Nordic Network for Adult Learning

The role of lifelong learning for inclusion in the digital transformation

– Work life of tomorrow

Indhold

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AALBORG UNIVERSITY

Preface

The Nordic countries are leading the digital transition. This primary position is challenging for enterprises and the labour market. In their 2021–2024 work plan the Nordic Council of Ministers calls for initiatives that may contribute to realising their vision of a competitive, green, and socially sustainable Nordic region in 2030. As a result, the Nordic network NVL Digital – Working Life implemented in 2021–2022 a research project with funding from the Council of Ministers. This project was to identify relevant Nordic challenges and contribute to shared Nordic solutions. The project has focused on small and medium-sized enterprises (SMEs), and specific attention has been given to skilled and unskilled employees.

The project´s aim has been to contribute to future initiatives that may promote digital transition through relevant skills development. In this report we offer recommendations and a tool for dialogue, hoping they may be beneficial to organisational development as well as employee retention and well-being. The overall aim is thus to support the Nordic region´s strong position within digitalisation and create a framework for new projects.

The project, the report, and the dialogue tool have been co-created by a team consisting of Mie Buhl, Maria Hvid Dille, Asbjørn Kårstein, and Kjell Nyman.

Mie Buhl, Professor, Aalborg University. Research manager.

Summary

In the period 2021–2022, the NVL Digital – Working Life network has had a focus on digitalisation in small and medium-sized enterprises (SMEs), and an interest in how new digital competences come to emerge in the manufacturing industries, with a focus on the skilled and unskilled employee. With this report's findings and recommendations for policy and practice, the network contributes to improving Nordic companies' participation in the digital transformation. The project explores the ways in which digitalisation is unfolding and organising working life, and how new learning practices can meet new opportunities and challenges.

The project is conducted as design-based research. This means that the project has generated a knowledge contribution in the form of recommendations, and that the project has designed a solution in the form of a mock-up for a dialogue tool described in the report. Furthermore, design-based research implies that the project is collaborative and that stakeholders related to SMEs in the manufacturing industry – i.e. employees, managers, and representatives of organisations through networks and reference groups – have been involved in and contributed to the different phases of the project. Finally, design-based research involves developing and testing a design proposal to contribute to solutions for – in this case – the development of digital competences related to digital transformation.

The main finding of the research project is that any digital transformation process shapes and is shaped by the concrete organisational practices of which it is a part. This means that the transformation is influenced by many factors that unfold empirically. In the present project, this unfolds in the form of identified paradoxes, particular narratives and changing understandings of hierarchy, among other things. Furthermore, another of the research project's findings is that digital technologies are just one of several actors that are helping to reorganise work and change the role and thus also the professional identity of individual employees. Therefore, learning initiatives cannot only prioritise digital upskilling in digital competence development, but must also involve professional experiences and insights possessed by the individual employee as a resource in the transformation. In this way, the project also contributes to pushing the boundaries of what it means to develop competences in the digital transformation. Thus, competence development is also about how to get employees more involved in a development and moreover about the implications on, for example, professional identity, forms of collaboration, etc.

The dialogue tool developed by the project team will therefore contribute to enabling enterprises to better understand some of these local implications of digital transformation and, on this basis, develop strategies for ongoing development of digital competences. This potentially creates a breeding ground for more innovation and growth, as well as creating more opportunities for participation that can have a beneficial impact on employee well-being.

Below are five recommendations that are the result of the research and developed through collaboration and dialogue with the NVL Digital – Working Life network during 2022. The five recommendations are presented in an order that addresses a policy and/or practice level, respectively. The first two recommendations address a policy and practice level pointing to the framework for companies' digital transformation. The remaining three recommendations point to concrete actions that can be taken in practice:

Recommendations

1. Implement timely slowness

Digital transformation is associated with the pursuit of ever-accelerating change.

Notions of digital technologies as inherently creating positive change, innovation and growth should be replaced by a principle of timely slowness. That is, taking the time to understand the complexities of change. An accelerating digital technology revolution driven by artificial intelligence requires reflective assessment, which is an integral part of Nordic democratic self-understanding.

Being careful not to rush is an essential factor in understanding digital transformation.

The recommendation concerns the policy as well as the practice level.

2. Prioritise a broad repertoire of strategies to navigate digital transition

Navigating digital transformation requires drawing on a diversity of strategies

At policy level, this means creating a framework for developing a broad repertoire of approaches and strategies to the digital transformation.

This means recognising that social dimensions (e.g. collaboration and critical reflection) coexist with technological innovation and economic growth.

At the level of practice, this means that enterprises should give priority to developing a variety of strategies to support transition processes. For example, companies should develop practices that enable employees and managers to engage critically and reflectively with both the opportunities and challenges of change.

A broad repertoire of strategies can create a collective awareness of what is "muddy'" as well as what is "shiny".

The recommendation concerns the policy as well as the practice level.

3. Create awareness(es) in practice of contexts

Enterprises should seek to create awareness of the contexts in which digital technologies are embedded, as it is local factors and conditions that enable the success of change. These are factors such as narratives, paradoxes, and ambiguities. They are the conditions that arise when people and machines entangle, which has the effect of changing organisational phenomena such as hierarchies and professional identities. Companies in the digital transformation will therefore find that different factors and conditions can both hinder and facilitate development.

Be aware that the contexts in which digital technologies are embedded constitute the whole of change.

The recommendation concerns the level of practice.

4. Include workforce knowledge forms as legitimate

Strategy development and decision-making should not only be anchored in management visions, but also in employees' professional competences. These are professional competences that exist, for example, as the manual tacit action knowledge of employees, articulated through an experienced sense of when a unit or component is "rightly placed". This is important in the maintenance of high product quality, in rationalising inappropriate processes and as a driver of innovation.

Including employees' professional competence as a legitimate form of knowledge can contribute to increased innovation, employee satisfaction and growth.

The recommendation concerns the practice level.

5. Link competence development with context awareness

Existing digital competence initiatives (upskilling through courses, continuing education) should link to employees' context awareness. This involves discussions about the ways in which change is occurring and its effects. The effects can be, for example, increased job satisfaction, dissatisfaction, new relationship formation, less/more control, more/less supervision, stress, and insecurity.

Focusing on contextual understandings increases employees' participation in change. In this way, employees are co-creative actors in a change process that can contribute to creating new, sustainable solutions and improvements.

The employee "walks alongside" the development instead of lagging behind the development.

The recommendation concerns the practice level.

Resumé (summary in Danish)

Netværket NVL Digital – arbejdsliv har i perioden 2021–2022 haft fokus på digitalisering i små og mellemstore virksomheder (SMV'er) i produktionsindustrien, samt på hvordan konturerne af et nyt udfordringsbillede for kompetenceudvikling tegner sig for den faglærte og ufaglærte medarbejder. Med indeværende rapports fund og anbefalinger til policy og praksis bidrager netværket til at bedre nordiske virksomheders deltagelse i den digitale omstilling. Projektet undersøger dels, på hvilke måder digitaliseringen udfolder og organiserer arbejdslivet, dels hvordan nye læringspraksisser kan imødekomme nye muligheder og udfordringer.

Projektet er gennemført som design-based research. Dette indebærer, at projektet har genereret et vidensbidrag om projektets fokusområde i form af anbefalinger, og at projektet har designet en løsning i form af et mock-up til et dialogværktøj, der er beskrevet i rapporten. Endvidere indebærer design-based research, at projektet er kollaborativt, og at interessenter med tilknytning til SMV'er i produktionsindustrien – det vil sige medarbejdere, ledere og repræsentanter for organisationer gennem netværk og referencegruppe – har været involveret i og bidraget til projektets forskellige faser. Endelig indebærer design-based research, at der udvikles og testes et designforslag med henblik på at bidrage til løsninger for kompetenceudvikling i relation til digital omstilling.

Forskningsprojektets primære fund er, at enhver digital omstillingsproces former og formes af de konkrete organisatoriske praksisser, den er en del af. Det betyder, at omstillingen er påvirket af mange forhold, som udfolder sig i praksis. I indeværende projekt udfolder dette sig blandt andet i form af identificerede paradokser, særlige narrativer og ændrede hierarkiforståelser. Et andet af forskningsprojektets fund er, at digitale teknologier blot er en blandt flere faktorer, der er med til at forandre arbejdet og rykke ved den enkelte medarbejders funktion, rolle og dermed også faglige identitet. Derfor kan læringsinitiativer ikke alene tage et digitalt udgangspunkt i digital kompetenceudvikling, men må involvere faglige erfaringer og indsigter, som den enkelte medarbejder er i besiddelse af, som en ressource i omstillingen. På denne måde bidrager projektet også til at skubbe til grænserne for, hvad det vil sige at kompetenceudvikle sig i den digitale omstilling. Kompetenceudvikling kommer nemlig også til at handle om, hvordan man fx får medarbejdere mere med i en udvikling, og hvilke følgevirkninger en omstilling har på fx den faglige identitet, samarbejdsformer mv.

Projektets udviklede dialogværktøj skal derfor bidrage til at gøre virksomheder i stand til bedre at forstå nogle af disse lokale følgevirkninger ved digital omstilling og på baggrund heraf udvikle strategier for den fortløbende kompetenceudvikling. Det skaber potentielt grobund for mere innovation og vækst, ligesom det skaber flere deltagelsesmuligheder, der kan have en gunstig indvirkning på trivslen blandt medarbejderne.

I nedenstående følger fem anbefalinger, som er resultatet af forskningen og udviklet gennem samarbejde og dialog med netværket NVL Digital – arbejdsliv i løbet af 2022. De fem anbefalinger adresserer henholdsvis et policy- og/eller et praksis-niveau. De første to anbefalinger henvender sig til et policy- og praksisniveau, der peger på rammerne for virksomheders digitale omstilling. De resterende tre anbefalinger peger på konkrete tiltag, der kan iværksættes i praksis.

Anbefalinger (recommendations in Danish)

1. Implementer rettidig langsomhed

Digital omstilling forbindes med at forfølge en udvikling, der til stadighed accelerer.

Forestillinger om digitale teknologier, der i sig selv skaber positiv forandring, innovation og vækst, bør afløses af et princip om rettidig langsomhed. Det vil sige at anvende den nødvendige tid til at forstå omstillingens kompleksitet. En accelererende digital teknologi-evolution drevet frem af kunstig intelligens fordrer refleksiv vurdering, som er en integreret del af nordisk demokratisk selvforståelse.

At være omhyggelig med *ikke* at skynde sig er en væsentlig faktor i at forstå digital omstilling.

Anbefalingen angår policy- såvel som praksisniveau.

2. Prioriter et bredt repertoire af strategier til at navigere i den digitale omstilling

At navigere i digital omstilling kræver, at man kan trække på en mangfoldighed af strategier.

På policy-niveau handler det om at skabe rammer for udvikling af et bredt repertoire af omstillingsstrategier for erhvervslivet. Det vil sige anerkende, at sociale dimensioner (fx samarbejde og kritisk refleksion) sameksisterer med teknologisk innovation og økonomisk vækst.

På praksis-niveau handler det om, at virksomheder bør prioritere at udvikle mange forskellige strategier til at understøtte omstillings-processer. Det indebærer fx, at man som virksomhed udvikler praksisser, der giver medarbejdere og ledere mulighed for at forholde sig kritisk-refleksivt til både muligheder og udfordringer i omstillingen.

Et bredt repertoire af strategier kan skabe en kollektiv opmærksomhed både omkring det, der "mudrer", og omkring det, der "glitrer".

Anbefalingen angår policy- såvel som praksisniveau.

3. Skab opmærksomhed(er) i praksis på sammenhænge

Virksomheder bør søge at skabe en opmærksomhed på de sammen-hænge, digitale teknologier indgår i, idet det er de lokale faktorer og forhold, som mulighedsbetinger omstillingens succes. Det er faktorer som fx narrativer, paradokser og tvetydigheder. Og det er forhold, der opstår, når mennesker og maskiner vikles sammen med hinanden, hvilket indvirker på, at organisatoriske fænomener som fx hierarkier og fagidentiteter ændrer sig. Virksomheder i digital omstilling vil derfor opleve, at forskellige faktorer og forhold kan være med til både at hæmme og fremme udvikling.

Vær opmærksom på, at de sammenhænge, som digitale teknologier er indlejrede i, udgør omstillingens helhed.

Anbefalingen angår praksisniveau.

4. Inkluder arbejdsstyrkens vidensformer som legitime

Strategiudvikling og beslutningsprocesser bør ikke alene forankres i ledelsesvisioner, men også forankres i medarbejdernes faglige produktionskompetencer. Det er faglige produktionskompetencer, der fx findes som manuel tavs handlingsviden hos medarbejderne, der artikuleres gennem sanset og erfaret fornemmelse for, hvornår en enhed eller en komponent er "rigtig". Dette spiller en rolle for virksomhedens opretholdelse af høj produktkvalitet, i forhold til rationalisering af uhensigtsmæssige processer og som igangsætter af innovation.

Inkludering af medarbejdernes faglige produktionskompetence som legitim vidensform kan bidrage til øget innovation, medarbejdertrivsel og vækst.

Anbefalingen angår praksisniveau.

5. Kobl kompetenceudviklingsforløb med forløb om kontekstforståelse

Eksisterende kompetenceudviklingsinitiativer ('upskilling' via kurser, efter- og videreuddannelsesforløb) bør koble sig til medarbejdernes kontekstforståelse. Det indebærer samtaler om måderne, omstillingen viser sig på, og effekterne heraf. Effekterne kan fx være øget arbejdsglæde, mistrivsel, nye relationsdannelser, større fordybelse, mindre/mere kontrol, mere/mindre overvågning, stress og utryghed.

Fokus på kontekstforståelse skærper medarbejdernes delagtiggørelse i omstillingens muligheder og udfordringer. Medarbejderne er på denne måde medskabende aktører i en forandringsproces, der kan bidrage til at skabe nye, bæredygtige løsninger og forbedringer.

Medarbejderen "går ved siden af" udviklingen i stedet for at halte bag udviklingen.

Anbefalingen angår praksisniveau.

1. Introduction

Digital competences in tomorrow´s working life

Nordic citizens´ daily life is becoming increasingly digitalised (Buhl et al., 2022). Digitalisation has become a part of all aspects of living, including the working life. The accelerated technological development in the labour market today has resulted in digital competences and skills being seen as basic and essential (Anthony et al., 2019) – on par with reading and writing.

Within a lifelong learning perspective digital competences are to be developed throughout one´s life, an aim that is mirrored in the large number of national, Nordic, and international policy initiatives on upskilling and in-service training (e.g. EU, 2020; NMR, 2020, 2021; OECD, 2020; Rolandsson et al., 2020; Thomson & Solsvik, 2020).

The concept of lifelong learning is related to how learning is taking place throughout one´s life, and how formal schooling during childhood and adolescence is only one part of this lifelong learning process (see e.g. Jarvis, 2006). A focus on adult learning and its required conditions is thus an important part of lifelong learning (e.g. Knowles, 1973). Previously, lifelong learning primarily referred to the facilitation of equal opportunities for all (despite age, class, ethnicity, income) to learn and be an active citizen (Delors, 1996), but today the concept has become an essential part of education policies as well as the skills development and labour market fields and has been adapted to convey learning throughout one´s *working* life – as defined by the European Council (2000a):

> *… all purposeful learning activity undertaken on an ongoing basis with the aim of improving knowledge, skills and competence. Lifelong learning must become the guiding principle for provision and participation across the full continuum of learning contexts.*

Workplace learning

The Nordic countries have a long tradition of and interest in lifelong learning and adults´ continuing opportunities for learning, including work-related competence development (Aarkrog & Wahlgren, 2012). The concept of lifelong learning in the working life applies to the creation of good opportunities for the acquisition and updating of competences and skills to ensure the best possible match with the

needs of the (national and global) labour market, today and tomorrow. Even if the Nordic countries are frontrunners within digitalisation (EU, 2022; OECD, 2012), and collectively place great emphasis on digitalisation (NMR, 2020), a recent study (Slåtto, 2020) underlines a need for pan-Nordic efforts on digitalisation within education and learning, including workplace learning. This need is the focus of the present report. This report contributes to a strengthened cooperation on digital transition in Nordic working life, including the development of shared Nordic solutions. By digital transition we understand the small and large changes resulting from the implementation of digital technologies, and which may take the form of additions to existing workflows and products. Later in this report, when discussing digital transformation, we refer to a more general debate on the pervasive changes in the framework of work processes, transforming e.g. workplaces, professions, professionalism, and the working life.

This report is the second report of the research project "The role of lifelong learning for inclusion in the digital transformation" and is therefore linked to the previously prepared report that focused on digital inclusion in the Nordic countries (Buhl et al., 2022). However, the present report applies a new perspective by discussing the ways digital inclusion unfolds and reorganises the *working* life, compared to the previous project that focused on daily life – for instance how digitalisation changes and reorganises the contact between doctors and patients, shopping in supermarkets, parking cars, ordering a passport, or other forms of contact with the public sector.

The research project that is the framework for both reports is a part of the Nordic Network for Adult Learning (NVL), and with this second report it is connected to the new network NVL Digital – Working Life (cf. annex 1). The report presents generated learning on the digital reorganisation of the working life, including the competence development needs of employees, and recommendations for policies and practice. The report thus aims to promote (digital) learning and increased participation in Nordic working life, supporting the Nordic Council of Ministers´ objective of digitalisation benefitting all (NMR, 2020).

Small and medium-sized enterprises in the manufacturing sectors

In the Nordic countries 99% of all companies are small and medium-sized enterprises (SMEs), following the EU´s definition (EU, 2003) of enterprises comprising 249 or fewer employees.

Research on enterprises´ digital transition in the Nordic countries highlights that SMEs struggle to keep up with the accelerated pace of technological development (Alm et al., 2016). Consequently, SMEs are often less digitalised than larger enterprises, and the continuing upskilling of employees´ competences is slower (Fredriksson, 2012). SMEs are therefore in a precarious situation when considering the digital transition of the working life (Iris Group, 2015), which is why the present report has focused on these enterprises in our learning and recommendations. Through this focus the report´s results may contribute to narrowing the potential digital gap between SMEs and larger enterprises in the years to come.

The research project of which this report is a part thus has an empirical limitation of giving attention to SMEs, but in addition it includes two other limitations: since the manufacturing industry is subjected to larger changes than other sectors (Berger & Frey, 2016), including changes in requirements and expectations related to employees´ skills development, this industry´s skilled and unskilled employees have been selected as a target group. This means that this report primarily has a focus on employees. However, the results of the report also build on cooperation with managers, and on dialogues with employers´ associations, and are thus relevant from the employers´ perspective.

Even though the results in the report are primarily based on insights created in SMEs in the manufacturing industry, and are therefore empirically connected to these contexts, the learning provided by the report has a wider relevance. Problems related to digitalisation of workplaces are of general interest, outside the manufacturing industry, including for instance how the facilitation of the transition may be a part of continuing professional development, how ideas on professionalism are negotiated and renegotiated in an organisation, and how transformations are supported with employee benefit and ownership in focus.

New insights into the digital transition of the working life

Digitalisation is everywhere and happens all the time. It affects and reorganises an increasing number of areas of modern society, and many established definitions of this concept convey this ever-changing and continuing dimension. Gray and Rumpe (2015, p. 1319) writes: "[digitalisation] represents the integration of multiple technologies into all aspects of daily life that can be digitized." Here, digitization refers to the process of making analogue information digital, while the concept of digitalisation is linked to the transformation of potentially all social spheres. In short, the comprehensive change that this integration results in, by transforming the contact between humans and machines, and thus the ways people live, work, and communicate.

Within the manufacturing sector digital transformation is linked to the transfer from automation (industry 3.0) to integration of digital processes and physical production (4.0), with an aim to make products while supported by intelligent, co-thinking production and service networks (Technological Institute, 2017). Recently, the European Commission submitted a complementary and value-based approach to digital transformation (Breque et al., 2021). The approach is named *industry 5.0* and includes employee well-being and sustainability as central perspectives in the transformation. This theoretical framework points towards increased attention to holistic perspectives on the digital transition of the working life.

The present report explores the unfolding and effects of digitalisation in a working life context and is relevant for organisational life since the applied understanding of digitalisation is a part of "the organisation". Therefore, digitalisation is described as: "The use of digital technology to change organisational processes and practices" (Plesner & Husted, 2019, p. 7), focusing on the collective reorganisation of practice shaped by digitalisation. For instance, digitalisation results in changes and adaptations of concrete work tasks, roles, and hierarchies.

Literature on future working life and the so-called "second machine age" (Brynjolfsson & McAfee, 2014), also called industry 4.0 (Liao et al., 2017), often discusses effects of digitalisation based on technology optimism (e.g. Kaplan, 2015) or pessimism (e.g. Pistono, 2015). Both perspectives claim some sort of technological determinism, where digitalisation is understood as a fixed development that either will result in new jobs (optimism) or job loss (pessimism). Without rejecting the reality of any of these scenarios this report offers another focus and proposes different solutions and types of recommendations to better understand and support

digitalisation in a beneficial way to everyone living in the Nordic countries. Our solutions and recommendations are primarily based on the reality employees and managers face when implementing new technology, digitizing workflows, or changing/replacing manual work tasks with robot technology. Our solutions and recommendations thus insist on adopting *a holistic view on digitalisation*, with an eye on how technologies are entangled, embedded, forming, and formed by concrete organisational practices of which they are part. It is this entanglement that the authors of this report focus on, and which we argue contributes to a reorganisation of the working life.

The power of cooperation

The report´s results are based on cooperation as the decisive point of the research project. This basis is visible in several ways. First and foremost, a part of the research project´s mission and general objective is to strengthen Nordic cooperation on digital inclusion. In short, the recommendations and learning provided by the report aim to contribute to a shared Nordic policy design, but also to create better understanding of and clarity regarding some of the shared Nordic challenges and opportunities inherent in digitalisation. The report offers relevant Nordic recommendations and learning since the research it rests upon has been developed by interested parties from all over the Nordic region. Collectively, employees and managers in small and medium-sized manufacturing enterprises from Iceland, Finland, Sweden, Norway, and Denmark have shared information and experiences through various channels (e.g. in-depth interviews and observation), and these important testimonials are thus another facet of how cooperation is vital in this project.

Lastly, but not less important, cooperation is visible through input *from* and continuous dialogue *with* the NVL Digital – Working Life network and a reference group with members from employers´ associations and trade unions from all Nordic countries.

Considering that the research behind this report is the product of a fan of "Nordic voices" (cf. above), the knowledge created on the challenges and opportunities of digital transition embodies a certain complexity, since the project includes both shared Nordic aspects of the transition of the working life, as well as endemic aspects. As previously mentioned, the Nordic countries are described as "front-runners of digitalisation" (EU, 2022). This status is based on their scoring on various indicators, like for instance the level of basic digital skills in the population, or access to the internet. Despite this shared frontrunner status there are variations in how

digitalisation manifests itself in the five countries. These variations include for instance how digital transition is discussed, contexts and priorities in national policy initiatives, and SME business conditions. In the project the differences between the countries as well as what they share have contributed to nuancing and informing the results of the research project and our recommendations.

Findings

The report presents five recommendations for policy and practice, as well as learning about dynamics that affect enterprises in their digital transition.

2. Research design: Design-based research (DBR)

The research project aims to identify problems and develop solutions

In DBR various stakeholders come together to play an essential role in the research phases. The rationale behind this is that the actors of the practice field possess important experiences and knowledge that contribute to the progress of the research. Furthermore, DBR is a research approach that simultaneously explores and intervenes in professional practice aiming to develop new learning and new solutions. Thus, DBR consists partly of collaborative problem identification, and partly of the development of alternative solution proposals, that are tested. Both activities take place in cooperation with relevant stakeholders. Consequently, DBR is an alternative to research designs that are interpretive or that test hypotheses. The approach was originally developed to implement digital technologies in the education sector and other professional sectors (Amiel and Reeves, 2008). The double focus of the methodology on investigating and intervening makes it suitable for high-complexity practice fields. The DBR approach implies that the present project is based on the following principles:

Pragmatic and applicable: focus on concrete problems in practice

Description: Within DBR the starting point is that knowledge is validated through its applicability in practice. This means that the learning that is being developed must stand its ground when facing the practice that is being researched.

Example: The present project is developing learning about employees´ and managers´ knowledge and experiences with challenges and opportunities linked to digital transition. This learning is validated through their feedback on the usefulness of the proposed solutions.

Collaboration as a decisive point

Description: Collaboration is the decisive point of DBR. This means that the involvement of a variety of actors from relevant fields of practice and other stakeholders is essential. They are all considered partners with valuable insights. This is true for the initial phase, when problems are identified, and later, when offering feedback on suggested solutions and in evaluating mock-ups when these solutions are tested in practice.

Example: In the present project we work in a collaborative manner when we during interviews and company visits ask actors belonging to the practice field to describe and point to opportunities and challenges linked to their specific roles in digital tasks, and later use this input in the continuing development of the project´s research questions and possible solutions.

Iterative processes: problem, development, testing, evaluation, analysis, and improvement

Description: DBR is characterised by iterative processes that intend to continue improving suggested solutions, making them as robust as possible and applicable in various contexts.

Example: In the present project we work in an iterative manner when we design and redesign solutions. This may happen when we for instance ask for feedback on vignettes (short stories produced by researchers; discussed in chapters to come), which is used as a basis for further development and improvement.

Theory-oriented – generalisation

Description: DBR is not only used to solve concrete problems. The research approach also creates new learning on the problem identified, that can be generalised and contribute to the development and nuancing of existing knowledge. Investigations and analyses are always theory-oriented. This means that they build upon existing and domain-specific knowledge within a given field. They look to the interpretative

sciences when identifying and understanding a problem, and design theory when initiating ideas and solutions. Lastly, but not least, theory is used in verification, when a solution´s validity is tested in practice.

Example: In the present project we work in a theory-oriented manner when we apply socio-material concepts to analyse and understand the complex situations that we meet in concrete practice contexts. This may for instance happen by focusing on the enterprises´ various material circumstances, like physical objects and spaces, or specific habits of and cultures in a workplace, that contribute to the specific design of work processes.

Intervention in practice

Description: DBR intervenes in practice since the solutions developed are also tested in a practice context. Consequently, new solutions influence existing practice by offering new ways of solving problems. In DBR intervention in practice aims partly to improve existing practice, and partly to develop better theories on practice.

Example: In the present project we intervene in practice when we offer solutions to practice actors in the form of vignettes, which may lead to new ideas on how to organise skills development. A narrow digital focus on specific digital skills is replaced by a holistic view on a digital workplace.

DBR is a wide research approach. This means that there is not one fixed method or design of how to develop the project. However, most DBR-projects work according to some well-established phases. For the present project (reports 1 and 2 inclusive) we have developed a four-phased research model, drawing inspiration from Amiel and Reeves (2008), that simultaneously applies a circular progress in phases and an iterative progress to improve learning and solutions.

The methodological considerations of the project are presented below, including methods, criteria for recruitment of participants, and an overview of the total dataset.

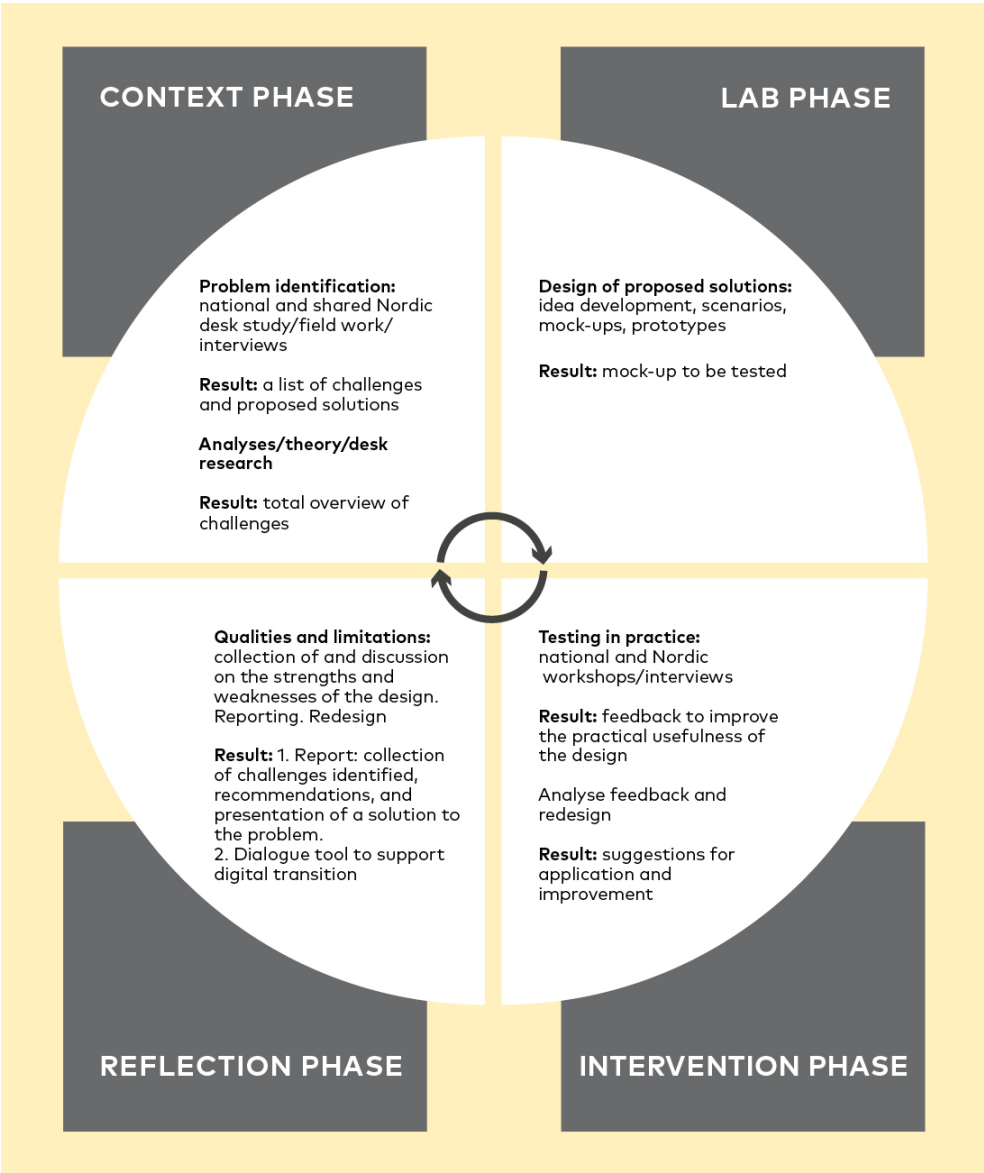

Figure 1 DBR model

2.1. Methodological considerations: cooperation, generating knowledge, and recruitment

Research cooperation implies a development of methods and generation of data based on "real life", i.e. the daily practices of the participants. It is thus a method within the DBR approach that is inspired by ethnography (Marcus, 1995), and primarily entails an engagement with reality by the researchers during the context phase. This means a placement in practice to obtain information about some of the complex connections that digital technologies are part of during a workday. It also implies that the insights and experiences of the participants (here: employees and managers) are viewed as valuable testimonies and contributions. In this way, participants are recognised as co-creators of knowledge on the challenges of digitalisation and contribute with solutions by highlighting possible alternatives for future policymakers, organisations, managers, and employees when making priorities and navigating the digital transition of the working life.

The aim of this ethnography-inspired method in the current project has been to create an extensive knowledge base *on* practice and *with* practice across the Nordic countries. The investigation has included several geographical localities across country borders, not for comparison, but rather with the aim of developing a rich and empirically nuanced description of the digital transition in the Nordic countries. As such, the project draws upon logics and understandings from the methodological approach multi-sited ethnography (Falzon, 2016), which is precisely characterised by the investigation of phenomena – in our case, digitalisation – across geographical locations, contexts, and practices.

Recruitment of participants from the working life

As our empirical limitation, as described above, relates to small and medium-sized enterprises within the manufacturing sectors, we have targeted companies in the five Nordic countries that fall within this limitation, and which have experience (limited as well as extensive) with digital transition. We are aware that enterprises develop in different tempos, however, in the current report we have *not* made our recruitment based on a categorisation of enterprises´ digital level (e.g. industry 3.0 or 4.0) and thus their estimated competitiveness. Rather, our research has focused on how entanglements between people and technologies unfold in the specific enterprises, regardless of how "far" they have come in their transition.

Since we have been concerned with creating a diversity of perspectives and reflections on the digital transition of working life, we have not made any further limitations on types of enterprises within the manufacturing sectors. Consequently, the enterprises with which we have cooperated vary considerably in terms of what products they manufacture. However, all of them work within some form of industrial production.

Besides the empirical limitations mentioned above the research team has made selection criteria related to *analytical selection* (Halkier, 2010). This implies that our selection has ensured a diversity of perspectives that are expressed through the participants´ roles in the enterprises as well as their various interactions with digital technologies in their daily work. As such, we have recruited "widely" and cooperated with both skilled/unskilled employees with direct experience from digitalisation as well as middle managers/managers. The latter employee group demonstrates different experiences with and perspectives on digital transition but is still relevant since middle managers/managers often carry the responsibility of making priorities, managing, and making strategic decisions on the implementation and maintenance of digital technologies. As such they shape the circumstances for how technologies are applied in the enterprises.

The research project has cooperated with one enterprise in each Nordic country. In some of the countries we have conducted limited fieldwork with observations and informal chats with middle managers/managers and employees, while other countries have seen interviews (discussed in the next chapter) with middle managers/managers and employees, respectively.

NVL Digital – Working Life and the reference group as gatekeepers

In the recruitment of enterprises members of the NVL Digital – Working Life network and its associated reference group have acted as national gatekeepers, to ensure a broad Nordic representation in the research project. Concretely, the members´ assignment has been to contribute to the facilitation of contact with local enterprises in their respective home countries. In Norway, Finland, and Iceland members of the network or the reference group have introduced the research team to manufacturing companies, followed by the developing of cooperation agreements by the researchers. In Sweden and Denmark, the researchers have used their own networks to develop the cooperation. Taken together this has contributed to the research team´s desired variation in types of production, differences related to national and international markets, geographical location of enterprises in and outside capital cities, as well as a heterogeneity in enterprise size from micro, via small, to medium-sized, based on the number of employees (1–249).

2.2. The research project´s database

The results of the research project are generated based on cooperation *with* the practice field in various contexts during spring and autumn 2022. The next chapter will discuss the specific characteristics of the contexts and the data generated; however, the data is also briefly listed below:

Fieldwork (observation and informal chats): Limited fieldwork was conducted in three Nordic countries (Denmark, Norway, and Sweden) with various participants from the working life, including skilled/unskilled employees as well as middle managers/managers. Three to six participants took part from each of the three Nordic countries:

- Data in the form of observation notes;
- Data in the form of photos;.
- Data in the form of email correspondence with the enterprises concerned.

Virtual interviews: Two rounds of in-depth interviews were conducted. The first round took place during spring 2022 and consisted of two interviews of an hour´s duration each across two Nordic countries (Iceland and Finland), with two different employee groups. In one of the interviews two skilled/unskilled employees from different types of enterprises in the two countries participated. In the other interview one middle manager and one manager from different types of enterprises in the two countries participated. The second round of interviews were conducted during autumn 2022 and consisted of five follow-up interviews with two of the four persons from the first interview round (Iceland and Finland), as well as three persons from field visits in Denmark, Norway, and Sweden. Data from the interviews consists of:

- Video data from interviews;
- Data in the form of observation notes from interviews – from interview round one exclusively (created by a researcher).

Summaries from dialogues with NVL Digital – Working Life and reference group: continuous presentation of findings and feedback.

Vignettes: two research vignettes (brief, empirical narratives from the field) have been developed. These address a topic identified by the research. The vignettes are created from the total data set and are developed as a part of the research project's suggestion for a solution. The vignettes may be used as a tool for stakeholders in digital skills development (unfolded below in the lab phase). The vignettes thus constitute both the data of and the solution to the project.

3. The context phase: problem identification

During the context phase extended insight into the domain and domain-specific knowledge is created

The first step of a DBR research project is to develop a context analysis to describe and better understand the totality of challenges of which a given problem is a part. This phase is called the context phase and often implies some form of preliminary and investigative work. However, it is also a phase to return to when new learning and insight is created, requiring nuancing and further development of the problems related to the research questions. The main aim of the phase is thus to create extended insight into the domain, and domain-specific knowledge, which, in the present project, embodies knowledge about the practice of digital transition in SMEs, relevant additional challenges, information on adult learning, lifelong learning, and digital skills development.

3.1. Methods we use in the context phase

Desk study – "studying at one´s desk"

As a part of the preliminary work on the empirical investigation into companies´ digital transition, a desk study has been conducted to create domain-specific knowledge and fine-tune the problem identification. During the desk study selected policy documents and examples of national initiatives on the support of SMEs in the Nordic countries are collected, evaluated, and presented. This work has resulted in a working paper that offers insight into recent trends on working life and digitalisation as well as policy development in the Nordic countries between 2012 and 2022, contributing to the generation of knowledge on common features and differences between the respective countries. This work further outlines some of the shared Nordic challenges in the digital transition of the working life.

In this report policy documents are defined as the most central and relevant documents that describe national policies – which often are the result of political negotiations. Examples include national strategies on adult learning and participation in the working life, labour market policies that outline political recommendations, initiatives and regulations, policies and programmes on digitalisation, future needs in the working life, etc.

The desk study primarily builds on literature, policy documents, and examples of good practice provided by the network NVL Digital – Working Life and the reference group, as well as searches made by the research team based on this input. Based on these recommendations we use a snowballing method (Greenhalgh & Peacock, 2005) to circle additional central policies, initiatives, and literature via references and other information in the texts. The policy documents and examples of practice initiatives discussed in our desk study are selected based on 1) policy: the most relevant policies related to the research project´s focus on the working life, 2) examples of practice initiatives: relevance related to the project´s limitations (SMEs), and 3) variation on examples.

Field work: observation and informal chats

In the project the research team has conducted fieldwork inspired by ethnographic methods (Ybema et al., 2009; Marcus, 1995). This means that we have visited companies and made observations of daily "digital interactions". The observations have been managed and organised by a middle manager/manager, whose function is to be the introductory contact to the enterprise. During all company visits this person has accompanied the researchers, introduced them to the main production processes, history, digital investments, opportunities, and challenges linked to digital transition as seen from the middle manager/manager perspective. This method has provided a space for several informal chats between researchers and middle managers/managers on the practices observed, puzzlements, and other issues that seem important in the field.

The middle managers/managers have introduced the researchers to several employees who daily experience the use of digital technologies. During these meetings informal chats also take place between researchers and employees, at their usual workstations, about the daily work, types of work tasks, changes, opportunities, and challenges. Some of these employees have been warned about the visit. Other meetings during the visits arose spontaneously. The informal chats have been characterised by an unstructured and explorative form.

During the field work the researchers obtained permission from the enterprises to photograph machines, products, and interactions between machines and employees – however, employees and enterprises appear as fully anonymous. The structure of the observations has been explorative and intuitive (Lofland & Lofland, 1995), and the researchers have therefore kept an open mind about how company digitalisation unfolds. However, specific attention has been given to exploring the technology framework. This means that the researchers have made a notice of the circumstances of which these technologies are a part, and how they are embedded. This could be circumstances related to architecture, temperature, ways of cooperation, colours, smells, concrete work tasks and other relevant features.

One company was visited by two researchers, and the other two companies by a single researcher. Both researchers have made observation notes following the visits, and these notes and photos taken at the enterprises have become part of the data used in the further analysis.

Figure 2 Examples of data: observation notes and photos from the field

Virtual interviews

During the context phase of the research project two in-depth virtual interviews were conducted with employees and middle managers/managers. Both interviews are semi-structured (Ybema et al., 2009) and as such the researchers have formulated some defined themes that they want to discuss with the interviewees, but the interviews have also developed in an intuitive manner and been shaped by the interviewees´ experiences and perspectives on digital transition.

The two interviews that were conducted during the context phase are of about one hour´s duration. Two researchers participate in these interviews, one of whom acts as the interviewer while the other adopts the role of observer and note-taker. In both interviews the two interviewees are present at the same time. The interviews thus share traits with focus group interviews (Halkier, 2010), where themes and questions are formulated to induce shared reflections and knowledge development,

and where there is an opportunity to comment on each other´s understanding of reality as well as experiences. The interview layout also ensures that the interviewees are from the same Nordic country, an aspect that may contribute to a discussion on national experiences and similarities, patterns, and differences. The interviews are also designed to correspond to the participants´ role in the company: one of the interviews consisted of middle managers/managers and the second of skilled/unskilled employees. This organisation is selected for the interviewees to speak "openly" about opportunities and challenges related to digital transition.

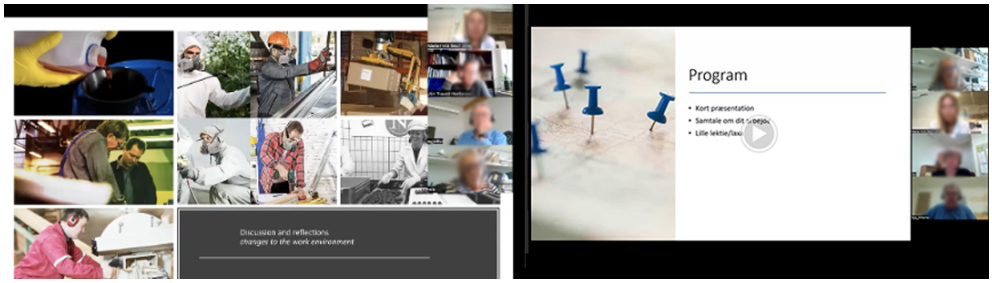

Figure 3 Examples of slides from an online interview

During the interview participants are presented with pictures that show scenes from the digital transition of a manufacturing plant. These are generic photos of work processes that are meant to produce memories of digital experiences from daily life and is thus a way to start the communication on daily work and daily work tasks, rather than producing "official" narratives on digital transition. The interviewees were also encouraged to take photographs of the various interactions they had with different technologies during a workday. These were sent to the researchers and became part of the total dataset. Examples of such data can be found in the "photos from the field" above.

Videos and the researchers´ observation notes work as data in the further analysis.

3.2. Digital transition of Nordic working life

As mentioned in the introduction to this report micro, small, and medium-sized enterprises make up 99% of all enterprises in the Nordic countries. Based on the EU ´s definition (EU, 2003) it relates to enterprises with fewer than 249 employees, and three subgroups exist: 1) micro-enterprises with fewer than 10 employees, 2) small enterprises with between 10 and 49 employees, and 3) medium-sized enterprises with between 50 and 249 employees. In addition to the number of employees, the EU definition includes company turnover and assets. Although we share the view

that turnover and degree of digitalisation are linked, this present project has limited itself to number of employees as the main criterion, since this is the most conventional way of classifying enterprises.

In the EU context the Nordic countries are often treated as one group, which is among the forerunners in digitalisation (e.g. EU, 2021; Alm et al., 2016; OECD, 2012), even if there is great variation between the five Nordic countries (Randall & Berlina, 2019). The ranking of the Nordic region is based on five indicators related to digital progression – indicators defined by the European Commission´s Digital Economy and Society Index (DESI) (EU, 2021): 1) connectivity, 2) digital skills, 3) use of internet, 4) integration of digital technology, and 5) public services. The Nordic countries top the scoring lists of these five indicators (cf. fig. 4). This means that the Nordic region has a strong position within digital development, according to DESI (2021) and other surveys. Recent research, however, finds that this position is uncertain when seen in a global perspective (Randall & Berlina, 2019; Alm et al., 2016), and if the Nordic countries would like to keep this position there is a need to strengthen and prioritise cooperation.

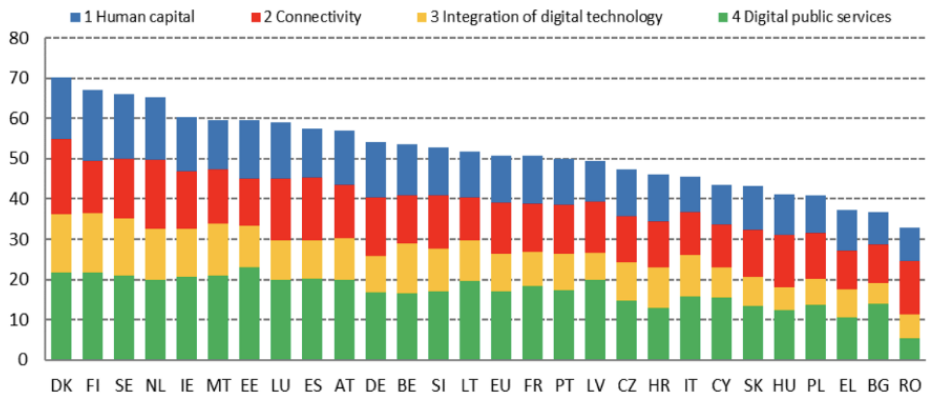

Figure 4 Digital Economy and Society Index, 2021

Despite this display of general societal digital strength, research on digital transition in enterprises (Alm et al., 2016) indicates that SMEs may struggle with the high speed of technological development, explaining why digital transition and the continuous upskilling of employees is slower in such enterprises compared to larger ones (Fredriksson, 2012). For instance, the large economic cost related to the removal of employees from the primary production to provide them with external training is one of the reasons for skills development not being a priority in SMEs. Consequently, the share of companies with IT specialist staff is lower among SMEs than among larger enterprises (Statistics Sweden, 2020). In addition, SMEs have

fewer economic assets compared to larger enterprises, resulting in less investment in technological solutions. In short, SMEs in general have a lower level of digitalisation, which means that they are more vulnerable in the digital transition (Heilala et al., 2020; Iris Group, 2015).

This development possesses an inherent risk of a growing digital gap between SMEs and larger enterprises in the years to come.

A relatively large percentage of employees in the Nordic countries works in a company with **less** than 249 employees. In Denmark, Sweden, and Finland the percentage is about 48, 65, and 66, respectively, while the share in Norway is about 70% (Statistics Denmark, 2022; Statistics Finland, 2022, Statistics Norway, 2022, Statistics Sweden, 2022). Data from Iceland´s statistical office does not give a basis for similar calculations, except from providing an estimate of at least 62% (Statistics Iceland, 2021). There are reservations linked to all these percentages as the various countries´ statistical offices treat data slightly differently, and the numbers are thus not fully comparable[1]. Nevertheless, the high percentages indicate the importance of supporting digital transition in these enterprises, considering that a large majority of the work force is hired by SMEs and thus is at risk of *not* benefitting from the digital transition.

The manufacturing industry as context

This report is focusing on the Nordic manufacturing industry – a sector facing extensive changes and new requirements (Berger & Frey, 2016; Kaplan, 2015; Pistono, 2015). Even if the technological development creates new (job)possibilities and general economic growth (McKinsey Global Institute, 2017; Sabbagh et al., 2013), we will also see job losses, specifically within the manufacturing industries (cf. fig. 5). This is true for all the Nordic countries, but even more so for countries where automation lags (see fig. 5). Compared to these countries the Nordic region and other even more advanced industrial countries like New Zealand, the USA, South Korea, and Canada are somewhat better situated, because according to the World Economic Forum (Martin et al., 2018) these regions demonstrate digital readiness on several parameters and are collectively far ahead in the digital transition.

1. Description of various tables that form the basis of the calculations: Denmark: "General company statistics by region, time, company size (full-time employees) and unit". Sweden: "Share of enterprises, employment, turnover and economic growth in the total non-financial economy, by size (based on employment) 2020, per cent". Finland: "Enterprises by sector and size in number of employees by year, TOL 2008, size category by employee and information." Norway: "Enterprise, turnover and employees except public sector, by employment group, statistical variable, year and region". Iceland: "Number of enterprises and operational information by sector and size 2008-2019. Total company economy incl. fisheries and excl. finance and insurance sectors."

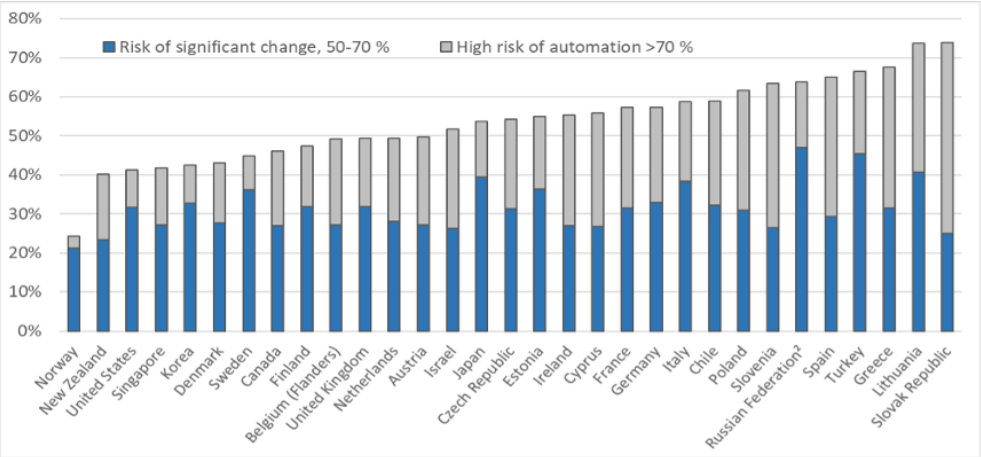

Figure 5 Variation in job automation (percentage of jobs at risk by degree of risk). Manufacturing sector. The table above is based on PIAAC data presented in Nedelkoska and Quintini (2018) and is a product of estimates made by the research team during the desk study.

As presented in figure 5, the risk of job loss is greater within the manufacturing industries in almost all industrialised countries compared to the total labour market. According to an OECD estimate (Nedelkoska & Quintini, 2018) the risk within this sector compared to the total labour market is about 10 percentage points higher in Denmark and Sweden, about 15 percentage points higher in Finland, while in Norway, which is an exception,[2] the risk in the manufacturing sector is about five percentage points lower. Because of technological and digital development, including automation and robotisation, there is a great need for new and increased digital skills specifically among employees in the manufacturing sector.

Job opportunities and job loss following the digitalisation of the manufacturing sector

The concept of industry 4.0 (Liao et al., 2017) refers to the digital transformation that today and in the future changes and will change the general (working)life in organisations (Brynjolfsson & McAfee, 2014; Susskind & Susskind, 2015). Industry 4.0 is characterised by integrating the physical production with the digital world, making room for ideas on intelligent production and service networks being self-organised and self-steered across industrial chains, as for instance between transportation belts, order systems, and suppliers (Technological Institute, 2017).

2. According to the OECD (Nedelkoska & Quintini, 2018) Norway is profoundly different in this grouping. Norway has the highest level of digitalisation and thus the lowest risk of job loss. This is first and foremost due to the petroleum industry being the country´s largest industry – an industry that for a long time has been based on automated processes, and where the opportunity for further automation is limited, compared to for instance the manufacturing sector.

In most workplaces digital technologies are introduced with promises of efficiency, simplification, and improvement. Within many sectors digitalisation offers the possibility to for instance develop new business models and related production processes, new forms of saving and sharing information/data, and new products and services. A central point in all these changes is the possibility of automation through digital technology, which for many enterprises imply the creation of new types of jobs, increased productivity, and lower costs.[3] Especially in the Nordic countries, where labour cost is higher than in many other countries, automation may be a way for the region to keep its competitiveness compared to other countries with cheaper employees (Iris Group, 2015).

This transition may however pose challenges for employees, who may lose their jobs or see their work tasks radically changed, potentially requiring new sets of skills and new professional identities. Historically, employees who have lost their jobs to "the machines" have had the opportunity to move into another part of the labour market, but as recent research indicates, the post-industrial society no longer has any digitally-free zones (Ask & Søraa, 2021). An opportunity for continuous upskilling is therefore essential for employees to ensure that they stay employed and can deal with changes in tomorrow´s working life.

Across the Nordic countries there is a strong focus on the digital transformation and its influence on the labour market. Within the economic growth discourse the transformation is seen as a "required change" (e.g. DK, 2022). The main idea is to secure future labour markets under a disruption logic, i.e. a disturbance of the ruling system that is articulated either within the discussion on job loss (Autor, 2015; Berger & Frey, 2016; Ford, 2015) due to automation and robotisation, or as job growth potential due to new functions/innovation linked to digitalisation (Alm et al., 2016; Degryse, 2016; Sabbagh et al., 2013). These two digitalisation conceptual-isations are often referred to as technology-pessimistic and technology-optimistic perspectives, respectively. The present report follows Plesner and Husted (2019) and Wajcman (2017) in holding a distance to these two conceptualisations as opposite poles. Instead, digitalisation is viewed as an indefinite and open process that is embedded and entangled in for instance concrete organisational practices, power dynamics, management systems, and other competences and skills in the organisation (Orlikowski, 2007; Plesner & Husted, 2019).

3. These potentials are of course dependent on whether the enterprise in question has the necessary resources that investment in new digital technologies requires.

Consequently, this report is based on a *non*-technology-deterministic and organisational perspective on digitalisation, creating the possibility of revealing some of the "surrounding" factors influencing the transition, when new technologies are introduced into an organisation and thus reorganise the working life. This perspective creates a framework for better understanding the effects of digitalisation, and thus which opportunities this learning offers to support enterprises in their work on this process. This framework discusses questions like why and how digitalisation is applied, which actors are involved in this work,[4] how action, power, influence, and effects circulate in the workplaces, and the importance this may have for the people involved – employees as well as managers. In this way the framework is also linked to the European Commission´s Industry 5.0 value-based access to digital transformation (Breque et al., 2021), which addresses socio-organisational circumstances like for instance employee well-being and empowerment as decisive parameters in the realisation of digitalisation.

Figure 6 Example of automation

4. This includes both human and non-human actors. This concept pair is unfolded in the part: Research findings – a picture of the working life drawn from empirical themes and theory.

The robots are coming

As outlined in the section above, there is evidence for a change in and reorganisation of the future working life due to digitalisation. Research literature on the influence of digitalisation on organisational life (e.g. Beyes et al., 2022) has for a long time discussed the "disruptive potential" of digitalisation, and how this change may be accessed and understood. Plesner and Husted (2019) highlight the twin concept of *blended* (Fleming, 2019) and *bounded* automation (Beunza & Millo, 2015), that provides a lens through which we may observe the contextual and organisational circumstances and factors embedding technologies, and which influences the way digitalisation locally unfolds. This has inspired us to use the same lens in this report to achieve insight into the dynamics of interaction that condition the nuances and complexity of organisational transformation. Furthermore, the two concepts make it possible to assess some of the effects of digitalisation and use this to support enterprises´ level of digitalisation and employees´ opportunities for labour market participation.

The concept bounded automation addresses *the organisational factors* of automation and digital transition. Within this concept, digital transition challenges are not necessarily linked to the technologies *per se*, but rather to the organisational circumstances steering how these technologies are applied. As such, digital technologies are not seen as having an inherent potential to create positive change, innovation, growth, etc., but as being limited by various socio-organisational factors that decide how and why a job or a task is automated (Fleming, 2019, p. 24). These factors cover for instance the price of labour, organisational practices, power dynamics, the work task itself, and so forth. In the present report the concept helps *facilitating a shift in focus and thus a new analytical correctness*: from an exclusive focus on digital technologies to observing the organisational factors that condition the technological progress (or transition).

The concept blended automation is linked to a special variant of organisational design, where most of the work is automated but humans intervene and "monitor" the machines or complement the work of the machines in case of an emergency (break-down), when adjustments are necessary, or in situations where there is a need for human judgement. As an example, Beunza and Millo (2015, p. 37) highlight the need to contemplate how humans and machines interact and are entangled – where automation cannot stand alone but needs people to analyse complex challenges, understand irony, ambiguity, and so forth (e.g. the teamwork between the autopilot and the pilot in an airplane).

In the present report the concept helps *facilitating an analytical correctness* towards the special form of organisation *that happens between humans and machines* when they are "blended" or entangled.

Collectively the two concepts bounded and blended provide the analytical movement in the research project that is the basis for the recommendations and learning in the report, since one of them points to the circumstances in which digital transition happens, while the other highlights the reciprocity between technology and humans in the unfolding of the same digital transition. They also shape the structure of the description of the research project findings (below) and describe the bounded and blended circumstances that the analysis has generated, which will influence the interaction between humans and machines in the work of employees and managers on digital transition and digital work processes.

3.3. Digital transition on the political agenda in the Nordic region

As mentioned above, the present report aims to support the strengthening of Nordic cooperation on digital inclusion related to the digital transition by submitting recommendations for a shared Nordic policy development. In addition to the empirical investigation of the digital transition of the working life, this entails, as part of the desk study, a mapping of relevant policy initiatives on national and strategic work on the digital transition of the labour market in the five countries.

The impact of digitalisation on the working life is reflected on policy level in all Nordic countries. This can for instance be observed in the way the countries have formulated and developed digital agendas, work plans and strategies aiming to maintain the strong position of the Nordic countries on digitalisation in a working life context. These initiatives are linked to laws and regulations steering the working life and the life of businesses in a digital age, but the initiatives also include the employees and their opportunities for skills development.

Despite similarities between the countries, they are also different on several parameters. Among these are specific national attention areas (e.g. cyber security or digital exclusion), links to other policy areas (e.g. the climate or innovation), or economic priorities on how to support digital transformation (e.g. initiatives deleting unnecessary bureaucracy for businesses, or efforts on further and continuing training).

An overview of relevant policies on the digital transition of the labour market in Sweden, Iceland, Finland, Norway, and Denmark is presented below. This is not an exhaustive overview, but rather a review of some of the themes and trends in relevant policy documents, which contribute to the shaping of the digital transition in the Nordic region.

Skills development

All the Nordic countries underline opportunities of employees for lifelong skills development as an important parameter for succeeding with digital development. This entails, for instance, that financial support is available for further and continuing training to strengthen the basic skills of employees. In most Nordic countries this support is linked to a view on lifelong learning (DK, 2022; NO, 2019; FI, 2021; SE, 2021). The importance of financial support is shared by the Nordic countries, but the ways in which this priority manifests itself are different. For instance, differences in learning pathways to develop skills can be observed, from informal learning arenas/workplace learning (e.g. Norway: NO, 2017), via possibilities for e-learning (e.g. Denmark: UVM, 2017), to strengthened cross-sectoral cooperation (e.g. Finland: FI, 2019). The countries share an ambition to strengthen skills as a solution to the mismatch between the employees´ present skills and those skills that enterprises are expected to request today and in the future.

The green shift

In Sweden and Denmark, particularly, the agenda on digitalisation is connected to the green shift *policy area* (SE, 2017; DK, 2022). This means that these countries develop work plans that consider digitalisation a transversal phenomenon that is dependent on other policy areas like for instance the climate. Efforts and solutions are viewed as cross-dependent – and securing growth in a global competitive perspective is linked to finding new digital solutions to the green shift.

Innovation

Other links can be observed to the *policy area* innovation. In recent policies, Iceland (IS, 2021), Sweden (SE, 2017), and Denmark (DK, 2022) present the many opportunities digitalisation can bring to innovative designs, IT-solutions, and more. Innovation is seen as inherently linked to digitalisation and is formulated as an explicit competitive parameter in a strong digital society.

De-bureaucratisation and guidance

In addition to the aspects above, there are specific policy areas put forward by all the five countries. This includes for instance digital initiatives making it easier and more flexible for enterprises to do business. In Finland (FI, 2020b), Sweden (SE, 2017) and Denmark (DK, 2021) this ambition is called "de-bureaucratisation". This entails a simplification of the interactions between enterprises and the government

by for instance making it easier for enterprises to share various types of data, or only submit data to the government once.

Another articulation in the policy ambition to simplify the daily life of enterprises is related to guidance. This includes initiatives that aim to create accessible digital guidance for enterprises on digital transition, including guidance on economic support to further and continuing training of employees, or options for trying out robotic solutions in enterprises (FI, 2020a; NO, 2017).

Denmark has recently seen a new national strategy on digitalisation (DK, 2022), with an explicit focus on SMEs, which is also the present report´s specific focus. In this strategy an ambition to strengthen the opportunities of large as well as small enterprises in the digital transition is presented, since Denmark experiences competitive challenges (cf. above on Digital transition of Nordic working life). The strategy contains several initiatives on how new digital technologies may simplify the daily life of enterprises (e.g. de-bureaucratisation and digital guidance), primarily seen from the enterprises´ perspective.

The brief overview above on selected policies presents a Nordic region that despite national differences and variation in concepts has a strong focus on digitalisation. However, a *shared* Nordic policy development is still in the womb, specifically on workplace learning and education (Slåtto, 2020). As part of the Nordic Council of Ministers´ plans and work on digitalisation (NMR, 2020) the focus has primarily been on the development of digital skills, including digital literacy and citizenship, digital infrastructure, enterprise operations and national digital service delivery. As highlighted in the introduction of this report, there is a need for strengthening, from a pan-Nordic learning perspective, the shared efforts on digitalisation and the reorganisation of the working life that is the result of this digitalisation. As presented in this report there is an additional need for an increased focus on SMEs, since they constitute more than 99% of all enterprises in the Nordic region (cf. above on Digital transition of Nordic working life). This report aims to meet both these needs, via its data and recommendations.

3.4. Research findings – an image of the working life drawn from empirical themes and theory

In the research project we focus on investigating and better understanding the ways digital transition unfolds and reorganises the working life. Partly, this originates from a thematic inspired analysis (Braun & Clarke, 2006) where we via shared and iterative analyses in the research team and supported by a hearing among the members of NVL Digital Working Life have identified patterns and themes across

the collected empirical material. The processing of empirical data has taken place in an interaction between the explorative (trying to be open towards what the data "tells" us) and a processing based on theory. Concretely, analysis of the data is based on the previously mentioned theory on bounded (the organisational circumstances) and blended (the new organisation that is the result of humans and machines interacting) digitalisation perspectives (Beunza & Millio, 2015; Fleming, 2019). This means that through analyses we have followed (mapped) what happens and what is related to the interaction between humans and machines in employees´ and managers´ work on the digital transition and digital work processes.

By giving attention to the relation between humans and machines – from now on called human and non-human actors – the research project rests on the theory of sociomateriality (Orlikowski, 2007), where both human and non-human actors have the power of action when they interact and entangle. They project a specific course of action for ways to conduct the work, and as such they also take part in the reorganising of the work. Within this theory not only humans and non-humans possess the power of action, but the power is rather viewed as being created during the interaction between *a variety of* actors that take part in the specific situation. The employee is of course in charge of the technology, but other facets like the interior design, room temperature, moods, smells, "dirt", emotions as in feeling shame, inadequacy, or success, narratives, specific circumstances, etc., also possess power of action. In short, in this research project we are concerning ourselves with this interaction and the resulting reorganisation and its effects, when investigating digital transition.

The thematic analysis, with the desk study and the domain-specific knowledge discussed above, contributes to the drawing of an image of working life, which also acts as an image of identified challenges. First and foremost, the image relates to working life under the digital transition phase and is thus drawn and defined by those people that daily experience this change. However, policies, literature and input from other relevant stakeholders contribute to the drawing. Taken together, the working life image exhibits some of the challenges that characterise digital transition in Nordic workplaces, and thus it also acts as an image of challenges. Consequently, the analysis contributes to the creation of a deeper understanding of how the digitalisation level of enterprises may be supported, and how employee participation may be increased.

In the presentation below on the research project´s findings, we use as a general structure the concept pair bounded and blended digitalisation circumstances. They both contain themes, identified by the analysis, that refer to specific organisational factors that condition the digitalisation (bounded), as well as specific forms of organisation that are produced in entanglements between humans, technology, and other actors in digital work processes (blended). Each theme has been given a headline that describes its main content. The themes have been unfolded via relevant theory as well as empirical examples. Even if our research argues that these themes are in play and contribute to the image of the working life under digital transition, it must be noted that all examples presented are just examples. Not all enterprises convey these themes, but they are examples of how specific themes have materialised during the present research.

3.4.1. Bounded digitalisation circumstances – organisational factors

Bounded digitalisation circumstances describe, as discussed above, the specific organisational factors that condition digitalisation. In the present project these factors are linked to three themes (analytical findings) related to various organisational dimensions, which can be seen as circumstances that respectively inhibit and promote digitalisation. As such they may point to potential delays or accelerations in the transition. This may for instance relate to communication processes that are muddled or flexible, or the architecture/interior design that supports or discourages new processes. The themes are presented below in a random order.

Narratives on digital transformation

Perceptions on the consequences of digital transition are made visible through workplace stories on digital shifts. This could for instance be ideas on whether digital transformation brings with it new and exciting opportunities, whether it is scary or unavoidable, or whether it changes the work tasks of employees and managers to the better. These ideas exist in organisations and are brought to life through stories or narratives on transformation, which employees and managers use to create meaning (Taylor et al., 2002). They do this to better understand and interpret past, current, and expected actions and experiences (Boje, 1991). This perspective on narratives focuses on the creation of meaning, and not on whether the stories are "true" or relate to an objective reality. Furthermore, it is a perspective that understands narratives as co-creators of organisations. They are powerful, as some narratives may be allowed to dominate, while others are marginalised, and as such they may influence and condition how for instance digital transition is practised,

understood, or experienced. Narratives can act as strong drivers that may support or discourage a local transition or change in an enterprise (Buchanan & Dawson, 2007).

IN BRIEF:

Narratives on digital transformation: The enterprises surveyed are different in how they discuss digital transformation. In the research team we treat this information as narratives that are formulated as either prejudices or attitudes. These narratives do not express a specific truth but are rather ideas that circulate among employees and managers, influencing how changes are made. Narratives may support as well as delay digital transition.

With this focus on narratives, we aim our attention at an analytical finding that points out some of the ideas present among employees and managers, related to digital transition. These are, as already mentioned, ideas based on past and earlier work experiences, as well as current experiences and expectations of the future.

In the present research we see that these narratives contribute to a reorganisation of the work under the digital transition. This is made possible through a production (and reproduction) of specific ideas on the transition and the actors related to it, resulting in some work processes, structures, skills, priorities, etc., being supported, which may speed up (that is, support) or create delays (that is, complicate) the transition. If a narrative on older employees being "technology-resistant" exists in a company, senior employees may feel less motivated to increase their skills, because they believe they are seen as such.

Narratives thus have power, since they influence an enterprise´s readiness for transition, employees´ relations with digital aspects, the cooperation between employees and managers, and the interaction between employees and machines. For an enterprise it may be interesting *to obtain information on which local narratives are in play and investigate whether they contribute to delaying or supporting an organisational change (or both)*.

TRANSITION TIP

An enterprise may find it interesting to obtain information on which local narratives are in play and investigate whether they contribute to delaying or supporting an organisational change (or both).

Two types of narratives that reorganise the work under the digital transition are presented below; they are concretely identified by empirical data.

Narratives expressing prejudices

One type of narratives that we have identified through our research is related to what we call *prejudices*. These narratives are mainly characterised as prejudices towards people involved in digital transition.

We have for instance uncovered in our data the existence of narratives that show prejudice towards employees who conduct work tasks related to digital technologies. These are narratives produced by the employees themselves, as well as middle managers and managers. In our data we can identify three versions of narratives that all relate to similar ideas about the employees who do not want to, or cannot, or are sceptical.

The first version is broadly related to employees "on the floor". As such, this version comes from a *hierarchical* understanding of the type of employees that conduct operative work tasks (as opposed to a manager with strategic work tasks), and who do practical, manual work with the technologies. This narrative conveys, in general terms and imagery, *technological resistance from employees on the floor.*

The second version is related to some form of *employee identity*, as the narrative is linked to "blue-collar" employees. These are employees whose background is from specific education programmes and levels and is primarily an identity centred on manual work. In this version the employee identity is connected to a form of conservatism and *fear of being monitored*. That is, a fear of being monitored by technologies, and being exposed as lazy, defiant, incompetent, etc.

Finally, the third version of the narrative relates to the age perspective and defines some employees as "older employees" who lack professional skills and *have difficulties with the introduction of anything new.*

Taken together the three versions make up a narrative on employees in the digital transition that for various reasons (education, age, place in the hierarchy) are challenged by anything "new".

In the digital transition the narrative becomes a part of the framework within which enterprises understand their employees, and the employees understand themselves. As such *the narrative contributes to the production of "realities"* since it, often implicitly, has a say in strategic decisions and priorities. For instance, enterprises may act on a narrative related to senior employees with non-adequate technological skills, resulting in a strong focus on how such employees can increase their skills, but a weak focus on other potentially fertile interaction arenas between humans and machines. It may, for instance, be beneficial to develop new forms of organisations focusing on the relation between traditional (manual) competences, which have been developed through years of tactile, emotional, and relational skills, and IT-specialised competences. It may also be beneficial to make use of skilled seniors in decision processes on digital upgrading related to purchasing and the physical reorganisation of manufacturing processes.

TRANSITION TIP

It may, for instance, be beneficial to develop new forms of organisations focusing on the relation between traditional (manual) competences, which have been developed through years of tactile, emotional, and relational skills, and IT-specialised competences. It may also be beneficial to make use of skilled seniors in decision processes on digital upgrading related to purchasing and the physical reorganisation of manufacturing processes.

The research project perceives that narratives related to prejudices take part in the reorganisation of the work under the digital transition. They contribute to the production of reality perceptions through which employees, managers and enterprises act and understand each other and themselves.

Narratives on attitudes

Another type of narratives that have been identified in the empirical data are related to what we call *attitudes*. Narratives on attitudes are in this research project seen as different from prejudices. We understand prejudices as stereotypical assumptions on group level, and attitudes as personal perceptions or assessments of situations and contexts related to digital aspects.

In the project data we find that attitudes towards digital aspects are oriented along various time dimensions called temporalities (Wajcman, 2015). They diverge from conventional and linear understanding of time by *not* being related to time aspects that can be numbered in seconds, minutes, days, and years. On the contrary, attitudes are oriented towards flexible time aspects that are produced in the entanglements between humans and machines, which contribute to the structuring, guidance, and organisation of current work processes (Orlikowski & Yates, 2002).

Futures

One temporality is related to the future and the profits that digitalisation may bring. These are wins that can already be observed and experienced in the manufacturing sector, but that simultaneously are tied to the dirty work of the past (oil, grease, toxic fumes, heavy lifting, monotonous routines) as well as dreams about the future. It creates a form of time fusion (past-present-future), while being oriented towards something in the future. We conceptualise this temporality as "*futures*" in digitalisation, as it is related to various temporal (future) landscapes. These landscapes contain both worries and hopes, that as mentioned above could be connected to a "dirty" past, a changed present, and are considered related to ideas about a future. The landscapes are thus complex, and they contribute to reorganising the work conditions since they influence whether an organisational change is considered meaningful/meaningless, dark/full of light, or as a mixture of potentially opposite perceptions – and as such very complex.

As an example of this complexity our data shows how hopes of flexible and effective processes get entangled with worries on how one´s work skills will match the new demands that these dreams entail. We can also find that when hopes about a "cleaner" future free from heavy lifting and the oil, fumes and bad smells of old machines get entangled with worries about whether the machines will completely take over one´s job, the complexity influences whether employees feel they can accommodate these futures.

"All-times"

Another temporality revealed by the analysis is what we have called "*all-times*". This a temporality that defines digitalisation as a basic term – a term that is so fundamental that it influences everything else. It conveys a temporal landscape that covers everything and is always present. This may be geography/locations, relations, work processes, products, clock time, hierarchies, professional identities, etc., and explains why the temporality is called all-times – it cannot be overlooked. This temporality implies an understanding of technologies as actionable entities that may create change, innovation, better processes, etc., everywhere and all the time, and as such expresses a form of technology determinism. The temporality is based on an a priori understanding of technologies as those circumstances or courses of power which always (all-times) create the best and most rapid results. One example we find in our data is the general optimism on behalf of technology that can be seen among managers and employees in the enterprises, and which is visible in the strategic priorities and related dreams about the future on competitiveness and product development. However, there is far less focus on some of all-times´ effects on the work environment and questions like: *How will the new digital work processes influence cooperation or professional identities?* Or recruitment: *Are we able to recruit the competences we need?* Or retention: *How do we most successfully manage skills development within the new organisation?*

In the present research project we understand the temporal landscapes "futures" and "all-times" as narratives that express attitudes on the concrete practices and potentials of digitalisation, and which contribute to the reorganisation of the work under the digital transition. They condition how the demands of digitalisation are met by employees and managers – and why "futures" and "all-times" may contribute to both limiting and supporting digitalisation.

Narratives on digital transformation: Voices from the field

"There is no doubt that younger people find it much easier to learn computers and so on, than older people do."

"I think that if we say that the elderly cannot learn to use digital technology – then it quickly becomes a self-fulfilling prophecy, doesn´t it? It may well be that this is more difficult for the elderly, but then these difficulties can be reinforced by such stories about the elderly. However, these narratives arise automatically, whether you want it to or not." (interview, December 2022, middle manager, SME).

Agencies of change – who has the power to act?

During digital transformation the technology itself is often the turning point. The focus of for instance policymakers, enterprises, managers, and employees is "the new" – that is, the technology to be implemented, and the technology that will innovate and change, create agility and effectiveness, etc.

As mentioned above, the research of this report is informed by a non-technology-deterministic perspective on the working life (Plesner & Husted, 2019; Wajcman, 2017). Consequently, digital technologies are not viewed as having inherent qualities that in themselves lead to change, innovation, streamlining, etc. Within this perspective, digital technologies do not have wilful power to act. The action and the potential innovation and change rather happen when technologies are entangled with concrete organisational practices, existing policy in the field, power dynamics, and work environments. This understanding is based on the above-mentioned theory on sociomateriality (Orlikowski, 2007).

A consequence of this theory is that the power to act does not "belong" to anyone. What is important in the various interactions and situations between humans and machines is not a given – it is the entanglement that happens between the technologies and other human and non-human actors in the surroundings that decides how digitalisation is unfolding. This perspective on the relation between people and machines implies that what is having agency, and thus the power to act, is a local matter and subject to change. A legitimate question to ask for any enterprise is: *who or what has the power to act in this situation, and how does it influence how our organisational change is implemented and owned?*

Figure 7 Example of non-human actors

IN BRIEF:

"Agency" is related to the many factors that influence the digital transition in a concrete situation. Some will say that the technologies are the agents of change, while others maintain that people are the agents of the digital shift and decide how employees do their tasks. Our investigation revealed that the transition is influenced by additional factors: e.g. 1) installed digital technologies supporting work at the assembly line create a limbo between two labour periods: "the control tower" in old manufacturing plants gets redundant. Or 2) assessment based on "tacit knowledge" on when a component is "correct" or a process is finalised, is necessary to monitor digital processes.

The agency of architecture

Our data identifies two agents that influence organisational change. One of these we call the *agency of architecture*. This agency becomes visible and obtains influence on the work design when new technologies "move into" older plants and buildings with traditional interiors. For instance, in our data we can observe an architecture and interior design that mirrors the work processes of old – a previous machine age – and that will "create noise" today since the architecture limits the way digitalisation may unfold and be practised. Matched with new technology, the old architecture gains the power to act, since work processes and other forms of work design are partly steered and accommodated by this architecture or interior design.

Examples of this aspect are the "control towers" or "glass cages" placed in the middle of the plant floor, which earlier functioned as places where middle managers could supervise the plant and follow the rhythm of the production, the employees´ productivity, etc. This kind of architecture may not serve any purpose today, as modern enterprises value mobility, self-management, and networking, and where manufacturing is supervised through the user interface in a digital artifact. The architecture is a type of remains within which the new machine age has developed. It may potentially create security by offering familiar interiors and practices during a gradual process into which "the new" is introduced. However, it may also offer an insecure atmosphere, since employees may have trouble identifying which logics and practices are the most legitimate. Is it the logic of digital systems related to mobility and self-management, or is it the middle manager in the "glass cage" that organises and steers work processes and progress?

By pointing to the agency of architecture as an aspect that during digitalisation reorganises and conditions the work, the present research underlines that there are effects to consider, whether the digital is developed within the architecture of an earlier machine age, or whether the digital is part of the development of an entirely new architecture.

The agency of senses

Another agent identified by our data is what we would call *the agency of senses*. This agency deals with the tactile senses of employees´ trained sensory apparatus that are set in motion in the meeting between machines and humans, and which challenge the precision of the machines. Examples include the sound of an element that is correctly placed in a constellation, or the sensation in the hand when touching a component that tightens or slides when it is being adjusted or screwed into for instance a machine spare part. The hand´s internalised tacit knowledge

(Nonaka, 2008) on when a component is placed "correctly", and with the correct angle, is a bodily sensation that is noticeable e.g. in the fingertips, developed through years of experience, and which influences the organisation of the interaction with technologies.

What our analysis has found, and what is materialised, is the agency of the senses in the interaction between humans and machines. What we can identify as being a part of the reorganisation of the interaction between people and machines, includes to a large degree employees´ tactile senses that are developed through year-long experience. These are senses that current technology cannot replace, but by which it is corrected. In this finding our research underlines that sensory knowledge is still relevant, and in interaction with digital technology this type of knowledge contributes to the reorganisation of work in a digital transition process.

TRANSITION TIP
In an enterprise it may be a good idea to be aware of how the interaction between humans, machines and architecture can contribute to supporting digitalisation.

In the present research project, we can observe the agencies of change as co-creators in the digital transition. This co-creation is important for the interaction processes between humans and machines. In this way, what has agency conditions how digital transition is executed locally. The agencies of change thus influence how digitalisation is supported or limited. In an enterprise it may be a good idea to be aware of how the interaction between humans, machines and architecture can contribute to supporting digitalisation. Our specific analytical findings on architecture and senses show how agencies of change can delay the transition, for instance if they create insecurity, and support digital transition, if different knowledges are prioritised when humans and machines interact.

Agencies of change – who has the power to act: Voices from the field

"When it comes to inspections and things that have to be done, there are a number of things that still have to be done manually. There is no digital system that can determine whether this is good enough in terms of quality when it comes to certain aspects." (interview, December 2022, middle manager, collaborating SME).

IN BRIEF:

Digital transition is not either good or bad, efficient, or inefficient. Our study reveals that both "strengths" are present at the same time in the work process. For instance, technologies create better conversations since smartphone messages overcome the distance between employees. However, if the recipient misunderstands the message, technology contributes to delaying the process.

Digitalisation creates "less" work because the robot arm can do the task, but also more work since the robot system leads to employees having to do new tasks like coordinating, programming, evaluating, supervising, etc.

Duplicities and ambiguities

As mentioned above, organisational life during digital transition is complex. This is materialised through specific narratives about digital aspects, but also as discursive *duplicities and ambiguities* in the digital approach, and this may result in tension.

By tension we mean potentially opposed movements in practice, where our analysis has found that digital transition appears as a "clash" between two or more ideas, demands, possibilities, strategies, wishes, etc. This is seen when interaction with digital technologies on the one hand is perceived as creating better conversations, products, and processes, and on the other hand contributes to fewer conversations, muddled processes, etc. The patterns of discursive duplicities and ambiguities show how interactions between technologies and humans both contribute to improvement and overclouding. Both "strengths" are present at the same time. According to theory on organisational paradoxes, tension, and dilemmas (Putnam et al., 2016; Smith & Lewis, 2011) this may lead to difficulties in management processes and delayed reaction time during organisational change (Fairhurst & Putnam, 2014).

By consulting organisational theory to better understand these tensions that are created by ambiguity, including the effect of their simultaneous presence, we may discover the "power" that these strengths possess. This is not a manifested power, but rather something that floats and creates specific rooms of manoeuvring. Some actions or attitudes are made possible and are legitimate while others are less probable and non-legitimate. For instance, an employee or manager may think it is non-legitimate to question the digital development, when it is simultaneously experienced and discussed in the enterprise as something that improves practice,

productivity, growth, etc. The transition is thus full of tension, which is why it becomes relevant for enterprises to *develop a repertoire of approaches and strategies* when navigating this issue (Putnam et al., 2016).

Consequently, it is often not sufficient to send employees on external courses to develop their digital skills. The paradoxes of transition demand that enterprises make several efforts, including the development of ways in which employees and managers can get the opportunity to relate critically and reflectively to *both* possibilities and challenges in the transition. Such approaches could potentially contribute to creating a collective attention towards what is "muddled" as well as what "shines".

Digital technology creates better conversations, but simultaneously too little conversation

An example of the duplicity that has been materialised across the data of this project is the communication on manufacturing that digital technologies facilitate. This includes the use of specific apps on telephones and tablets that makes communication between employees and between employees and managers possible, who in earlier machine ages would not communicate. Likewise, the communication features of programmes that in real time register the presence of a product within a production flow, and automatically update managers or customers on the flow, challenges related to the flow, and when the flow is expected finalised.

This is a form of communication that reorganises the work by providing new processes that have various effects on practice - effects that sometimes are ambiguous and thus may be perceived as containing tension. One example is how, on the one hand, digital technologies are described as something that support direct communication. The technology contributes to a practice where employees through an app can bypass various barriers and communicate (directly) with the one colleague who is responsible for the quality testing or approval of a product. At the same time technology is described as something that removes direct communication. The use of technology results in employees and managers engaging in real communication face-to-face less often than before. In this way, technology is described and experienced as an aspect that contributes to a loss of human relations with consequences for collegiality and employee well-being (*removes* direct communication), while simultaneously being an aspect that supports more targeted communication, "better" conversations, and potentially more time-saving communication (*creates* direct communication).

Digitalisation creates “less” work, but also more work

Another duplicity or ambiguity that has materialised from the data, and which contributes to conditioning the transition, is related to the work burden of digitalisation. Several processes and the daily coordination of work tasks have become more streamlined – for instance through the example above on communication apps. As the example indicates, it has in many instances become easier and less work intensive to reach the correct employee, or coordinate the work tasks of employees, between employees and managers, and between the enterprise and the rest of the world (clients/authorities, etc.).

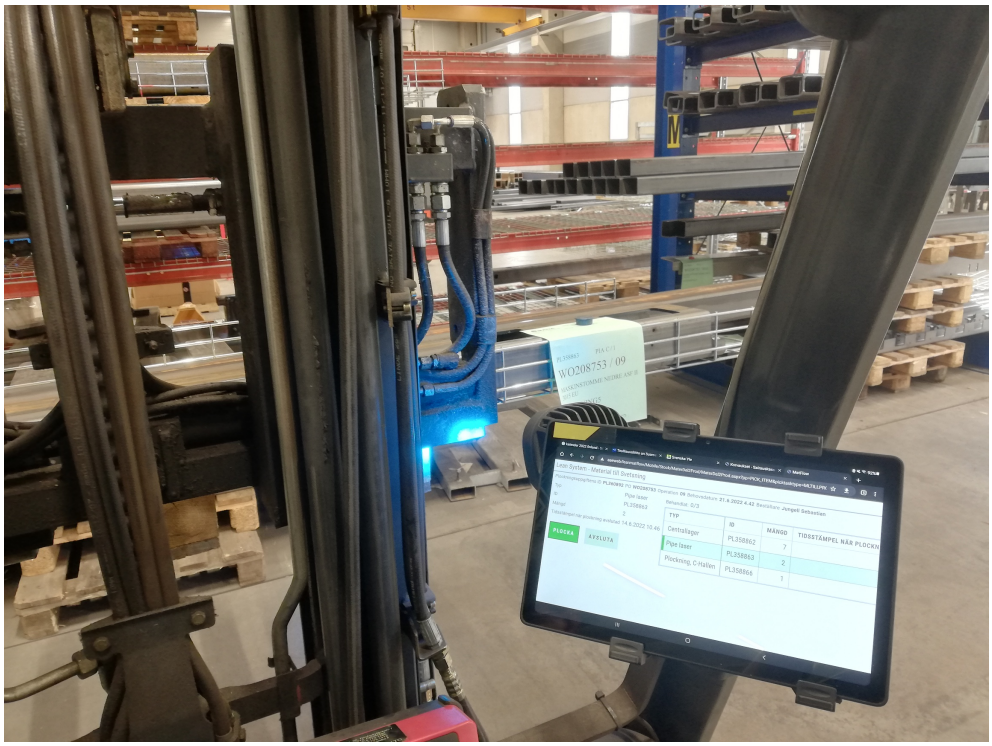

Figure 8 Example of “more buttons – more tasks”

Digitalisation is however also perceived as something that creates more work for the employees. The same app that creates more streamlined processes also makes it possible for the employee to initiate several types of tasks. Concretely, the many possibilities of the app are summed up in the slogan-like *more buttons – more tasks*. The more buttons the app possesses, the more possibilities it embodies for extra work tasks – tasks that earlier may have been the responsibility of other employees in the enterprise. These tasks may include administrative tasks like online registration, coordination, and communication on a product. The app thus makes some processes easier and creates less work, but simultaneously the number of work tasks increases, something which is not always clearly visible. This results in a reorganisation of the work.

This duplicity of "easier processes" and "increased work burden" may be perceived as full of tension since an employee may not want to highlight the extra work when other processes have become more agile. A tension is created that is being *individualised in the employee*, unless the enterprise recognises this tension and the "invisible" work.

We understand duplicity and ambiguity and the tension they create as co-creators of digital transition, because they contribute to creating specific rooms for action. These rooms may be difficult to handle because digitalisation both muddles and simplifies, clouds over and improves. These duplicities and ambiguities thus produce a complexity that makes it difficult to find the correct solution or the correct form of upskilling of employees.

TRANSITION TIP
Enterprises may want to *develop a collective awareness on "the new normal",* where tension is part of the daily interaction with technologies.

This aspect is however not to be understood as our research arguing for a dismissal of ambiguities in enterprises. This, we think, is not possible, and secondly, not useful. On the contrary, our research highlights that enterprises may want to *develop a collective awareness on "the new normal",* where tension is part of the daily interaction with technologies.

Duplicities and ambiguities: Voices from the field

“On one side digitalisation leads to more direct communication between the employee and the person in the company who needs help or needs some information. You don´t have to go through several layers, so less work. However, one of the downsides is that this smartness also creates more work – the more buttons on the machine the more tasks the individual employee has to do himself.” (focus group, July 2022, SMEs).

This present chapter discusses three analytical themes generated by the empirical data: narratives, agents of change, and duplicities and ambiguities.

These themes project a part of a view on working life during digital transformation. However, the themes analysed are not necessarily aspects that can be found in all enterprises, but they illustrate one of the research project´s ideas on how an enterprise can develop a curiosity for local circumstances that condition (bound) change.

TRANSITION TIP
Enterprises should develop a curiosity for local circumstances that condition (bound) change.

3.4.2. Blended digitalisation circumstances – organisational factors

While bounded digitalisation circumstances describe the organisational factors that condition change, blended digitalisation circumstances describe some of the organisational forms that develop when human and non-human actors entangle, and by this entanglement obtains the power to act and thus reorganises the work in new ways. In the present project these organisational forms consist of two themes which we through our analysis find are characterised by specific qualities: transfers as new permanent practice, and the transition of organisational phenomena. The specific qualities describe the "presence" or the unfolding of the themes in an enterprise and may influence how an enterprise works on or navigates within the digital transition. This may for instance be related to financial priorities on organisational learning and choice of upskilling pathways.

The analytical findings below are presented in a random sequence – the presentation of the themes and their qualities are not listed with the most important or most significant first.

Transfers as new (permanent) practice

As the concept digital *transition* implies, society as we know it is changing. It is a gradual change, but it can be seen as quite radical since the finishing line is moving, as are the requirements for adjustment and upskilling. It is a process characterised by transfers to something else, but at the same time it can be observed as entangled with existing and known practices and processes. Within anthropology (Van Gennep, 1901/1960) transfers are sometimes described as liminal phases. These are phases that originally referred to temporary conditions like for instance the transfer from child to adult: a person has left childhood but has still not become an adult and is therefore in a liminal phase – a waiting "place" marked by past experiences, today´s circumstances and ideas about the future. Researchers on organisations have developed this liminal notion and conceptualised (Borg & Söderlund, 2015; Dille, 2022) it as a much less restricted phase. "The liminal" is understood in a more procedural manner and thus as a constant transfer phase.

In the present research project, we understand digitalisation as an example of a constant transfer phase because it is viewed as a transition that is perpetual in its creation, since the development never ends. *Enterprises are in a permanent liminal phase*, and "transfers" are thus the permanent new practice in the so-called fourth industrial age – industry 4.0 (Liao et al., 2017), in which enterprises must learn to navigate. We observe these liminal states as various transfers that are continuously visible in practice, and to and against which employees and managers are to orient themselves. These transfers contain certain qualities that may describe how transfers appear.

IN BRIEF:

The idea that transfers will stop will probably never be a reality. Digitalisation creates changes in the machine flow and the manual tempo in an enterprise: transfers from static to mobile processes, manual slowness as opposed to machinery. Change and transfer are the new normal. Work design and matching qualification requirements change rapidly; they create an upheaval that must be handled on a personal level. Changes may be perceived as taking "two steps forward and one step back".

In our data we find three qualities, and one of these relates to the quality of *displacement*. This quality refers to how the primary content of work *changes character* during digital transition. Concretely, this entails for instance a displacement from primary experiences to secondary experiences. By this we mean that our data finds transfers from primary experiences on manipulating an element or component (make holes, grind, drill, and knock) to monitoring a digital steering and mechanical manipulation of an element or component – which is a secondary experience. Monitoring may be characterised as a secondary experience since the employee only supervises a machine that is programmed to manipulate an element, and the manipulation is thus secondary. This displacement may also be defined as a transfer from a tactile level – touch, feel, and sense – to a form of virtual level.

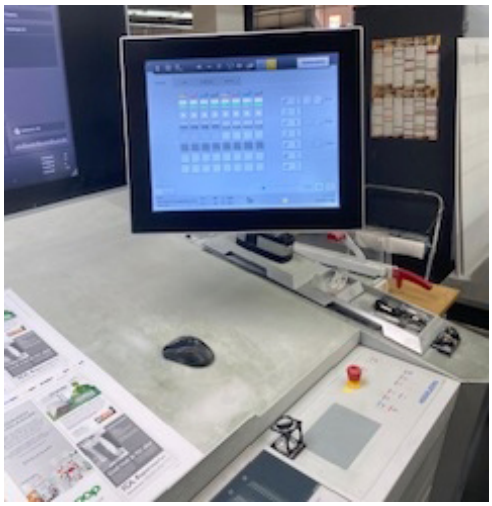

Figure 9 Example of a monitored process of mixing materials

Another quality that characterises the organisational form of transfer is *non-progressivity*, that is, processes that are not progressive. This quality typifies thus *the process itself* in the digital transition, and efforts enterprises make in the transfer from one machine age to another. Our data shows that the non-progressive is a quality within these transfers since the transition typically does not happen in a linear manner. Development does not happen in a continuous and progressive process but may rather be described as "two steps forward and one back". This is for instance obvious in the way enterprises use automated robot arms to execute a task but are dependent on manual experience and internalised tacit knowledge for the assessment on whether the task is performed correctly, or if the manufacturing process must be stopped.

A third and last quality that we can find in our data deals with temporality that is, a specific "*flow*" that is connected to the transfers that become visible during digitalisation and which influences the work tasks and activities to be performed. This may for instance be the constant "hum" of the machines, or specific discourses in the enterprise on growth, pace, and speed, or large, heavy machine robots in the manufacturing hall, that set a specific flow. As discussed in the previous chapter, temporality as a quality does not refer to any form of quantitative temporality, or linear time that is measured in hours, days, and weeks, but to experienced time. One of the temporal qualities that we can observe, and which is related to transfers, deals with a specific progression temporality. This temporality is synchronised to requirements and expectations on optimalisation and efficiency. It is a temporality – as such a specific flow – that entails giving some activities and work tasks a new meaning. This may for instance be in the transfer from static processes, where the employees typically stand at the same workstation/machine and perform the same type of task and activity, to mobile processes. In mobile processes the employee moves around between several workstations/machines and may, thanks to new monitoring systems and tablets, have the responsibility for several stations, and thus, because of his or her mobility (and speed) monitors or steers the continuous "manufacturing hum".

Another temporal transfer quality that we find in our data co-exists with the identified progression temporality. It characterises a form of "hand temporality" – the specific flow that is contained within soft touches, adjustments, and fine motor skills to produce and refine a product. It is a temporality that is synchronised to the listening of sounds and the sensing of the room temperature and their influence on the manufacturing components at work. It is also a temporality that is developed through conversations between partners on angles, anomalies, specific manual challenges, etc. It is a temporality that in its unfolding usually is characterised by slowness and as such may compete with the pace, efficiency, and speed that mark the progression temporality´s direction towards efficiency.

TRANSITION TIP

Discuss some of the transfer qualities with the employees to strengthen their participation in the transition. Instead of walking "behind" the transition they can get the opportunity to walk "alongside" and contribute with valuable insight from their lived experiences.

When an enterprise during digital transition finds itself in a permanent liminal state where transfers to something else is a new permanent practice it may be meaningful to investigate what characterises these transfers, and what kind of influence they have on the degree of digitalisation in the enterprise, including the opportunities of employees to remain in the working life. In this way enterprises get the opportunity to access and explicitly reflect on some of the challenges that digitalisation brings. They may for instance have talks with employees on some of the qualities of the transfers and thus strengthen the employees´ participation in the transition. Instead of walking "behind" the transition they can get the opportunity to walk "alongside" and contribute with valuable insight from their lived experiences. These include insights into some of the effects that happen when people and machines entangle.

Transfers as new (permanent) practice: Voices from the field

“New technology is now being introduced, which requires a great deal of new knowledge from those who will be working on the floor. This results in greater time pressure at various points. With the new computer technology being introduced, it is important that everything works all the time – because there must be no downtime in production. It is a very fast pace when the new technology is adopted”. (interview, December 2022, managers, SME).

Change of organisational phenomena

Digital transition entails, as the concept implies, a change that has the digital aspect as a turning point. These changes result in new skills requirements or routines, that must be cultivated in the organisation. Digitalisation happens, however, in the tension between adjustment levels – that is, changes – and a true transformation – that is, an alteration or conversion of practice. According to research on digital organisational processes, we should pay specific attention to changes (Plesner & Husted, 2019).

The ways changes appear in organisations take many different forms. Completely new organisational forms can be seen, like for instance transfers becoming a permanent new practice, as discussed above. Another new form of organisation is the change of what we may call "classic" organisational phenomena like *hierarchy, professional identity,* and *legitimateknowledge*. Those are phenomena that through human and non-human actors´ entanglements are changed and understood in a new way.

IN BRIEF:

New constellations happen between digital technologies and knowledge in organisations, that challenge established hierarchies between employees and management. Technologies are for instance used to share information across employee and management boundaries. This shared insight has the potential of shaping the way decisions are made. The definition of legitimate knowledge favouring "IT-brains" is recognised, while manual skills are taken for granted. The shift from manual production to a function of monitoring and touching digital screens creates a transformation of professional identity from being in charge of one´s job to becoming a digital novice.

Hierarchy

Our data shows that the entanglement of human and non-human actors reorganises a phenomenon like *hierarchy*, since the divide between employees and managers becomes blurred. We can see an example of this in the new digital cooperation technologies. These technologies contribute to the sharing of information and the possibility to get an overview of processes, giving employees "on the floor" an opportunity to give comments to management and thus potentially influence managers´ communication to customers, how resources are prioritised,

and other acts of management. For instance, it is possible to imagine that managers, informed by the insight made possible by technologies, choose to adjust a manufacturing process, since the employees´ opportunities for giving immediate feedback have made it clear that this specific manufacturing process delays the process, seems illogical, etc.

This means that the conventional lines of command sometimes change, and new rooms are created in which employees and managers can cooperate, which again leads to a revision of the enterprise´s classic understanding of organisational hierarchy. This does not mean that technology on its own contributes to better cooperation, or flattens hierarchies, when the employees get better opportunities to influence management. In some contexts, classic hierarchical structures are challenged, and employee participation is increased, in others the opposite happens. Even if our data finds that digital technologies create a change in the phenomenon hierarchies, it does not mean that technologies per se create more "equal" work relations and less control, only that relations are shaped in a different manner that results in a change of hierarchy in various ways. It means that the change indicates a transformation of hierarchical processes dependent on context and other socio-organisational factors, of which technology is a part.

Professional identities

Another change that we can extract from our data, and which reorganises the work by creating new processes, is linked to *professional identities*. This change is revealed when employees on the one hand experience some form of "deskilling" (Zuboff, 1988) and get the impression that technologies are taking over more and more of their work tasks, but at the same time have an expectation of "upskilling" (Zuboff, 1988). As such, this is a requirement to continuously re-qualifying their skills and routines. This "double pressure" of losing some of one´s usual work tasks and having to renew oneself can be seen as a change of professional identity. One example may be a vocational identity, which earlier was the dominant one in the manufacturing industries, that *gradually* changes into an IT-informed identity due to the double pressure discussed above, and thus in the long run experiences a real transformation of professionalism and a new professional identity. This transformation takes place for instance when new technologies require new forms of interaction between humans and machines. This may be a form of interaction characterised by the monitoring of technical processes (supervision) via a digital display, and the mastering of a simple coding language to initiate mechanical production (programming), rather than the execution of manual manipulations of an element/a component (grind, drill, adjust).

Some employees experience this professional shift as natural and as an exciting opportunity to learn new skills and obtain new professional competence. Others experience a loss of identity, legitimacy and meaning, and thus see this change as a struggle or as a great effort, contributing to a feeling of displacement or of no longer being valuable. These are topics identified in literature on professional identities (Brown, 2015), and which form the basis for the European Commission´s new value-based approach to digital transformation – industry 5.0 (European Commission, 2022).

Legitimate knowledge

A final change we have identified in our data is related to what is seen as *legitimate knowledge* in the organisation. The shift in legitimate knowledge is connected to professional identity, as the understanding of what is the most valuable or powerful knowledge has changed from "the knowledge of the hand" to knowledge about IT. This shift from the vocational to the IT-related is not directly related to the transition process of each single employee but is rather related to the internal negotiation process on what is the most important aspect of an enterprise. This aspect is defined by management in for instance financial priorities, recruitment, courses provided, topics that are discussed in meetings, and the words that are being used when talking about quality and processes.

What is "legitimate" is also defined by the employees, when for instance colleagues with specific skills are labelled "IT-brains" or "IT-experts". However, it is also defined by the design of the physical manufacturing environment and for instance the relationship between the number of large, digital machines and humans (rooms empty of people), robot arms, displays, sounds of machines running, etc. In this way legitimate knowledge is something that "floats" in the organisation and is being negotiated between all these human and non-human actors.

Change of organisational phenomena: Voices from the field

“When you go from being the one in control, to suddenly becoming the one who can´t do anything right – the one who constantly must ask for help. It´s the same as when we old people start peeing our pants – a bit degrading, in other words (interview, December 2022, employee, SME).

The present chapter presents two forms of organisation that the empirical data has generated: transfers as new (permanent) practice and change of organisational phenomena.

The forms of organisation partly describe an image of the working life, and thus draw the contours of the digital transition even clearer, as these new forms challenge classic positionings in hierarchies, professional identities, and legitimate knowledge. This working life image offers insight that may be relevant for the ways enterprises, including employees and managers, navigate and make priorities in the digital transition. This may for instance be in relation to which fields of knowledge are being weighted, which employees are being recruited, and how employee well-being is being supported.

3.5. Summary of research findings – a working life image

As described above, discussions on digitalisation are often related to whether this transition contributes to job loss or new employment opportunities. Without contesting the relevance of these discussions, the focus of this present research project is elsewhere. In this project we have concerned ourselves with investigating the *change* itself and how it concretely is revealed in the working life, as well as its effects. We have done this by using sociomaterial optics to analyse the concrete *interaction between human and non-human actors, that conditions and reorganises the work*, as well as focusing on how employees and managers create meaning related to this interaction. This research approach may unfold something new since digital transition is an open process where nothing is decided in advance – neither technological utopias nor dystopias.

An approach to transition as an expression of human and non-human processes that are entangled, offers an opportunity to investigate it "holistically". Thus, digitalisation itself is not explored, solely the contexts of which it is a part. This approach opens local effects and thus the consequences that the transition brings into the manufacturing enterprises. Some consequences belong to what is called the dark side of digital transition. Our analysis finds examples such as struggles with identity and the growth of specific bias in the organisation, or ambiguities that muddle employees´ experience of and access to the transition.

An important point in the analysis is however that these work reorganisations are from the start not viewed as "good" or "bad", but they are always "political", that is, *not* neutral. They are conditioned by specific organisational factors and shaped by specific forms of organisation that influence for instance employee well-being, communication flow, cooperation, recruitment, and which could have been different. As such they are reorganisations that enterprises may choose to *change*, given any unwanted consequences.

In the analyses we have identified relations and factors that influence the interaction between humans and machines. The analytical findings reveal local versions of digital transition, happening as gradual adjustments. The findings highlight that employees have valuable insights through their direct experiences with interacting with technology, that may support a transition process and potentially create stronger ownership of the process among employees. Finally, the findings uncover that enterprises may benefit from an increased holistic view on skills development during digital transition processes. Overall, the context phase results in findings that are in the enterprises´ interest to better understand to create evidence-based approaches and financial priorities on organisational learning and selection of upskilling pathways. In this way the analytical findings contribute to the discussions on how digital skills development could be handled.

4. The lab phase: designing suggestions for solutions

In the lab phase the objective is to develop a design for new learning practices with the findings from the context phase as the starting point

In this process we focus on involving relevant actors that may confirm, challenge, or nuance our research findings and early ideas for solutions. Concretely, this entails a dialogue between the research team and several stakeholders and experts within digitalisation and working life, through the NVL Digital – Working Life network and by attending conferences. In these arenas we have presented tentative findings from the context phase, that inform the proposed design framework and our main ideas for a solution. Through design iterations (dialogue with network/conferences) we have developed a mock-up design for a new learning practice, that will be further presented below. In this way we have translated the research findings presented above to concrete suggestions for solutions.

Our mock-up is the result of iterative movements between the DBR model´s three first phases: the context, lab, and intervention phases, and is as such a collaborative result co-created by researchers, participants from practice/enterprises, experts, and stakeholders. The intention behind this mock-up is to contribute to enhancing Nordic enterprises´ current skills development practices within the digital transition, the level of digitalisation seen in enterprises and the opportunities of employees to take part in the future working life, by implementing a holistic view on change. However, it is important to highlight that the design of a final solution is *not* within the framework of this research project.

4.1. Methods we use in the lab phase

Vignettes

Vignettes are vivid and atmospheric brief stories created on the basis of empirical data (Dille & Plotnikof, 2020; Ericson, 1986; Jarząbkowski et al., 2014). During this research project we have made two vignettes that build on data collected via field visits to manufacturing plants in Denmark, Sweden, and Norway, as well as data

from two virtual interviews with Finland and Iceland, respectively. The vignettes are small "portraits" that describe tension or topics that are specifically condensed or "vibrant" in the data set, which we during analysis have identified across geographical locations, job titles, and types of manufacturing enterprises. It is important to underline that they do not represent the reality of only one enterprise, or only one employee, but are constructed based on several data collections, impressions, informal chats with participants in practice, as well as stakeholders from the NVL Digital Working Life network. They are furthermore informed by relevant theory on for instance identities or narratives.

Vignettes are powerful stories that offer authentic insight into the realities of participants and create a possibility for the reader to experience the field – at least partly. They are specifically valuable in the showcasing of muddled or entangled relationships between empirical themes and theory, as well as exposing data that is not text-based and thus more contextual, tactile, and emotional. Vignettes are inherently more than just reproduction of what has been said or seen; they are rather a theoretical retelling of a returning or "critical" topic.

In the development of our design idea vignettes are a part of a dialogue tool made available for enterprises in the digital transition, which will make enterprises capable of better understanding some of the local consequences of the change and thus develop strategies for continuing skills development as well as the creation of opportunities for employee participation in the transition.

4.2. Mock-up: vignettes as a dialogue tool in the digital transition

The mock-up in this first design iteration is shaped by two vignettes produced by the research team. The vignettes were developed immediately after the thematically inspired analysis (cf. previous chapter) and following a dialogue with the NVL Digital – Working Life network on the tentative findings of the research project. The topics of the vignettes were identified from some of the categories that the preliminary coding generated. The topics selected were, as discussed above, themes that were visible across data and thus created from several different contexts. There is not any specific employee/manager or enterprise that is the basis for the individual vignette. The vignette describes, rather, a topic that is identified across data sets.

The purpose of the vignettes is to create a dialogue tool for enterprises to support them in their understanding of the consequences of digital transition for employees and managers, and as such create an opportunity for enterprises to change, adjust, nuance, or re-prioritise specific initiatives or strategies for their local digital

transition. As highlighted by the analysis, there are several organisational factors and new forms of organisation that have effects that may delay and speed up the transition, which is why it may be interesting for enterprises to be curious about these factors.

The dialogue tool is to be viewed as *a local in-house initiative and supplement* to sending employees to upskilling courses, and as a way for employees and managers to relate critically and reflectively to opportunities as well as challenges in an enterprise´s transition. It is a tool that aims to *create shared scenarios on the future* and support the digitalisation level of enterprises by involving employees as informed and resourceful actors with deep knowledge on local transition practices. In this way both employees and managers may "be ahead" of the development, and employees may play an active role by contributing with solutions and ideas for improving the various parts of the transition. Potentially, it creates fertile ground for innovation and growth, as well as more possibilities for participation, that may have a beneficial impact on employee well-being. The tool thus contributes to *creating a collective awareness* of the digitalisation level of the enterprise and the possibilities for employee influence. It furthermore supports another point of the analysis, which is that enterprises should have a broad repertoire of strategies when planning and making priorities on future digital transition.

TRANSITION TIP

The dialogue tool is to be viewed as *a local in-house initiative and supplement* to sending employees to upskilling courses, and a way for employees and managers to relate critically and reflectively to opportunities as well as challenges in the enterprise´s transition.

The testing of the first iteration of the vignette tool (unfolded in the next phase) identified a need for a version of the tool that gives the possibility of creating concrete local stories. Based on this, the tool developed into having two parts: 1) a dialogue tool with "generic" vignettes produced by the researchers, and 2) an invitation to explore the stories of the individual enterprise. The first iteration thus resulted in our concrete development of a mock-up of the dialogue tool´s use and design.

4.3. Suggestions for the dialogue tool´s use and design

The tool is designed for concrete use in practice and can be applied for instance in performance and development interviews or other "meetings" between employees and managers. *The tool can be used across the manufacturing sectors*, and it is as such not developed for a specific industry. It is applicable for all types of enterprises that are in the middle of a digital transition process, and which are seeking knowledge on some of the local circumstances that may influence the process, positively and negatively, as well as on how to ensure the participation of all employees to create and profit from a more extensive employee endorsement. The tool has an inherent perspective on the future, as it aims to support employees and managers in their collaboration to achieving a deeper knowledge of the consequences of digital transition. The goal is to sharpen the future connections between practice knowledge "from the floor" and the strategic ambition "of the offices".

The dialogue tool consists of *two elements* that taken together constitute a "package" that will support the digitalisation level of enterprises and employees´ opportunities for continued participation in a digitalised labour market. The individual elements can be applied on their own or used as a two-step rocket. The dialogue tool consists of:

ELEMENT 1: *Evidence-based vignettes* on the working life during a digital transition, where managers and employees jointly read and discuss one or several selected vignettes. In its final version the tool consists of 10 pre-produced vignettes that, based on research on digital transition in the working life, address various topics and tensions related to this transition. The manager and employees jointly select the/those vignette(s) that seem relevant, for the employees or the manager, for the specific company circumstances of which they both are a part. The vignette aims to create a dialogue on some of the possibilities and challenges that may be difficult to spot or discuss during a hectic workday. An important point related to this element is that the vignettes are *not* personal stories, but stories that according to research relate to a reality. This is important since it offers the opportunity to discuss difficult or muddled themes that an employee may not want to be associated with one´s personal story, but that still are legitimate stories since they contain topics and tensions that are identified by research within that domain.

Evidence-based vignettes

***Stories as effective drivers** (employee and management perspective)*
Organisations sometimes contain "stories" about management or a specific group of employees. These are stories that are told and shared by everyone, often without an actual owner or a clear messenger. They are abundant in formal and informal happenings like for instance during coffee breaks or over lunch, like jokes, in meetings, or just as "internal" stories in people´s heads. Often, these stories convey implicit prejudices that influence how we see or understand each other.

Linked to the digital transition there are specific stories about senior employees or unskilled factory employees. These are stories told by both management and colleagues, describing these employees as uncommonly "conservative", as someone who struggles with the digital transition, and often as someone who is not equipped to handle new technology. These are stories that narrate a general resistance from employees "on the floor".

Stories that are told in organisations may both delay and speed up the digital transition. For enterprises in a digital transition, it can make sense to be curious towards the stories we tell ourselves and each other, because they are effective drivers that can create delays by for instance intensifying feelings of resistance. However, they can also advance the transition, in the purposeful work to change implicit and explicit prejudices that influence strategic decisions or the development of new routines or practices.

***Professional identities under pressure in the digital transition** (employee perspective)*
Organisational changes affect many aspects, routines, and practices: the way work is being done, the cooperation between colleagues, the management and communication style, etc. Dependent on the magnitude of the change, it may also influence the way we assess our own skills and competences, which may determine our feeling of *belonging* in the workplace. It is specifically challenging if our work tasks from one day to the next suddenly require something from us that we cannot give yet. In those situations, we can discover that our professional identities come under pressure.

During the digital transition organisational changes are often perceived as comprehensive and "radical". For employees these changes often entail a growing number of work tasks being taken over by machines. Alongside this change new skills are required, that may seem irrelevant to one´s profession and altogether alien. Sometimes these requirements may result in employees feeling "homeless" in their

usual work. They may experience a loss of legitimacy or identity because their expertise and insight are no longer acknowledged as valuable. Suddenly they are not experts anymore, but novices.

Organisational changes are inevitable, and they will always influence concrete work tasks. However, they may also influence the identities of employees who see their tasks being radically changed. Enterprises facing digital transition may find it meaningful to discuss the employees´ potential identity pressures when planning for skills development and consider whether other requirements than technical courses are needed.

ELEMENT 2: *Exploring local practice stories* is an invitation to managers and employees to explore the stories in their own enterprise. It is an invitation to behave like an anthropologist and be curious and investigative about specific topics – large and small – that can be found in local practice, for instance inappropriate or contra productive rhythms and sequences. The tool contains a template with room for comments, ideas, and reflections on specific topics that employees and managers agree on together. Furthermore, it offers an opportunity to write down any agreements on follow-up or other issues that are expected to be handled later. The objective of this exploration is to give both parties an opportunity to achieve insight into what goes on locally. Compared to element 1 (above), that element is concerned with "what goes on" generically, and as such does not necessarily address topics that are relevant locally. This second element in the vignette tool requires a great deal of trust between management and employees on agreeing that the focus of the exploration will be "the issue" (i.e. the transition), and not employee performance. Therefore, it may be beneficial to start with element 1 before the local exploration.

Exploring local practice stories

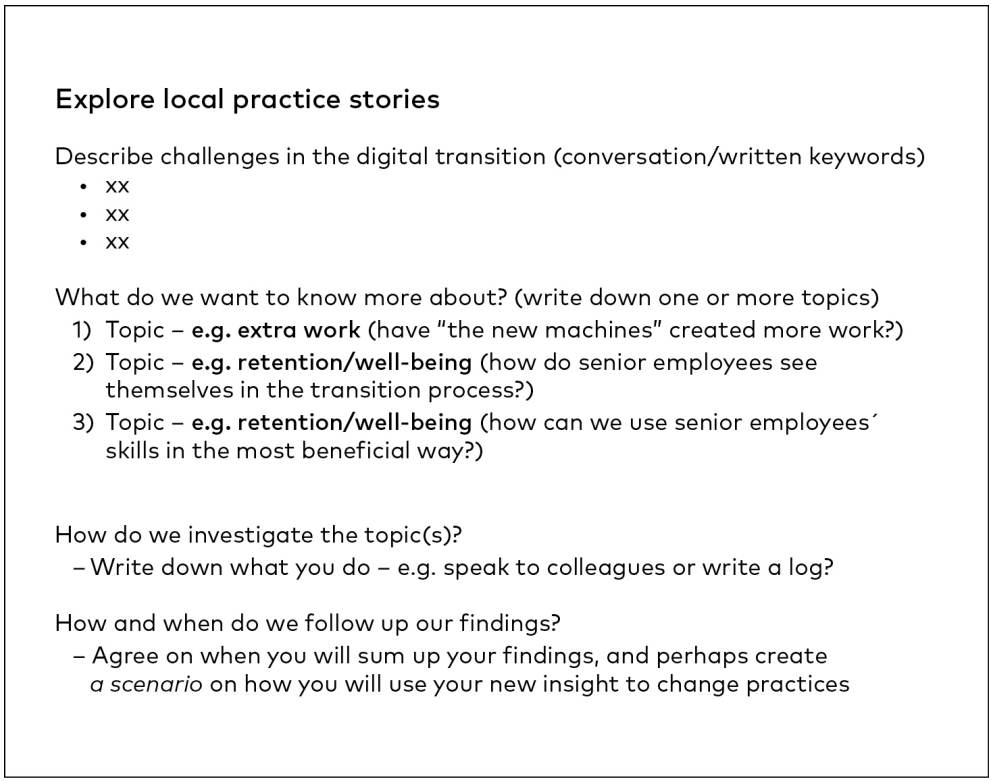

Figure 10 Support questions for local practice stories

5. The intervention phase: testing in practice

In the intervention phase the aim is to involve participants from practice to test and prepare a design solution

The intervention phase is the phase where a design in the form of a mock-up is tested on relevant stakeholders that may be potential users of the final design. In the lab phase the involvement of actors has as its aim to obtain input that may nuance analytical research findings in the idea development and tool drafting, while in the intervention phase the tool´s concept and design is being tested. Tests include usability, for instance whether it is easy to understand how the tool works, as well as practice relevance, for instance if the tool seems relevant for its purpose. Into the research team we have invited some of the managers and employees that participated in the context phase, to test the mock-up developed. We would like to get feedback on how the authentic narratives in the vignettes may work to initiate reflections and conversations in the enterprises. Likewise, the testing of the vignettes should prove their relevance to practice, in whether the topics, that are based on a holistic view on digital transition and skills development, would be recognisable for the users of the tool.

5.1. Methods we use in the intervention phase

Virtual interviews

During the intervention phase of the research project five interviews were held. The interviews had a duration of between 25 and 45 minutes. The interviews had the character of follow-up since all respondents either had participated in the first round of interviews or been in dialogue with the researchers as a part of the field visits. The aim of the interviews was to test the tool solution developed (the mock-up), that the same respondents had contributed to in the context phase (cf. field visits and first round of interviews).

The respondents represented six different enterprises across the five Nordic countries. One enterprise from Denmark, Sweden, Iceland, and Norway, respectively, and two enterprises from Finland participated. We interviewed one middle manager and one employee in the Danish as well as the Swedish enterprise. From the two Finnish enterprises local union representatives participated in the interviews, while from the Icelandic, Finnish, and Norwegian enterprises one manager participated. The five interviews were conducted digitally via Zoom, recording the sound for later use.

In preparation for the interviews, we had distributed via email the two evidence-based vignettes, and a text that outlined the objective of the interview and the vignettes. The research team was specifically interested in whether the respondents recognised the topics presented and the challenges they represent, and whether the vignettes, as a part of the dialogue tool, is a productive tool to use for navigation and making priorities in the digital transition, and thus support future skills development approaches.

5.2. User friendliness: vignette topics of generic character have advantages and limitations

Feedback from respondents made us aware that the pre-produced vignettes have advantages and limitations. The main advantage is that the generic and general form of the vignettes, as they appear in the mock-up, makes it highly probable that employees and managers in enterprises across the Nordic region recognise themselves. However, our respondents highlighted that the same advantage may also be a limitation as the generic vignettes are not concrete or precise enough, and not adjusted to local circumstances. This testing and analysis of the interview data contributed to a deeper awareness of local narratives and resulted in a final design that encompassed these as well. The second iteration of the tool thus consisted of the dialogue tool “exploring local practice stories”.

5.3. Practice relevance: new topics defined by the practice field

As outlined above, one of the aims of the intervention phase is to investigate whether the pre-produced vignettes of our dialogue tool are sanctioned by the actors of the practice field. The respondents confirmed in several ways that they recognise the topics and tensions described.

The vignette "Stories as powerful drivers" was recognised by most respondents and thus exemplifies the worry that various workplace prejudices may turn out to be self-fulfilling prophesies where for instance older employees tell themselves *I cannot do this or understand this* – which potentially contributes to older employees experiencing digitalisation as more difficult than what it is really is.

The vignette "Professional identities under pressure in the digital transition" was also recognisable. Respondents highlighted several nuances of this pressure, for instance shameful feelings related to not being able to master "the digital aspects", and experiences of partly having lost one´s independence through digitalisation, because one constantly must seek help with a colleague. There is an experience of changing from an expert into an apprentice.

In the intervention phase the respondents produced other relevant topics from the practice field, that could be included in the dialogue tool part 1 (pre-produced vignettes). They are briefly presented below:

Work-life balance: This tension relates to how digitalisation contributes to the sliding transfer between work and free time. This topic is not explicitly relevant for employees on the floor, but rather employees in manufacturing companies that for instance experience requirements to constantly keeping themselves updated on new information, also during their free time, or requirements to constantly being available and replying to emails at all times.

Voluntary versus mandatory: This tension relates to the ways training and skills development are designed, and the downwind and headwind factors that may appear if for instance the upskilling is mandatory, or whether it is a voluntary offer.

Increased time and efficiency pressure: This topic is related to the importance of involving employees when enterprises are to embark on large change processes, as well as various changes related to automation and control mechanisms – like for instance monitoring or built-in quality assurance systems.

Simulation as a safe place of learning: This topic relates to the opportunity of using various types of simulations. Through simulations of work processes employees may for instance be given the possibility to learn new technology within a safe environment and in a tempo that fits their personal preferences.

Indirect changes: This topic addresses how the digital transition multiplies itself in the enterprise with small changes in one place influencing something somewhere else. This means that the digitalisation of a task indirectly influences other work tasks, even if they are not connected. This may lead to uncertainty among employees since changes that are not in themselves digital still may be influenced by digitalisation.

As a part of the progress of DBR research a tool´s life continues also after the research project has ended. Within the present project´s resources it is not possible to develop the topics listed above into vignettes. The research team however assesses that these topics are obvious "raw material" for the dialogue tool element 1 in the future (see below on "The future of the tool").

5.4. Vignettes as dialogue tools

In more ways than one, the respondents confirm that they recognise the topics and tensions of the pre-produced vignettes. In general, the vignettes are viewed as good examples of stories that most probably can initiate discussions on possibilities and limitations in the digital transition.[5] The respondents highlight in various ways that the usability of this type of vignettes is linked to how they function as a starting point for talking about and reflecting on company circumstances, that often go "below the radar". The research team also believes that the conversations that happened during the interviews with the respondents illustrate exactly this point. Colleagues being prejudiced and how rapid changes can put identities under pressure are, according to the respondents, good examples of circumstances that are easy to forget or overlook in a busy workday. The respondents also highlighted that a dialogue tool based on vignettes may be a good basis for performance and development interviews, but that translating valuable conversations into action potentially is a challenge in the enterprises.

5. The Norwegian enterprise is the only one among the five enterprises that expresses difficulty in recognising the topics of the vignettes. They do however contribute with ideas to other, and for them more relevant, topics in the digital transition. These are among others listed in the section "Practice relevance: new topics defined by the practice field".

The intervention phase has thus contributed to a nuancing of the problem identification – the working life image and challenges therein – and resulted in a solution iteration in developing part 2 of the dialogue tool: "Exploring local practice stories". This phase has however also contributed with insight into a potential limitation and thus highlighted a need for further development, since a plan for operationalising the output of conversations is necessary if the insights are to lead to more agile change processes, more well-being, and growth.

6. The reflection phase: qualities and limitations

In the reflection phase the robustness of a given solution/tool is assessed

In the current research phase, there is a focus on the robustness of the dialogue tool, and thus its sustainability. This means that we critically reflect on the qualities and limitations a solution possesses, as well as whether the solution is applicable outside the concrete empirical context in which it is developed. This aspect is specifically important in DBR research since we are preoccupied with how the developed solutions can be disseminated and thus enrich other contexts and learning arenas.

The reflection phase includes a form of assessment of whether a solution can be transformed into other contexts, but also an evaluation of the further life of the solution, obvious developments, and upscaling possibilities.

In relation to the present research project this concretely entails a discussion on the qualities and limitations of the mock-up developed. As unfolded in the previous chapters this dialogue tool is the product of conversations and cooperation with participants from the practice field through interviews with employees and managers as well as through observations in the field – that is, observations of the interaction between people and machines in manufacturing enterprises across the five Nordic countries. The development of the dialogue tool has not been linear but is the result of an iterative process between analysis, testing, and adjustments. The reason for this is to ensure that the dialogue tool is as robust as possible and thus able to create the best conditions for its transformation to other contexts.

6.1. Qualities

6.1.1. A dialogue tool that can be used across sectors

One of the qualities of this tool, which we assess as being important in the transferability to other contexts, is its theoretical grounding in organisational theory and sociomaterial theory. We believe that these theoretical perspectives focus on the conditions of which digitalisation is a part. It means that theorywise we concentrate on *the change* (*the materialisation*) itself and all the framework factors

and circumstances in which the change is embedded. This includes of course the specific practices, technologies, behaviour, moods, narratives, designs, hierarchies, professional identities, etc., but with this perspective we can also discover the local effects and implications. It is exactly these circumstances we encourage enterprises to consider. This means that the primary focus of the dialogue tool, and what it does, and that it can be transferred to other contexts, ensure that attention can be given to *local drivers* that both limit and support digitalisation. It is everything that happens "around" the technologies and which is a co-creator of the digital transition.

With "everything that happens around the technologies" we mean that the tool aims at creating a dialogue on those issues within the digital transition that are hard to pin down, and which often are those issues that present themselves in specific ways in various enterprises. Those are for instance issues related to prejudices we have about each other, professional identity struggles, and empowerment of colleagues, but they also include the specific organisational forms that develop and their implications. For instance, if it is locally discovered that a new coordination app creates better (more qualified), but fewer face-to-face conversations, and the enterprise via dialogue learns that this has implications for the well-being, one must make sure that these face-to-face dialogues happen elsewhere. The point is that this dialogue on framework conditions, new organisational forms and their implications must take place locally, and that it is this dialogue that can be facilitated by the tool, across all sectors that find themselves in a digital transition process.

6.1.2. Involvement of participants from practice

Another quality of the dialogue tool, and which strengthens its robustness, is the basis upon which the tool is developed. In several of the research process phases the research team has, as mentioned above, cooperated with relevant stakeholders. These are first and foremost employees and managers experiencing digital transition but also includes a variety of professionals within digitalisation and working life through the networks NVL Digital – Inclusion and NVL Digital – Working Life. These professionals have specifically contributed to the sanction of the domain-specific information in the context phase, but have, during the lab and intervention phases, also contributed with valuable input to the preliminary analytical findings and offered feedback on our mock-up of the dialogue tool (the latter has exclusively involved practice participants). Despite this deep involvement it must be mentioned here that the tool is only tested in one interview intervention in six enterprises, thus there is still uncertainty regarding the tool´s robustness in practice (this aspect will be unfolded during "Limitations" below).

6.1.3. In-house organisational development

A third quality of the dialogue tool is its invitation to "in-house" organisational development. The tool is *not* meant as a product that enterprises can buy for its usefulness, like for instance a new evaluation system, or as a provision where employees are to be sent out of the house for a brief or longer period to train new skills. This is an advantage, on the one hand because it is not expensive (no fees, course payments, etc.), and on the other hand because employees are not sent away for a period (which for SMEs is a heavy burden). Rather, the change processes are strengthened by combining dialogues and critical reflections with already existing practices like for instance performance and development interviews. In this way the insight developed through dialogue is anchored in the real working life within the individual enterprise. Realisations and insights are directly attached to the concrete machines, cooperation dynamics, hierarchies, IT requirements, etc. Consequently, a possibility of a real transfer of learning to the concrete work practices is created, compared to when employees for instance are sent away to external courses (Aarkrog & Wahlgren, 2012).

Despite these potential time and financial cost savings, and the possibility of a more real connection to actual work practices, we are aware that the use of the tool is not entirely "free". Its use must be a priority in the organisational dialogue (which is time/money consuming). In addition, time must be set aside if agreements are made on exploring local practice stories (element 2), and their follow-up.

6.2. Limitations

6.2.1. Limited testing in practice

As described in the two previous phases the mock-up developed is the result of testing with participants from the practice field. This testing has been performed via in-depth, virtual interviews that aimed to investigate whether the topics that the vignettes of the dialogue tool describe can be recognised by the actors in the field. Another aim has been to discuss whether conversations in the enterprises on some of the implications of digitalisation can contribute to creating better or more frictionless change processes in which employees are more involved. That is, develop a higher degree of empowerment among employees taking part in such processes.

Even though these aspects of the dialogue tool have been tested in the form of interviews and follow-up adjustments, a limitation concerning the mock-up developed is that it has not been tested *in* practice by employees and managers. As

such, we cannot say anything about whether the tool, when tested *in* practice as a part of an enterprise´s repertoire of approaches and strategies in the planning and priority of digital transition, will be assessed as relevant. The research team thus recommends planning for more interventions in practice, to create a testing ground for the robustness of the tool and to assess whether it can contribute positively to the increase of enterprises´ digitalisation level and employees´ opportunities for participating in tomorrow´s working life (on the future life of the dialogue tool, please see below).

6.2.2. Value for practice

Another limitation that concerns the sustainability of the tool and as such its robustness, is related to the dialogue tool´s focus on everything that is going on "around" the technologies, and which co-creates the digital transition. This aspect is characterised above as a quality, but we perceive it also as a limitation since there is a risk that enterprises do not see a direct and tangible output of the explicit work with this focus. It may be regarded as a waste of time in a busy workday with a lack of specialised labour and economic worries, because the implications of such a focus are long-term and at times not readily visible to others than the employees themselves – but they carry a large potential for productivity, well-being, retention, innovation, and other aspects.

To use the dialogue tool as a part of a repertoire of approaches and strategies on digital transition in the enterprise thus requires a "mental" surplus and courage to work in a targeted manner with all the local contexts of which digitalisation is a part and see the potential in thinking differently on processes that may seem locked and immutable.

6.3. The future life of the dialogue tool – new iterations?

A natural part of DBR-inspired research is the amplification of good ideas or ambitions on specific improvements of the product developed, that have not been possible to realise within the time frame of the project. However, these are still potentially valuable ideas or improvements that for instance enterprises or other stakeholders may continue developing, and as such it is meaningful to address some of the future perspectives and the future life of the product.

6.3.1. The dialogue tool as a part of organisational change within the digital transition

In the present report the dialogue tool takes the form of a mock-up. A mock-up is an early draft and a "model" of a dialogue tool-to-be. This mock-up is, as mentioned above, tested via interviews, and based on feedback received we have adjusted the dialogue tool to include a locally oriented approach on exploring the enterprise´s own stories (the dialogue tool – element 2).

The current form of the dialogue tool requires further development. It requires the development of a real prototype in the form of a "tangible" version of the two elements of the dialogue tool. This should include the development of additional evidence-based vignettes to be used as "conversation and reflection starters", as well as more guidance and support for employees and managers linked to the template for exploring the enterprise´s own narratives. The further development should also address how enterprises may operationalise the achieved inputs into action in a busy working day.

This development requires another and larger intervention than the existing interviews. The research team considers that it needs a long-term cooperation with enterprises in which the dialogue tool becomes a part of practice – a part of how "we" consider organisational development. It could be specifically relevant to test the dialogue tool in enterprises that know that they face larger investments and changes of a digital nature, which will change work tasks, routines, and practice. Such testing would be interesting since it could offer insights on whether the tool could act as a supplement to IT courses, and as an in-house provision focusing on well-being, innovation, employees´ empowerment, recruitment, productivity, and retention.

7. Conclusions

The present research project has aimed to explore how digitalisation reorganises the working life in small and medium-sized enterprises in the Nordic region, and how new learning practices can support enterprises´ and employees´ opportunities to meet the growing and changing requirements of digital transition. The results of the project will contribute to understanding and acting in the current digital transformation of Nordic working life.

In the research project we have focused on *the change*, and the ways digitalisation daily changes not only concrete work tasks but also cooperation, professional identities, hierarchies, and organisational forms on employee as well as manager level. With this focus the project becomes a part of the value-based industry 5.0 agenda of the European Commission (Breque et al., 2021), in which employee well-being is a central turning point in the digitalisation of the manufacturing sector, and it is also in line with the Nordic Council of Ministers´ 2030 (NMR, 2021) plan for a competitive *and* a socially sustainable Nordic region. Evidence-based knowledge on the real working life with technologies in the Nordic region does not only contribute with insight into some shared Nordic challenges related to adequate skills development in a continuous change process. It may also contribute with insights into how the Nordic societies´ digital transformation happens asynchronously in SMEs and is being experienced as local changes in the tension between the third industrial revolution, characterised by automation technologies that aim to create products quicker, better, or cheaper, and the fourth revolution, characterised by turning products and processes over to digital concepts and distribute these concepts as services (Technological Institute, 2017). As a contribution to realising the Nordic Council of Ministers´ social sustainability goals (NMR, 2021) the project has analysed some of the downsides of digitalisation, where the interaction between production and employee is being challenged. With this information we have also been able to highlight specific points of attention and options that enterprises can focus on in the digital transition. These are circumstances that can delay but also potentially support the digital change in the individual enterprise.

Design-based research (DBR) has been the overall research design of the project. DBR is characterised by a close cooperation between researchers and those people who daily experience the challenges, as well as other experts within the given field. In the present research this design has made possible a collaborative process between the research team and employees/managers from six small and medium-sized manufacturing enterprises in the Nordic region, as well as NVL Digital Working Life.

The actors involved have in various ways contributed with insight and information on their work practices in a daily life perspective, as well as relevant literature on policy and practice on digitalisation and workplace learning/skills development in the five Nordic countries.

The research findings display some of the new organisational forms that are created when humans and machines are entangled into a shared practice and point to the fact that this entanglement influences the individual employees´ functions, roles, and thus their professional identities. The findings also identify relationships and socio-organisational factors that influence the transition, and which result in the work being changed. The analysis points to several effects of these entanglements and relationships by which "the digital aspect" is formed and itself forms its context, as well as highlighting various consequences. In this way the analytical findings "draw" an *image of the working life*, which is also an image of the challenges that characterise the digital transition processes in Nordic enterprises. The analysis thus contributes to creating a deeper understanding of how the level of digitalisation in enterprises can be supported, and how opportunities for employees´ involvement can be increased.

Based on its analytical findings the research project has formulated five recommendations for the policy level as well as the practice level. On policies, *the recommendations target the Nordic cooperation* on digitalisation and lifelong learning, and the changes in the working life that digitalisation creates. In this way the recommendations support *the objective of the Nordic Council of Ministers* on the benefits of digitalisation for all (NMR, 2021). The recommendations are also valid for national decision-makers with responsibilities within the labour market and digitalisation.

On the practice level the recommendations are relevant for enterprises that are embarking upon a digital transition process, or enterprises that are "in the middle" of the process, and which need insight into some of the circumstances that can contribute to supporting or delaying the transition, as well as insight into and information on how to better involve the employees.

The research project is also offering a concrete suggestion for a solution. Based on the DBR collaborative and inclusive principles, that aim to contribute to theory-based solutions in practice, we have developed a mock-up of a solution based on evidence from the project analyses. The solution aims to support new learning practices in enterprises under digital transition and has the form of a dialogue tool consisting of two elements. The first element offers an opportunity for employees and managers through evidence-based vignettes to enter into a dialogue on some of

the opportunities and challenges that digital transition may bring, and which may be difficult to identify or address in a busy workday. The other element is to be based on agreements between employees and managers and invites to an exploration of local topics (challenges, tensions, or other topics) that may have a negative influence on the transition.

7.1. Recommendations

The following are the overall recommendations, which are the result of the research project and the collaboration with participants from practice as well as members of the network NVL Digital – Working Life:

1. Implement timely slowness

Digital transition is associated with the pursuit of ever-accelerating change.

Notions of digital technologies as inherently creating positive change, innovation and growth should be replaced by a principle of timely slowness. That is, taking the time to understand the complexities of change. An accelerating digital technology revolution driven by artificial intelligence requires reflective assessment, which is an integral part of Nordic democratic self-understanding.

Being careful not to rush is an essential factor in understanding digital transition.

The recommendation concerns the policy as well as the practice level.

2. Prioritise a broad repertoire of strategies to navigate digital transition

Navigating digital transition requires drawing on a diversity of strategies.

At policy level, this means creating a framework for developing a broad repertoire of approaches and strategies to the digital transition. This means recognising that social dimensions (e.g. collaboration and critical reflection) coexist with technological innovation and economic growth.

At the level of practice, this means that enterprises should give priority to developing a variety of strategies to support transition processes. For example, companies should develop practices that enable employees and managers to engage critically and reflectively with both the opportunities and challenges of change.

A broad repertoire of strategies can create a collective awareness of what is “muddy” as well as what is “shiny”.

The recommendation concerns the policy as well as the practice level.

3. Create awareness(es) in practice of contexts

Enterprises should seek to create awareness of the contexts in which digital technologies are embedded, as it is local factors and conditions that enable the success of change. These are factors such as narratives, paradoxes, and ambiguities. They are the conditions that arise when people and machines entangle, which has the effect of changing organisational phenomena such as hierarchies and professional identities. Companies in the digital transition will therefore experience that different factors and conditions can both hinder and facilitate development.

Be aware that the contexts in which digital technologies are embedded constitute the whole arena of change.

The recommendation concerns the level of practice.

4. Include workforce knowledge forms as legitimate

Strategy development and decision-making should not only be anchored in management visions, but also in employees' professional competences. These are professional competences that exist, for example, as the manual tacit action knowledge of employees, articulated through an experienced sense of when a unit or component is "rightly placed". This is important in the maintenance of high product quality, in rationalising inappropriate processes and as a driver of innovation.

Including employees' professional competence as a legitimate form of knowledge can contribute to increased innovation, employee satisfaction and growth.

The recommendation concerns the practice level.

5. Link competence development with context awareness

Existing digital competence initiatives (upskilling through courses, continuing education) should link to employees’ context awareness. This involves discussions about the ways in which change is occurring and its effects. The effects can be, for example, increased job satisfaction, dissatisfaction, new relationship formation, less/more control, more/less supervision, stress, and insecurity.

Focusing on contextual understanding increases employees' participation in the opportunities and challenges of the transition. In this way, employees are co-creative actors in a change process that can contribute to creating new, sustainable solutions and improvements.

The employee "walks alongside" the development instead of lagging behind the development.

The recommendation concerns the practice level.

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Annex 1:

List of participants in the reference group and the NVL Digital – Working Life network

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Krista Paavola, Finland	Service Centre for Continuous Learning and Employment in Finland, Finland
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Linda Larsson, Sweden	The Swedish Trade Union Confederation, Sweden
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