworks to be used and adapted for digitalisation. The models tend to focus on core business digitalisation journey, which might impact to the use of the models for support functions. Despite of the lack of maturity models adoption, participants talked about similar elements that takes place for the decisions making on strategic level.

Digitalisation is more of a continuous development and evolution, for which each organisation should aim to find the best way to prioritize and adapt (Vanderlier, 2020. 261; Tursunbayeva, 2019, 7). The data provides the evidence that the priorization, reviews of the roadmaps and alignment within a company is a continuous effort rather than rarely conducted cyclical strategic effort. The decision making is thus continuous and the internal and external scanning alongside that effort even though the external knowledge acquisition intensity varies in innovation process. In this context, maturity level and need to adapt to changing conditions is managed, but not through specific HR adapted digitalisation maturity models.

The HR digitalisation decisions are linked to the strategy and often because of the above mentioned efficiency reasons. It seems that the main target is to improve the company performance by improving process efficiency in HR. Specific HR digitalisation strategy is not executed, but the digitalisation related decisions are part of HR strategy. This finding is in line with the study done by Florkowski & Olivas-Lujan (2006, 701) who found that majority of the companies did not have HR Technology strategy. Companies operate in different business environments, where exploration and exploitation differ and as a result the HR architecture must support companies to adapt to varying requirements based on their specific needs in competition (Hansen, Güttel & Swart, 2017, 648-650). Priorization and management of the initiatives is conducted with roadmaps. The decision making is constant as the digital technologies evolve all the time and the innovation is largely incremental after the initial major implementations. The constant decision making is complemented with the cyclical reviews, for which the frequency varies based on the company practices and their strategy process.

6.2 Digital technologies for HR processes innovation

Digital technologies, especially cloud-based solutions, are well established as delivery method of HR processes. This finding confirm the literature review yet at the same time the results indicate that the industry and company digitalisation maturity level impacts the use level of these technologies. An example of the impact is the use of mobile, which was impacted by the industry of a company. The recent move to cloud-based solutions have offered new possibilities also to HR to scale digital HR processes (Larkin, 2017, 55), which was confirmed by the study results.

According to Hussain, Wallace & Cornelius (2007, 85) digital technologies in HR processes are used to various needs and purposes increasing the efficiency. The findings agree with the literature as the digital technologies are found to be enablers to optimize HR processes on scale. The results indicate that digitalisation support fast HR process execution as the HR services should be available at any time in the modern workplace regardless of the time and place. The results found evidence that HR process digitalisation cover transactional employee lifecycle but also annual HR processes. Efficiency was the most often mentioned objective also in this study.

Generally, the results indicated a view that any HR process can be enabled by digital technologies at least partially. These findings are in line with the literature review. Social media did not emerge as a significant process enabler in the discussions. Analytics seemed to be considered to be natural part of the HR processes delivery. Further the automation was seen an integral part of developing the interoperability of the cloud based applications for HR processes. Emerging application areas for new innovations are employee experience based solutions, artificial intelligence and potentially also ChatGPT. According to the responses, virtual and augmented reality, surprisingly, had not gained foothold. Especially artificial intelligence based solutions are the emerging themes for the future. Also, employee experience focused delivery solutions has started to be mainstream focus, but still emerging rather than well established. The results of the study were for most parts in line with the literature review with the exception of virtual and augmented reality as its use was very low.

These findings gave a good background to study how innovation process for HR digitalisation is managed in globally operating companies. This is further analyzed in the next chapters.

6.3 Innovation process for HR process development with digital technologies

New knowledge creation through external and internal knowledge acquisition during innovation process was introduced as third sub-research question. This question is answered in the detail in this chapter. The external knowledge exchange as outside-in knowledge flow and new knowledge creation was studied through sensing, seizing, transformation and routinization phases. The results help to understand how knowledge creation through inter-organisational knowledge exchange takes shape in practice and how new knowledge creation with the applied open innovation alike practices can be harnessed for HR processes innovation in a company. The study revealed that the external knowledge acquisition is highest when the digitalisation is at sensing stage, when ideas and solutions are searched and scouted. After this phase the intentional search of external knowledge reduces gradually throughout the following phases. The opportunities scanning with outside-in knowledge exchange activities is anyhow constant but the initiatives planning, and transformation efforts turn focus inwards into the organisation and to established collaboration with the technology vendors and implementation partners. The knowledge processes facilitate innovation as the tacit and explicit knowledge is acquired, implemented and combined into new knowledge in social context in HR for HR, managers and employees.

Organisation's ability to absorb external knowledge depends on its absorptive capacity (Ritala & Hurmelinna-Laukkanen, 2013, 154,166) which in turn is dependent on the existing, earlier acquired knowledge on the same topic (Sheng & Chien, 2016, 2302; Diaz-Diaz & Saa-Perez (2014, 430, 440-441). The results demonstrated that HR digitalisation innovation is considered to take place in between technical vendor and the organisation through dialogue. The way the dialogue takes place throughout the innovation process enables and forces to the continuous absorption of knowledge for the benefit of a company. Equally important is the finding that during the various phases, inter-organisational knowledge is not acquired on the same level and scale despite of the fact that the general networking to acquire external knowledge was considered to be constant. Despite the variation in intensity, this study found support to the overall thinking by Warner & Wäger (2019, 336) that digital transformation is a continuous journey requiring strategic agility in changing the operations of an organisation.

Even though the intensity of the external knowledge acquisition varies, the search of opportunities, ideas and knowledge is continuous, this is also reflected in the constant priorization of initiatives as part of the decision making in a company. The results indicate that open innovation outside-in type of knowledge exchange processes and practices have an established role in HR digitalisation.

6.3.1 Continuous knowledge exchange in innovation

Innovation as a process can be looked at as a journey. HR digitalisation opportunities are identified, formed and shaped for initiatives, HR digital innovations are adopted through transformation and finally routinized in a company. The study focused on understanding what are the external sources of knowledge and how the new knowledge creation takes place throughout the innovation process for HR processes innovation with digital technologies. The role of open innovation was scoped to the knowledge exchange from outside-in activities.

The results help to understand how knowledge creation with inter-organisational networks takes shape in practice and how new knowledge creation with the applied open innovation and like practices can be harnessed for HR processes innovation in globally operating companies. The role of experience based more tacit or tacit and codified explicit knowledge acquisition and transfer is prevalent compared to pure codified knowledge acquisition. The findings support the ideas introduced in the models introduced in the literature review for open innovation and digital co-operative model to acquire digital capabilities. Description of outside-in knowledge sources, knowledge transfer methods and tools to facilitate the innovation discussions and knowledge transfer within an organisation described in the chapter 5.6. combined with this conceptual model gives basis to understand the importance of the open innovation for HR processes innovation with digital technologies.

According to Arif, Nunes & Kanwal (2021,15, 17) knowledge management impacts innovation also in process and technology innovation. New knowledge is always created in a social context. Social contexts are political, where diverse factors and the legacy of the participants impact on how successful the organisational knowledge processes are for innovation. (Nonaka & von Krogh, 2009, 647-648) According to the results the focus is on acquiring subject matter knowledge and practical experiences for inspirational purposes and to stay in the forefront of innovations in the HR field and also specific functionalities for processes and technology. The type of knowledge looked after is more tacit than explicit and thus the methods used for the knowledge acquisition support acquiring tacit or combination of tacit and explicit knowledge. A lot of practices relate to social collaboration with others in communities, networks or in other social constructions.

The innovation journey does not happen without challenges. The challenge grouping revealed technology and vendor, decision making, data privacy and compliance as well as change management related challenges. The change management challenges relate to how the knowledge is transferred in intra-organisational context during transformation and maintenance.

6.3.2 Sensing and identifying the opportunities

The results of the empirical studies showed that constant sensing and identifying opportunities through inter-organisational knowledge exchange plays a significant role in the digitalisation of the HR area. According to Tajudeen et al. (2022, 608-609) dynamic capabilities assist an organisation to identify opportunities and utilize those to the benefit of an organisation by sensing, seizing and reconfiguring for innovation. New knowledge and ideas are sought from outside the organisation in several different ways. The results showed that the outside-in knowledge flow is a primary way, and that in-house ideation plays a smaller role in identifying digital opportunities. According to Chesbrough (2017, 35) in open innovation knowledge is acquired from external, cross company, sources. The results are in line with this view and indicates that companies no longer look inward and consider that the best knowledge is not necessarily preserved in-house instead various sources of knowledge used to acquire knowledge for the HR digitalisation purposes.

It is interesting to note that the practice is well established to HR processes innovation with digital technologies and thus supports the earlier research that external networks provide novel ideas and help companies to acquire knowledge they need for their HR process innovation. This also indicates that open innovation outside-in knowledge transfer alike practices can be applied also to HR process innovation. On the other hand, Marler & Fisher (2016, 117) have made a note that in the HR processes diffusion of innovation in HR the observability was low as there would not be much visibility of how other companies have implemented them. In this study the results observed indicated the contrary.

Both technical vendors and implementation partners as well as the organisations adapting the innovations for HR processes digitalisation benefit from inter-organisational knowledge exchange. Technical vendors own their products and make commercial agreements to the use of their applications. This indicates that the vendors are considered to be more like suppliers rather than co-creative collaboration partners. In addition, it was assessed that some participants mentioned that not all vendors are that keen on listening the customer and thus from their perspective acquire outside-in knowledge from customers. Despite of the challenge, the knowledge exchange is a mutual benefit even though the other party uses the knowledge for core technical digital innovation development in commercial terms and the other party benefits by getting new knowledge for strategic decision making, identification of opportunities for investment decisions and for HR process innovation, and thus increasing the dynamic digital capabilities and improving the overall company performance. We can say that open innovation alike practices are applied also in HR field for process innovation with digital technologies though the context is unique without mutual commercialization purposes during the sensing and identifying new opportunities.

The results indicated that the inter-organisational networking takes place also with other actors, not only with vendors and implementation partners. Other actors are other companies in own industry and from other industries, general webinars, seminars and alike events held both face-to-face and virtually. Well-known respected individuals, benchmarks and other methods were also in use. The results indicate that other customers of the same vendors, vendors and other networks are the main source for outside in external knowledge acquisition. None of the participants indicated that universities or other research organisations would have been used to acquire or create new knowledge for HR processes innovation for digitalisation purposes. User innovation and user communities with other type of collaborative innovation activities are in use. Crowdsourcing was mentioned only in two responses. These findings of executing various different methods support the earlier studies. Open innovation is very generic concept which can be executed through user innovation and community or crowdsourcing, which are all overlapping to each other. (Barbaroux et al.,2016, 85-86) According to the new knowledge creation in innovation process (figure 10), the knowledge creation is a dynamic process, which is noticeable also in this study results in the way new knowledge is acquired externally.

6.3.3 Forming the initiatives

Focus on intra-organisational innovation is in organisation's internal processes while inter-organisational innovation provides answers to how relations between organisations can be a benefit for innovation for an organisation (Holmström et al., 2021, 249-250). According to the study results the role of outside-in knowledge transfer reduced when initiatives were formed compared to the opportunities identification. The focus at this stage, during seizing, is on deciding the right priorities, analyzing and aligning them with roadmaps through intra-organisational dialogue in a company. According to the new knowledge creation in innovation process (figure 10), the knowledge creation is a dynamic process, which is noticeable also in this study results in the way new knowledge is integrated to the existing knowledge for decision making. This study found evidence that due to the nature of the digitalisation, focus on company internal HR processes moves the knowledge exchange inwards into a company even though inter-organisational knowledge exchange is in the background as continuous effort.

The new knowledge is combined with old through analyzing and prioritizing the ideas and requirements and further placed to the roadmaps for realization. The first phase of identifying the opportunities and ideas is more collaborative and networking based, perhaps more free flow and creative than a formal process. At this stage the knowledge is being formalized and processed through company internal processes for execution.

6.3.4 Transformation

During transformation the key factors were all intra-organisational aspects. Transformation requires absorptive capacity from the entire organisation. According to Diaz-Diaz & Saa-Perez (2014, 430, 440-441) an organisation benefits from absorbing new knowledge from external sources up to a certain point before it reaches inertia. Newly acquired knowledge and its application to decision making for HR processes innovation with digital technologies and further its transformation through development and implementation requires organisation to learn and adapt to the new way of working with new digitalized HR processes. This describes how new knowledge acquisition, its integration to old knowledge and transformation to prevalent knowledge takes place in innovation.

Development and implementation is supported by the technology vendors and implementation partners, who have quite visible role in the transformation. Other than this the external knowledge exchange was almost non-existent, most probably due to the focus to intra-organisational transformation efforts. The selected technical vendor and implementation partner have a central role in knowledge exchange when the selected initiative implementation and related transformation is active. During the innovation adaption vendors are in main role in providing the external knowledge despite of the fact that the focus turns to intra-organisation learning and knowledge absorption during transformation and routinization. Technical vendors also maintain their solutions and thus the collaboration continues over the initial initiative during maintenance and routinization for following incremental implementations. The results reveal that the first implementation of digital solution are perceived radical while the following initiatives are considered to be primarily incremental. Radical and incremental innovations are complementary and follow each other as the radical innovation requires smaller development efforts to support its maintenance, these incremental innovations also support fast implementation of new ideas (Berggren C., 2019, 462, 470).

As stated above in the result section, the most essential factors for the transformation were communication, getting people along, training and top management support. The various views, further analyzed into these categories are available in the chapter 5.5. in the table 5. Participants highlighted the behavioral change over the digital technologies' implementation, the focus should stay on processes, more precisely, way of working. The essential factors in transformation are in accordance with Breznik & Hisrich (2014, 374-376) who have highlighted that that learning, and management role are in crucial role in implementation. The results indicate that it can be assumed that the main focus is on intra-organisational aspects in managing the change, share knowledge and ensure that the new knowledge transforms to new way of working and behavior. Results are similar with the cloud computing-bases SaaS innovation adaption model, which indicates, for example, that the support of top management is essential throughout the diffusion.

6.3.5 Maintenance and routinization

Moving to maintenance and routinization in the innovation process did not have any outside-in knowledge transfer remarks, but instead the support for people in the organisation was seen as the key focus area. On the other hand, the developments and maintenance was seen a continuous effort after initial adoption, so in this light the selected technology vendors remain in the innovation circle also after the initial initiatives have been implementers. Vendors, as stated, develop continuous technical innovations and thus the companies can continuously benefit from the vendor existence for their further optimization incrementally.

The knowledge re-combination leads to changed tacit and explicit knowledge as a result of the innovation process (Barbaroux, Amel & Schenk, 2016, 34). This phase can be considered to be the end of one cycle and the beginning of the new innovation cycle where the newly acquired knowledge has been used to innovate HR processes and enable them with digital technologies and routinized through transformation and continuous support and maintenance. At this stage the new knowledge has been fully combined to existing knowledge and thus the new knowledge creation in innovation process has taken place.

6.4 Framework for HR process innovation with digital technologies

The main research objective was to understand how globally operating companies innovate HR processes with digital technologies. The overall result is visualized in the figure 15. In this study HR digitalisation was seen successful when aligned with company and HR strategy. The external outside-in knowledge acquisition, sourcing of ideas and development of the innovative solutions is constant rather than tight to certain cycles. The drivers for digitalisation were found to focus on efficiency and improved employee experience at workplace. Digital technological innovations are cloud based and thus the technical innovations are done by vendors. Companies need to be able to choose the right set of digital solutions, decide scope for HR processes digitalisation and being able to combine the best configuration to digitalize the HR processes in innovation process in order to reach the strategic goals. This innovation process and knowledge exchange continue to be inter-organisational throughout the effort. The initiatives and technical transformation is managed with vendors in co-creative collaboration. Internally the transformation focus on internal knowledge transfer from one group to another through communication, training, involvement and top management support.

To reach routinization and move to maintenance for new way of working there are established practices to seek for external knowledge to identify ideas and solutions to a company needs, and further to select the initiatives, which has best fit to the strategy. It looks like the depth and breadth of the external knowledge search is widest at the opportunity identification, sensing phase. Results also sheds light that the inter-organisational external knowledge exchange practices, which can be associated to open innovation activities, are most active at the very beginning of HR digitalisation during sensing and identifying the opportunities. Interestingly the results indicate that the vendors play significant source of knowledge acquisition and new knowledge creation in innovation process. In this light it is surprising that only a few answers emphasized the competence of suppliers and its importance for successful HR processes innovation. During seizing when road mapping, priorization and forming the initiatives takes place, the focus turns more inwards into a company. Vendors and implementation partners have a role in transformation projects as they are typically integral part of technically configurating or developing the scoped solutions. The acquired knowledge is further harnessed, and the new HR processes are developed with digital technologies. The routinization and moving to maintenance focuses on ensuring that the knowledge has been well transferred and that the new way of working is well in place. Additionally at this stage the maintenance of applications start, and the initial, possibly radical innovation is followed by incremental improvements. Throughout the innovation process tacit and explicit knowledge is exchanged in a dynamic process between organisations and individuals.

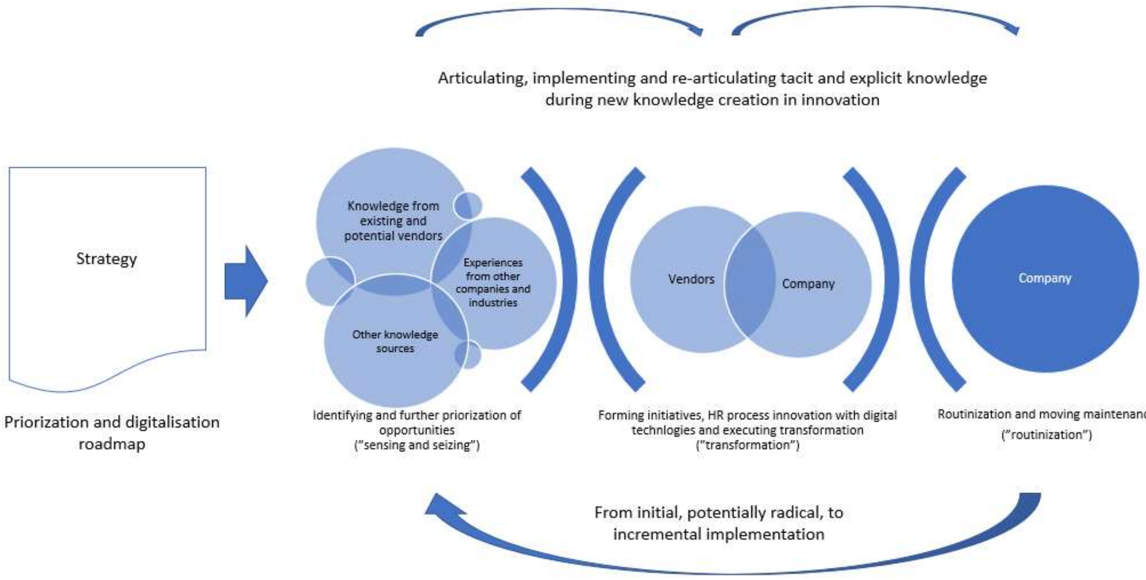

Figure 15. External knowledge acquisition and new knowledge creation for HR process innovation with digital technologies

In this study the outside-in knowledge transfer methods were categorized to pure experience based, tacit and codified explicit and mix of both types in order to understand what type of knowledge is acquired, combined and integrated in HR digitalisation innovations. Outside-in knowledge transfer through communities, user innovation and other open like innovation methods are largely in use. Knowledge processes play significant role in acquiring, combining and benefiting from the newly integrated knowledge in HR digitalisation.

The study results were similar to other studies on general level despite of the differences on certain specific areas. On the other hand, it was hard to find any similar studies and thus this study provides input to how open innovation alike outside-in knowledge flows are embedded to HR processes innovation when they are enabled with digital technologies. The knowledge processes are facilitators in innovation, these knowledge processes are utilized, but perhaps not structured and harnessed to optimal level for the HR digitalisation between organisations and other stakeholders or within an organisation for intra-organisational knowledge transfer. The results help to understand that external knowledge acquisition outside-in is useful and particularly necessary also for process innovations to adapt digital technologies in a non-commercial context. In summary, external knowledge, when combined with existing internal knowledge during innovation process helps in making right choices for digital technologies investment and their configuration in order to meet the set requirements for HR processes to meet strategic and operational targets.

6.5 Managerial implications

Managers responsible for HR technology should carefully structure innovation practices by structuring the innovation to everyday life and job expectations for the subject matter experts in the HR technology field. The results reveals that the technology development is fast and leads to a situation where opportunities identification, priorization and implementation is constant, parallel and dynamic. This sets new requirements for managers to carefully consider organising the most optimal knowledge processes to acquire new knowledge and to establish knowledge management practices within a company for HR digitalisation.

There are few key aspects as a takeaway from the study. How to organise the work to maximize the constant innovation adaptation with help of open innovation outside-in knowledge transfer and what core competencies does this require from the subject matter experts and management to fully utilize externally acquired knowledge in HR process development, in the intra-company transformation and routinization. The study did not take stand on the leadership style, but new open innovation like knowledge transfer and related knowledge processes require considering both the aforementioned knowledge management practices and appropriate leadership style in order to get most out from the innovation process and empower the subject matter experts. The study results and the framework (figure 15) help to consider traditionally thought technical projects from knowledge processes perspective and become more people oriented than purely technology oriented efforts.

6.6 Limitations and future research

The study focused on describing HR digitalisation through open innovation alike outside in knowledge acquisition, transfer and new knowledge creation perspective based on the experiences from HR technology subject matter experts, who have worked on managerial level on globally operating companies. The introduced framework is a first draft, and it should be tested in order to further challenge, develop and complement the viewpoints.

The sample of the participants impacts the study results. Participants had experience from globally operating companies from various industries and geographies. Diversity of the participants were considered, but if there would have been a possibility to expand the interviews to experts from developing countries, this could have further increased the diverse views to innovation process as the technological development and maturity in digital technologies varies geographically. This could have also given different weighting to detailed views. The study could have also been done as a case study, but this time it was more important to gather cumulated information from the subject matter experts to have wide perspective and plentiful examples and cumulative knowledge to study the HR digitalisation from knowledge processes and innovation process perspective. Company specific case studies could complement the study results.

The future research could further expand the study to cover perspectives from employees, who work on specialist roles and other stakeholders, like technology vendors and end-users. The comparison of differences and similarities between startups, small and medium size companies and global enterprises would be interesting to discuss as the business environment and the role of HR and HR digitalisation in these companies is likely to be different to globally operating companies.

Further, this study focused on understanding HR processes innovation with digital technologies. HR does not operate in vacuum. The relationship of HR digitalisation with other functions and core business functions were intentionally left out, but as the organisation's processes input and outputs are in interaction each other, it would be interesting to study how the digitalisation of different functions impact each other and develops the digital maturity in companies. Further digitalisation and digital technologies covers various different ways of enabling HR processes. Each of the digital technologies and the emerging ones could be researched also separately. Finally, the interviews raised many perspectives to the phenomenon, which could be further embedded to the discussion as new studies. Investment affordability and competing priorities are two good examples from other perspectives, which could be researched to understand what type of external knowledge and new knowledge creation process is needed to reach that stage that the ideas turn into initiatives with approved financial funding.

References

Alhan O. (2023) Positive and Negative Effects of Human Resources Management Digitalisation. In: Vardarlier P. (eds) Multidimensional and Strategic Outlook in Digital Business Transformation. Contributions to Management Science. Springer, Cham.

Amladi P. (2017) HR's guide to the digital transformation: ten digital economy use cases for transforming human resources in manufacturing. Strategic HR Review, 16, 2, 66-70.

Ashwani U., Khandelwal K. & Jayanthi I. (2021) AI revolution in HR, the new scorecard. Sage Publications Pvt. Ltd.

Arif M. & Nunes M. & Kanwal S. (2021) Knowledge management and Innovation: A Critical Literature Review. Library Philosophy and Practice (e-journal) 6459, 1-25.

Baker M. & Zuech T. (2023) Gartner Survey Identifies Top Strategic Imperatives for HR Technology in 2023. [www document]. [Accessed 28.7.2023]. Available https://www.gartner.com/en/newsroom/press-releases/02-22-2023-gartner-survey-identifies-top-strategic-imperatives-for-hr-technology-in-2023

Balasundaram S. & Venkatagiri S. (2020) A structured approach to implementing Robotics Process Automation in HR. Journal of physics: Conference Series, 1-11.

Barbaroux P., Amel A. & Schenk E. (2016) Knowledge management and innovation: interaction, collaboration, openness. 1st edition. London, England, Hoboken, New Jersey, ISTE Wiley.

Bates-Brkljac N. (2012) Virtual reality. New York, Nova Science Publishers, Inc.vii.

Bellantuono N., Pontrandolfo P. & Scozzi B. (2013) Different practices for open innovation: a context-based approach. Journal of Knowledge Management, 17, 4, 558-568.

Benner M. & Tushman M. (2003) Exploitation, exploration, and process management: the productivity dilemma revisited. Academy of Management Review, 28, 2, 238-256.

Berggren C. (2019) The cumulative power of incremental innovation and the role of project sequence management. International Journal of Project Management, 37, 3, 461-472.

Bhatt G. (2001) Knowledge management in organizations: examining the interaction between technologies, techniques, and people. Journal of Knowledge Management, 5, 1, 68-75.

Boroughs A., Palmer L. & Hunter I. (2008) HR transformation technology delivering systems to support the new HR model. Aldershot, England: Gower; Burlington, VT: Ashgate.

Breznik L. & Hisrich R. (2014) Dynamic capabilities vs. innovation capability: are they related? Journal of Small Business and Enterprise Development, 21, 3, 368-384.

Bryce V., McBride N. & Cunden M. (2022) Post-COVID-19 ethics of people analytics. Journal of Information, Communication and Ethics in Society, 20, 4, 480-494.

Castro G. (2015) Knowledge management and innovation in knowledge-based and high-tech industrial markets: The role of openness and absorptive capacity. Industrial Marketing Management, 47, 143-146.

Chapano M., Mey M.R. & Werner A. (2022) Adoption of digital strategies across the human resource value chain. SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulppbronbestuur, 20, 0, a 1992, 1-12.

Chesbrough H. (2003) Open Innovation the New Imperative for Creating and Profiting from Technology. Harvard Business School Press, Boston.

Chesbrough H. (2017) The Future of Open Innovation. Research Technology Management, 60, 1, 35-38.

Cho V. & Chan A. (2015) An integrative framework of comparing SaaS adoption for core and non-core business operations: An empirical study of Hong Kong industries. Information Systems Frontiers, 17, 3, 629-644.

Cooper N., Millela F., Cant I., White M.D., Meyer G. (2021) Transfer of training—Virtual reality training with augmented multisensory cues improves user experience during training and task performance in the real world. PloS ONE 16, 3, 1-22.

Craig A. (2013) Understanding augmented reality concepts and applications. First edition. Amsterdam, Morgan Kaufmann.

Diaz-Diaz N. & Saa-Perez P. (2014) The interaction between external and internal knowledge sources: an open innovation view. Journal of Knowledge Management, 18, 2, 430-446.

DiClaudio M. (2019) People analytics and rise of HR: how data, analytics and emerging technology can transform human resources (HR) into a profit center. Strategic HR Review, 18, 2, 42-46.

Edmonson A. & Harvey J-F. (2018) Cross-boundary teaming for innovation: Integrating research on teams and knowledge in organizations. Human Resources Management Review, 28, 347-360.

El-Khoury D. (2017) Digital transformation and the world-class HR difference. Strategic HR Review, 16, 2, 86-88.

Florkowski G. (2021) HR Technology Goal Realization: predictors and consequences. Personnel Review, 50, 5, 2021, 1372-1396.

Florkowski G. & Olivas-Lujan M. (2006) The diffusion of human-resource information-technology innovations in US and non-US firms. Personnel Review, 35, 6, 684-710.

Gemünden H., Leker J., Salomo S., Schewe G. & Talke K. (2014) Human Resource Management Systems in New Business Creation an Exploratory Study, Wiesbaden : Springer Fachmedien Wiesbaden: Imprint: Springer Gabler.

Gobble M. (2018) Digitalisation, Digitization and Innovation. Research-Technology Management, 61, 4, 65-69.

Grimsdottir E. & Edvardsson R. (2018) Knowledge Management, Knowledge Creation, and Open Innovation in Icelandic SMEs. SAGE Open, 8, 4, 1-13.

Grinter S., Pang C., Freyermuth J., Hanscome R., Poitevin H., Chandra R., Kostoulas r., Chiba E. & Stewart R. (2022) Magic quadrant for Cloud HCM Suites for 1,000+ Employee Enterprises. [www document]. [Accessed 2.4.2023]. Available https://www.gartner.com/doc/reprints?id=1-2BKSRI2S&ct=221102&st=sb]

Hauptmann S. & Steger T. (2013) "A Brave New (Digital) World? Effects of in-House Social Media on HR. German Journal of Human Resources Management, 27, 1, 26-46.

Hansen N., Güttel W. & Swart J. (2017) HR in dynamic environments. Exploitative, exploratory, and ambidextrous HR architectures. The international journal of human resource management, 30, 4, 648-679.

Hendrickson A. (2003) Human resources information systems: Backbone technology of contemporary human resources. Journal of Labor Research, 24, 3, 381-394.

Holmström J., Magnusson J. & Mähring M. (2021) Orchestrating Digital Innovation: The Case of the Swedish Center for Digital Innovation. Communications of the Association for Information Systems 48, 31, 248-264.

Hosseini S., Kees A., Manderscheid J., Röglinger M. & Rosemann M. (2017) What does it take to implement open innovation? Towards and integrated capability network. Business Process Management, 23, 1, 87-107.

Hunt S.T. (2011) Death of the ring-binder: the future of talent management lies in the cloud. Strategic HR Review, 10, 5, 37-38.

Hussain Z., Wallace J. & Cornelius N. (2007) The use and impact of human resources information systems on human resource management professionals. Information & Management, 44, 74-89.

Jakhar D. & Kaur I. (2019) Artificial intelligence, machine learning and deep learning: definitions and differences. Clinical and experimental dermatology, 45, 1, 131-132.

Jemine G. & Guillaume K. (2021) Lifting the veil on HRIS adoption: the role of vendors and consultants in the diffusion of HR innovations. Information Technology & People, 36, 7, 2418-2440.

Jha A. & Bose I. (2016) Innovation research in information systems: A commentary on contemporary trends and issues. Information & Management 53, 297-306.

Jiménez-Jiménez D. & Sanz-Valle R. (2011) Innovation, organizational learning, and performance. Journal of Business Research, 64, 4, 408-417.

Johnson D., Lukaszewski K. & Stone D. (2016) The evolution of the Field of Human Resource Information Systems: Co-Evolution of Technology and HR processes. Communications of the Association for Information Systems, 38, 28, 533-553.

Querent B. (2022) Six Key Ingredients to Manage HR Digital Transformation. Workforce Solution Review, 13, 1, 7-10.

Kahn K. (2018) Understanding innovation. Business Horizons, 61, 453-460.

Kamen M., Mahoutchian T. & Paynter N. (2023) Deloitte Insights New Fundamentals for a boundaryless world 2023 Global Human Capital Trends Report [www document]. [Accessed 10.6.2023]. Available www.deloitte.com/us/en/insights/focus/human-capital-trends.html#explore

Kilgore J., Herrington O. & Sutcliff LLP (2022) How to respond to the HR Explosion. Workforce solutions review, 13, 1, 4-6.

Kluemper D., Mitra A. & Wang S. (2016) Social Media Use in HR. Research in Personnel and Human Resources Management. In: Social Media Use in HR, United Kingdom: Emerald Group Publishing Limited.

Kruft T. & Gamber M. (2021) Connecting the Corporate Brain: How Digital Platforms Accelerate Digital Transformation and Continuous Cultural Renewal. In: Digitalisation Approaches, Case Studies, and Tools for Strategy, Transformation and Implementation. Springer.

Kupilas K., Rodriguez M., Diaz P. & Alonso A. (2022) Sustainability and Digitalisation: Using Means-End Chain Theory to determine the key elements of the digital maturity model for research and development organizations with the aspect of sustainability. Advances in Production Engineering and Management, 17, 2, 152-168.

Lalić, D., Bošković, D., Milić, B., Havzi, S. & Spajić, J. (2020). Virtual and Augmented Reality as a Digital Support to HR Systems in Production Management. In: Advances in Production Management Systems. The Path to Digital Transformation and Innovation of Production Management Systems. APMS 2020. IFIP Advances in Information and Communication Technology, vol 591. Springer, Cham.

Larkin J. (2017) HR digital disruption: the biggest wave of transformation in decades. Strategic HR Review, 16, 2, 55-59.

Leonardi P. (2011) When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies. MIS Quarterly 35, 1, 147-167.

Liao S-h., Fei W-C. & Liu C-T. (2008) Relationships between knowledge inertia, organizational learning and organization innovation. Technovation 28, 183-195.

Lv Z., Tan Z. Wang Q. & Yang Y. (2018) Cloud Computing Management Platform of Human Resources Based on Mobile Communications Technology. Wireless Pers Commun, 102, 1293-1306.

Manuti A. & De Palma D. (2018) Digital HR, A critical management approach to the Digitalisation of organizations. Cham: Springer International Publishing: Imprint: Palgrave Macmillan.

Marler J. & Parry E. (2016) Human Resources Management, strategic involvement and e-HR technology. The International Journal of Human Resources Management, 27, 19, 2233-2253.

Marler J. & Fisher S. (2017) Making HR technology decisions: a strategic perspective. First edition. New York, Business Expert Press.

Martinez-Caro E., Cegerra-Navarro J. & Alfonso-Ruiz F. (2020) Digital technologies and firm performance: The role of digital organizational culture. Technological Forecasting & Social Change, 154, 119962.

Martins R., Oliveira T. & Thomas M. (2016) An empirical analysis to assess the determinants of SaaS diffusion in firms. Computers in Human Behaviour, 62, 19-33.

Mauro, T. & Borges-Andrade J. (2020) Human Resource system as innovation for organizations. Innovation & Management Review, 17, 2, 197-214.

McCartney S. & Fu N. (2022) Bridging the gap: why, how and when HR analytics can impact organizational performance. Management Decision, 60, 13, 25-47.

Merriam S. & Tisdell E. (2016) Qualitative Research A Guide to Design and Implementation. Fourth edition. San Francisco, CA: Jossey-Bass, a Wiley Brand, 2016.

Menchini F., Russo P. Slavov T. & Souza R. (2022) Strategic capabilities for business model Digitalisation. REGE, 29, 1, 2-16.

Morsch P. (2021) Innovativeness to Enlarge Digital Readiness - How to Avoid Digital Inertia? Journal of international technology and information management 30, 4, 157–173.

Moussa N. & Arbi R. (2020) The impact of Human Resources Information Systems on individual innovation capability in Tunisian companies: The moderating role of affective commitment. European Research on Management and Business Economics, 26, 18-25.

Mülder, W. (2016) Mobile HR – Einsatzmöglichkeiten und Restriktionen. HMD, 53, 771-784.

Nambisan S., Lyytinen K., Majchrzak A. & Song M. (2017) Digital Innovation Management: Re-inventing Innovation Management Research in a Digital World. MIS Quarterly, 41, 1, 223-238.

Nonaka I., Toyama R. & Konno N. (2000) SECI, Ba and Leadership: A Unified Model of Dynamic Knowledge Creation. Long Range Planning, 33, 5-34.

Nonaka I. & von Krogh G. (2009) Perspective – Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organizational Knowledge Creation Theory. Organization Science, 20, 3, 635-652.

Pavlou P. & El Sawy O. (2011) Understanding the Elusive Black Box of Dynamic Capabilities. Decisions Sciences, 42, 1, 239-273.

Pierenkemper S. & Gausemeier J. (2021) Developing Strategies for Digital Transformation in SMEs with Maturity Model. In: Digitalisation Approaches, Case Studies, and Tools for Strategy, Transformation and Implementation. Springer.

Ritala P. & Hurmelinna-Laukkanen P. (2013) Incremental and Radical Innovation in Coopetition – The Role of Absorptive Capacity and Appropriability. Production Innovation Management, 30, 1, 154-169.

Ritala P. & De Kort Benoit Kally C. (2023) Orchestrating Knowledge Networks: Alter-Oriented Brokering. Journal of Management, 49, 3, 1140-1178.

Ritala P., Olander H., Michailova S. & Husted K. (2015) Knowledge sharing, knowledge leaking and relative innovation performance: An empirical study. Technovation, 35, 22-31.

Ritala P. & Stefan I. (2021) A paradox within the paradox of openness: The knowledge leveraging conundrum in open innovation. Industrial Marketing Management, 93, 281-292.

Robillard M. (2009) What makes APIs hard to learn? Answers from developers. IEEE Software, 26, 6, 27-34.

Rogers E. (2003) Diffusion of innovations. Fifth Edition. Free Press, New York.

Sengupta A., Lalwani S., Goswami S. & Srivastava P. (2021) Reinventing HR functions with SMAC technologies – an exploratory study. Materials Today: Proceedings, 46, 10169-10174.

Schein P. & Schein E. (2016) Organizational culture and leadership. 5th Edition. New York, Wiley.

Sehlin D., Truedsson M. & Cronemyr P. (2019) A conceptual cooperative model designed for processes, digitalisation and innovation. International Journal of Quality and Service Sciences 11, 4, 504-522.

Shankar A. (2022) Does employees' perception towards mobile human resource management application quality affect usage? A moderated-mediation analysis. The TQM Journal, 34, 1, 145-159.

Shankar A. & Nigam A. (2022) Explaining resistance intention towards mobile HR application: the dark side of technology adaption. International Journal of Manpower, 43, 1, 206-225.

Shanker R., Bhanugopan R., Van Der Heijden B. & Farrell M. (2017) Organizational climate for innovation and organizational performance: The mediating effect of innovative work behavior. Journal of Vocational Behavior, 100, 67-77.

Sharon G. (2018) Know which human capital management technologies are emerging and see their timelines for likely evolution and possible adoption [www document]. [Accessed 3.2.2023]. Available https://www.gartner.com/smarterwithgartner/6-trends-in-the-gartner-hype-cycle-for-human-capital-management-2018

Sheng M. & Chien I. (2016) Rethinking organizational learning orientation on radical and incremental innovation on high-tech firms. Journal of Business Research, 69, 2302-2308.

Shet S., Poddar T., Samuel F. & Dwivedi Y. (2021) Examining the determinants of successful adoption of data analytics in human resource management – A framework for implications. Journal of Business Research, 131, 311-326.

Sivathanu B. & Pillai R. (2018) Smart HR 4.0 – how industry 4.0 is disrupting HR. Human Resources Management International Digest, 26, 4, 7-11.

Sumbal M., Tsui E. & See-to E. (2017) Interrelationship between big data and knowledge management: an exploratory study in the oil and gas sector. Journal of Knowledge Management, 21, 1, 2017, 180-196.

Tajudeen F., Nadarajah D., Jaafar N. & Sulaiman A. (2022) The impact of digitalisation vision and information technology on organization's innovation. European Journal of Innovation Management, 25, 2, 607-629.

Teece D. (2009) Dynamic capabilities and strategic management organizing for innovation and growth. Oxford; New York: Oxford University Press.

Thite M. (2022) Digital human resources development: where are we? Where should we go and how do we get there? Human Resources Development International, 25, 1, 87-103.

Thite M. (2013) Problems & Prospects of Technology as an Enabler of Strategic HRM. Journal of Human Resources Education, 7, ¾, 22-30.

Thompson T., Ghee L. & Sherin A. (2007) The adoption and diffusion of human resources information systems in Singapore. Asia Pacific Journal of Human Resources, 45, 1, 44-62.

Thordsen T., Murawski M. & Bick M. (2020). How to measure Digitalisation? A Critical Evaluation of Digital Maturity Models. In: Responsible Design, Implementation and Use of Information and Communication Technology. 19th IFIP WG 6.11 Conference on e-Business, e-Services, and e-Society, I3E 2020, April 6-8-, April 6–8, Skukuza, South Africa.

Torre T., Sarti D. & Antonelli G. (2022) People Analytics and The Future of Competitiveness: Which Capabilities HR Departments Need to Succeed in the "Next Normal". In: HR analytics and digital practices Digitalisation post COVID 19. Palgrave Macmillan imprint is published by the registered company Springer Nature Singapore Pte Ltd.

Tripathi A. (2018) Learning robotics process automation: create software robots and automate business processes with the leading RPA tool – UiPath. UK, Packt Publishing.

Tursunbayeva A. (2019) Human Resources technology disruptions and their implications for human resources management in health care organizations. MBC Health Services Research, 19, 268, 1-8.

Ulrich D. &Yeung A. (2019) Agility: the new response to dynamic change. Strategic HR Review 18, 4, 161-167.

Van De Ven A. (1986) Central problems in the management innovation. Management Science, 32, 5, 590-607.

Vander H. (2021) Best-of-Breed or Unified Solution? You decide! Workforce Solutions Review, 12, 2, 12-13.

Vardarlier P. (2020) Digital transformation of Human Resource Management: Digital Applications and Strategic Tools in HR. In: Digital Business Strategies in Blockchain Ecosystems Transformational Design and Future of Global Business. Cham: Springer International Publishing1st edition.

Warner K. & Wäger M. (2019) Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. Long Range Planning 52, 326, 349.

West J. & Lakhani K. (2008) Getting Clear About Communities in Open Innovation. Industry and Innovation, 15, 2, 223-231.

Wikhamn B., Styhre A. & Wikhamn W. (2023) HRM work and open innovation: evidence from a case study. The International Journal of Human Resources Management, 34, 10, 1940-1972.

Ye P., Liu L. & Tan J. (2022) Creative leadership, innovation climate and innovation behavior: the moderating role of knowledge sharing in management. European Journal of Innovation Management, 25, 4, 1092-1114.

Yu Z., Guangjian L, Xiaoxi C. & Lijun W. (2021) The impact of HRM digitalisation of firm performance: investigating three-way interactions. Asia Pacific Journal of Human Resources, 59, 1, 20-43.

Zafar H. (2013) Human resources information systems: Information security concerns for organizations. Human Resources Management Review. 23, 105-113.

Zhang J. & Chen Z. (2023) Exploring Human Resources Management Digital Transformation in the Digital Age. Journal of the Knowledge Economy, 1-17.

Appendix 1: Interview guide

Opening of the interview and thanking for the demographic questionnaire				
General terms and background for the research Introduction: - Digital technologies - HRM digitalisation - HRM relates to Human Resources processes widely - Innovation: open innovation - Interview sections				
Theme	**Theme high level questions**	**Interview questions**	**Possible probes, if needed, in addition to the questions emerging in the interviews**	
Theme: digital technologies and HRM	What are digital technologies for HRM?	What are the digital technologies you have used to enable HRM processes?	Probe: Is there some emerging technology? Probe: Some special applications? Probe: Automation?	
		Why should HRM digitalisation take place?	Probe: what is the value technology brings to HRM field? Probe: What are the drives to invest in digital technologies for HRM? Probe: Goals? Probe: Benefits?	
		What are the HRM processes you have enabled with digital technologies?	Probe: Is there some new emerging areas?	
Interview theme 2: HRM digitalization strategy	How do organizations make decisions for digital technologies adaptation?	What are all the organisational readiness factors considered when developing HRM digitalisation strategy?	Probe: technology, organization, culture, people, company, external, internal	
		How are the focus areas for HRM digitalisation decided?	Probe: current, future, where are you now, you get to the future? Probe: Do you review the business model you have and how the digital HRM fit into it?	
		How often do you review, measure and update HRM digitalisation strategy?	Probe: Why is that?	

Interview theme 3: innovation and knowledge processes	What is the role of open innovation in HRM digitalization initiatives?	According to your experience, what is the role / what are the reasons to use digital technologies for HRM processes innovations?	Probe: When can digital technologies provide sustainable competitive value for an organization?	
		What types of innovations do you have in your digital HRM strategy, incremental or radical?		
		Let's discuss a bit about the innovation phases. According to your experience how do you identify the digital opportunities for HRM?	Probe: External Probe: Internal	
		How about making the choices and formulating the digital initiatives for HRM initiatives?	Probe: External Probe: Internal	
		Could you describe the essentials to be considered in HRM digital transformation?	Probe: development Probe: implementation	
		Thank you! Let's now move on to discuss the innovation adaptation. Would you describe the concrete practices you have used in innovation initiatives adaptation?	Probe: How does the practices differ for incremental or radical innovations? Probe: According to your experience have you used some specific innovation approach or combination of practices to innovation in HRM field?	
		How should maintenance / routinization of innovations be taken care of?	further development	
		If you compare your experiences in different companies, what have been the common vs unique factors in innovation adaptation?	Probe: is there difference cross countries, continents, industries, companies?	
		Open innovation relies on knowledge transfer as outside in and inside out flows. How do you acquire and integrate external knowledge during different phases of innovation?	Probe: cross-organisational teams, what are the knowledge sources?	

		How do you acquire and integrate internal knowledge during different phases of innovation?	Probe: intra-organisational teams, what are the knowledge sources?	
		Where does incremental and radical innovation ideas come from?		
		What is the role of your technology vendors in your innovation processes?	Probe: How do you collaborate with vendors from selection to maintenance?	
		What type of input/ knowledge you need and from whom?		
		Digitalisation has changed the innovation to collaborative co-creative, innovation. How do you apply this to HRM field?		
		What are the channels or ways you collaborate?		
		If you think about the external and internal knowledge transfer- what are the challenges?		
		Knowledge processes are acquisition, storage, distribution and use of knowledge. Could you give examples of how these knowledge processes have been managed in innovation initiatives?	Probe: learning	
		Why should organizations invest in innovating externally and internally?		
		Can you see risks in open innovation for HRM area?		
		If you think about some examples from your career, what would be your advice for the recommended approach to innovate (develop and implement) technologies to enable digital HRM?		
Closing		Thank you for all that valuable information, is there anything else you'd like to		

		recognize or share before we end the interview?		

Appendix 2: NVivo codes at the end of the coding in alphabetical order derived from NVivo.

Thesis

Codes

Name
Architecture
Decision making for strategy
Digital applications
Digital innovations
Digital opportunities seizing
Digital opportunities sensing
Digital processes
Digital services
Digital technologies
Digital tools' purpose & value & benefits
value
Emerging themes with digitalisation in HRM
Final give a way
Innovation challenges & risks
Open innovation risks
Innovation co-creation
Innovation culture
innovation routinization
inside out knowledge transfer

Name
Intra-organisational knowledge transfer
Knowledge processes
Organizational readiness for digital innovation
Outside in knowledge transfer
Processes and practices
Radical innovation & incremental innovation
References in the thesis
Society
Society
Transformation
Digital innovation adaptation
Vendor role in innovation
What type of knowledge