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Digitalisation, jobs, and competences – emerging innovative practices

Hanne Shapiro futures

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SIRI Commission – A National Policy Commission initiated by Member of Parliament Ida Auken and the Danish Confederation of Engineers and with participation of social partners, companies and researchers in a joint steering committee. The aim is to promote an innovative, sustainable, and inclusive approach to adoption and exploitation of cognitive technologies. Through studies and informed debates the SIRI Commission has shown they are a collective and powerful voice, which have shown that digitalization is about strategic choices at multiple levels, which ultimately influences job quality and opportunities to create opportunities for all. A sub-group has been formed headed by the Union for Commerce and Trade. The aim of the working group has been to explore what the characteristics are of the strategic environment and the implementation processes of those companies that do not just perceive digital technologies as a means to reduce head-count. These companies are in fact capable of pursuing unique strategies, which exploit automation and augmenting capabilities of digital technologies building on work organization practices, which see the workforce not as a cost, but as the most unique asset to value creation in a digital economy.

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1. Summary

Digital technology is transforming the labor market, but Danish and international analyses in no way agree about the consequences of this transformation for the job market or for future skills and job requirements. Despite debate about 'digital disruption' there are few studies that clarify in a concrete way how enterprises' strategic approach to digitization influences competence requirements and the organization of work processes. The SIRI commission hopes to contribute to a qualified discussion about digitization's potential opportunities through the following four selected case studies, two from the public sector and two from the private sector. The enterprises in these four cases can all be characterized as front-runners in their strategic approach to digitization. Analysis of these cases indicates that the following parameters are crucial if Denmark is to make full use of the transformation potential embedded in digital technologies:

- A visible management and a leadership culture with a long-range vision for the value added of digitization, capable of communicating this vision and engaging employees in it.
 - Implementation is seen as an organizational change process and not an ICT project.
 - Advanced robotics and cognitive technologies have such different properties so you need to experiment systematically in order to capture the potentials, but this implies that in particular SMEs have "sandboxes in Europe where they can have hands on access and support as needed to experiment and explore the potentials, and these models need to be replicated in the design of learning environments
 - The focus on ICT is dual- automation- and augmentation- how can ICT increase our value added?
 - It is not presented by management (or by a consultancy or ICT supplier) as a fully developed solution.
 - The approach is one of enquiry, systematic experimentation, and learning.
 - Employees are involved at an early stage or have themselves been a driving force for development.
 - Employees are seen as a resource and not a cost.
 - The management and company boards must have a strategic understanding of the potentials of these new technologies with transformative technologies, otherwise the risk is high that they will ignore and not understand the full potentials, which can lead to true competitive advantage medium term

The four cases emphasize the importance of empirical knowledge about how strategic approaches to advanced digitization influence the organization of work processes, job content and quality, and competence requirements. A recent review of OECD's activities¹ in relation to the digital economy emphasizes the need for empirical knowledge at enterprise level as a basis for differentiated policy initiatives. The cases also show that it is crucial for employees to be able to experiment with the technologies that are being implemented. This is not merely a question of learning about technology; employees must contribute to forming new work processes and new professional identities through on-the-job learning and through the projects that they work on. This sets new requirements for suppliers of adult education and continuing training regarding organization, pedagogics, and knowledge about businesses and innovation. *Technologies such as machine learning, 3-D printing, and smart virtual agents are so new that it can be difficult for SMEs to analyze their potential for a specific business context.* PP collaboration on *Sandboxes or future-of-work labs*, which for example Fraunhofer has established in Germany, can present cost-free opportunities for SMEs to experiment with the innovative potentials of new technologies, and can help increase the numbers of enterprises exploiting digitization so that it leads to greater value added.

2. Introduction

The labor market is being transformed by a number of new technologies such as collaborative robots, machine learning, neural networks, chatbots, and smart virtual agents. There is, however, no general consensus about

¹ Berkeley- OECD Earning, Learning and Working in the digital economy. November/December 2017

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what the future will bring. Some analyses point to a dismal future with massive job losses because of automation (Frey & Osborne, 2016), while others conclude that technology-driven job destruction is nothing new, and that we should pay more attention to the characteristics of new technologies, how they are being implemented in workplaces, and what this means for job and competence requirements² (Committee on Information technology, automation, and the US workforce, 2017). Previous analyses have emphasized the automation gains due to artificial intelligence and advanced robot technology, but technology alone cannot automate routine job functions. The interplay between humans and technology can also be used to create new service solutions if employees have the skills to exploit the potentials of artificial intelligence and advanced robot technology.

Despite this there are few case studies that demonstrate how enterprises that have invested in technologies primarily to improve service quality have integrated these in their organization processes, nor is there much evidence as to what has been done so that employees have the necessary competences to exploit the potentials of new technologies.

The SIRI Commission has therefore initiated this analysis to provide insight into public and private sector front-runner enterprises' use of the innovation potentials in new technology in interaction with competent employees. The goal of the case studies is more specifically to uncover how enterprises' strategic approach to digitization has influenced the organization of work processes, job content, and employee competences, and how employees have been involved in the overall process.

The four cases were selected by the SIRI Commission and carried out at the end of 2017. The two private sector enterprises are a wholesale construction supplies company and a Swedish bank with a branch in Denmark. The two public sector cases represent healthcare and education. Interviews were held as far as possible with management and with employees. All interviews were based on using the same semi-structured interview framework, and it had been presented to the enterprises ahead of time.

Interview themes:

- Commercial and strategic background
- Implementation process
- Organization of work processes, jobs, competences
- Discussion

² Review OECD digital Economy- Berkeley December 2017

2.1. Case overview

AO Johansen – wholesale construction supplies	Mørkhøj School – Gladsaxe Municipality	Odense University Hospital Anesthesiologic Intensive Care Unit V	SEB Group Stockholm
<p>The A&O Johansen Brothers had a vision of transforming their wholesaler business into a knowledge, ICT, and logistics enterprise. A new s-commerce platform was to strengthen customer relations. In collaboration with Netcompany the enterprise developed an AI³ based e-commerce platform built on a neural network which can precisely predict client purchasing patterns and the risk of losing customers. A color-coded personal 'dashboard' is used by sales representatives as a dynamic tool for managing and prioritizing sales processes and customer care. Representatives can quickly be aware of a client's changed purchasing patterns, and clients receive a more personalized level of service.</p>	<p>Mørkhøj School has established a new Innovation Center in its previous school library. It is structured as a Future Classroom Lab where students work innovatively with idea development and problem solving in order to acquire 21st century competences. The Center is divided into learning zones: presentation zone, feedback zone, coding and innovation zone, creativity zone, and several production zones. The Center has learning-support technologies such as 3D printers, virtual reality, and Lego Mindstorm robots. The Center's goal is to provide opportunities for teachers and students to collaborate on creating digital learning processes that assist students in designing their own learning. This changes the professional identity of teachers, who to a greater degree take on the role of facilitator.</p>	<p>Patients at Odense University Hospital Anesthesiologic Intensive Care Unit who are on life support are not placed in an artificial coma. The limited possibilities for communication are a great challenge to professional holistic nursing and care functions. Based on the catch phrase "<i>There is an App for it All</i>", some of the nurses go an idea about how to give life-support patients a voice that could be heard. The solution, called <i>Talk2Care</i>, is a tablet-based app developed through a collaboration between the Unit nurses, the Blue Fragments consultancy, and Microsoft. It is based on simple, intuitive icons, and does not require any new competences in the nursing staff; it is more a matter of motivation.</p>	<p>Technological curiosity is a driving force for SEB to implement its 2026 vision of delivering world class customer service. Since 2016 SEB has been in the process of integrating the intelligent virtual agent Amelia, developed by IPsoft, calling it Aida. The possibilities are almost endless, since Aida can be coupled to the back-office data center and thereby in time be able to not only answer questions, but also to recognize customer service problems. Aida was first implemented in the internal service department in Vilnius so that employees could be freed from the most monotonous job functions and thus be able to acquire new competences that are attractive in the labor market. In its second phase Aida is being integrated in customer interface functions, which over time will free up employee time which can then be used on more complex customer service.</p>

³ AI = Artificial Intelligence

2.2. Strategic background

In recent years a number of reports have come out about AI and robot technology and what they will mean for employment and task automation (Frey & Osborne, 2016) (McKinsey, 2017) (McKinsey, 2017). This has led to dystopian headlines such as:

"A new report has a stern warning for the global workforce: stay flexible. The McKinsey Global Institute cautions that as many as 375 million workers will need to switch occupational categories by 2030 due to automation."
CNN 28.-11 2017.

2.3. Employees – resource or cost?

It is interesting to note that none of the four case enterprises invested in advanced digital technology in order to improve *efficiency* and reduce labor costs. Investment was justified as promoting *new developmental and professional roles* that provide personalized and qualitatively better service to the customer or user. The two private enterprises, AO Johansen and SEB Group, invested in technology as part of a transformation of their basic mode of business; where they previously sold products, there is now a greater emphasis on customer service and advice. AO Johansen's sales representatives can better prioritize and plan because their 'dashboard' can monitor their customer base. AO Johansen emphasizes competition in the construction industry as the most pressing issue that has driven its choice of technology. In contrast, the SEB Group has invested in AI technology more in order to investigate its potential, but without any specific business case focus. SEB Group approached AI investment as an experimental venture capital project; the technologies are so new that now is the best time to become an expert in the use of AI.⁴ But to understand their potential you have to "get your feet wet".

Current focus in public sector workplaces is to a great degree on how technologies can support efficiency improvement and to a much lesser degree how they can improve quality in the public sector (Shapiro, 2017). In that sense the two public sector cases are promising, because they both illustrate that technologies can drive improved quality and development agendas, but also illustrate the importance of the perspective one has and how technology gets integrated in organizational processes. The two public sector cases, Odense University Hospital Anesthesiologic Intensive Care Unit and Mørkhøj School, both view technology as supportive to a development and quality agenda. The nurses at the Intensive Care Unit recognized how a simple user-friendly technology could support the holistic care paradigm that is central to their profession. The goal at Mørkhøj School is for the Innovation Lab to be a driver of a new pedagogical model that can support the development of students' 21st century competences. There are however some pronounced differences between the two cases. Implementation at Mørkhøj School takes place in an environment composed of a top-down centrally defined vision for schools in Gladsaxe Municipality, and a bottom-up approach from school management that motivates teachers and supports changed teacher roles through a combination of continuing education and learning agents (also called local impact coaches) who function as internal support. The vision for Gladsaxe Municipality's schools is based on the European Schoolnet initiative and its Future Classroom concept⁵ as a method for developing pedagogical praxis and creating the physical framework for learning that promotes 21st century competences. The Innovation Center at Mørkhøj School is a concrete instance of the Future Classrooms concept and was made possible because the school library was relocated and the school received a grant from an enterprise. The *Talk2Care* app at Odense University Hospital Anesthesiologic Intensive Care Unit was very much a bottom-up initiative and is anchored in and driven by professional nursing praxis in the intensive care unit. The intensive

⁴ AI- kunstig intelligens

⁵ <http://fcl.eun.org/>

care nurses – supported by the head nurse – were principal organizers of the project and also participated in the development of the app solution.

3. About the implementation process

All four enterprises view the chosen technologies and their possibilities as innovative. This means in practice that:

- Implementation was seen as an organizational change process and not an ICT project.
- It was not presented by management (or by a consultancy or ICT supplier) as a fully developed solution.
- The approach was one of enquiry and learning.
- Employees were involved at an early stage or had themselves been a driving force for development.

3.1. The importance of management visibility

Management played a central role in the implementation process in all four cases. At Odense University Hospital it was the head nurse who *removed the stumbling blocks* – as she put it – so that the nurses' idea could become reality. In the three other cases it was management that presented the vision to motivate and engage employees, while at the same time monitoring how the new technology was integrated into company praxis and what this required of employee competences. Gladsaxe Municipality explicitly defined a central role for management so that technology could support innovative procedures and so that management could communicate a vision that directly addressed employees. Nevertheless, *Future of Jobs* from the World Economic Forum (World Economic Forum, 2016) among other reports points to the three most important barriers to the utilization of new technology such as artificial intelligence as being:

- Lack of management insight into technology's disruptive potential for their field of business
- Lack of resources
- Short-term stakeholder focus on profit optimization.

AO Johansen explicitly mentions competitive pressure, so management here had a clear goal of creating a vision of a burning platform that made implementation a necessity. Management used the metaphor of a 2-ton melting iceberg to frame its business goals. The use of powerful metaphors is for example often used in Japanese management philosophy. Metaphors have been shown to be a major driver of learning innovation processes where change, collective knowledge formation, learning, and organizational development are closely linked. (Nonaka & Takeuchi, 1991).

SEB Group is the only case that explicitly involved trade unions in its implementation process. The goal was for employees to view Aida as a development opportunity rather than as a threat of imminent job loss. This was the background for the implementation process at the internal helpdesk in Vilnius. The intelligent agent Amelia was renamed Aida and was given a CV so it could communicate simply with employees about what it had learned. One of the most common tasks at the internal helpdesk was answering requests from employees who had forgotten their passwords. The opportunity to automate a simple routine task that was not very motivating or enlightening was a "window of opportunity" for several reasons:

- Helpdesk employees in Vilnius did not see answering questions about passwords as a career and life pathway, so they viewed Aida in a positive light since it could lead to more meaningful job functions;
- Implementation of AI-based technology give employees opportunities for developing new competences. Instead of being seen as a threat to employment, Aida implementation was seen as a motivational factor for developing new employee competences by implementing Aida and training it;

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- Given the experimental and investigative approach to AI, it was important to clearly define a field of application with a large volume of interaction that was central to training the Aida virtual agent, including the fact that it had to become fluent in “SEB Swedish”.
- Finally, it was important to gain experience that could be used in the further integration of Aida in customer service solutions.

Mørkhøj School is part of the Gladsaxe Municipality school system. The municipality has worked intensively to create a common vision for the school of the future by establishing common indicators that have been sent in a consultation procedure to trade unions, employee committees, parent associations, and student councils. One of the challenges during this process was that - despite all the good intentions about involving and engaging relevant stakeholders, and especially teachers – it can be difficult to reach out to the individual teacher and address concerns or resistance and skepticism. Gladsaxe Municipality therefore sees the question of creating teacher motivation so everyone pulls in the same direction as an important task for school management which cannot be achieved through central administration alone. This in turn requires school managers to “buy” the concepts of the school of the future and possess an in-depth understanding of the possibilities inherent in each technology. *“You have to have knowledge before you can motivate others”* – and therefore the Municipality has emphasized that school managers must possess the competences necessary to drive transformative processes.

3.2. The role of union representatives, management, and management boards in technological change

The four cases underline how important it is for management and boards to have insight into the potentials of ‘game-changing’ technologies so that they can communicate and retain focus on goals in relation to employees, clients, and users, and also can participate in a knowledgeable dialog with ICT consultants and maintain strategic direction. This is also the case for union representatives. The more they know about new technologies, the more employees will have a voice in the implementation process and be able to identify fields where they need further education and training or assure that the implementation of new technology that takes over more and more functions does not create “narrow” jobs that in the long run can lead employees into a specialization trap. The four cases demonstrate that digital transformation is not dependent on technologies as such. Enterprises and organizations that are “immature” in their integration of digital technologies typically have operational goals for their investments. “Mature” enterprises most often have a clearly defined digital strategy so that investments in cognitive technologies, cloud solutions, etc. support business and organizational transformation and value added. Digitally mature enterprises can better communicate visions and goals, their culture is more collaborative, and they are to a greater degree willing to take risks. Less mature enterprises have difficulty conceptualizing the business potentials of new technologies; this makes it more difficult for them to take the necessary steps to assure that in-house competences match the requirements and possibilities inherent in digitization (Kane, et al., 2015).

The strategic approach to digitization is for example reflected in how AO Johansen approached implementation: At first all the stakeholders sat around a table and sketched out the processes. *“This takes time, but is completely necessary. Otherwise implementation is doomed to failure,”* because it is crucial that the point of departure be customers and their needs and not the technology in itself.

3.3. Organizational embedding of digital expertise

Two of the cases demonstrate the necessity of organizational embedding of the implementation process:

- Mørkhøj School – Innovation Center – Future Classroom Lab
- SEB Group – Aida Center of Excellence

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Both cases deal with physical environments with associated expertise that are drivers of technological innovation and at the same time are central to the development of in-house organizational capacity. The Center of Excellence for Aida in the SEB Group has affiliated six employees with cross-disciplinary expertise in AI and financial services. These six are in charge of the implementation and training of Aida along with the software developer and supplier, IPsoft from the United States. Mørkhøj School employs learning consultants with expertise in the Future Classroom concept; they have a special role in disseminating the concept and supporting the other teachers in their new professional teaching roles. The consultants have received their training from UCC University College, which participates in the European Schoolnet. But there are also differences between these two environments. Future Classroom is a physical space that is arranged after principles that are different from those found in a traditional classroom environment. The goal is to promote a range of learning modes and competences in the associated learning zones. The Innovation Center is the physical framework for the Future Classroom concept, but school management does not see the physical framework as central: *“Technology is not in itself a learning outcome, because the technology we have in place at the Innovation Center will quickly become obsolete. Technology is transient, so it is important that we embed learning into it. Competences and learning processes are the most important elements; however technological mastery is also important in itself.”*

ICT consultants have been closely involved with the Odense University Hospital Anesthesiologic Intensive Care Unit and with AO Johansen. The Intensive Care Unit collaborated with Blue Fragments and with Microsoft, and AO Johansen collaborated with Netcompany. AO Johansen has a very eclectic client base including large construction contractors and small, skilled craftsmen who work in construction. Management indicates that successful implementation was due to employee involvement from day one, and was also due to a point of departure in *the customer journey*. From the start the goal was for the new platform to contribute value added for customers by being used as a tool that could improve efficiency and quality in customers’ processes, not merely in AO Johansen’s processes. The long-term goal is for AO Johansen to be able to stand out as a service and consultancy company for large contractors and for small construction craftsmen. Sales representatives previously defined themselves uniquely by their product expertise; digitization has given them a visual tool that can be used to strategically prioritize their sales efforts and support enduring customer relations.

3.4. Can one measure the effects?

Enterprises’ focus on qualitative value added is reflected in their approach to assessing effects.

SEB Group sees the value of Aida to a greater degree as related to scalability and consistency of service, rather than being a question of saving the salaries of a few employees; nor does it regard these investments as a question of increased efficiency. The CIO considers the latter to be a meaningless parameter, since the goal is to free employee resources so they can use their time on complex issues that create value for customers, all in relation to SEBs vision 2025. The CIO also emphasizes that SEB’s varied customer segments demand a differentiated view of value added. Some clients prefer (or exclusively employ) digital channels in their contact with the bank. Satisfaction for others is based on meeting a personal financial consultant; in these cases, technology can support internal processes and strengthen the employee’s expertise in communicating with customers. Implementation of the smart agent Aida is just starting up regarding customer service functions, and is not imagined as a replacement for client support services. But in the long run Aida will take over some service functions in order to support a 24/7 accessibility concept for clients. As with all other financial service enterprises, the SEB Group continually monitors client satisfaction.

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Management at AO Johansen regards its new e-commerce platform with its churn prediction⁶ element as a tool for the busy sales representatives, who can better focus their strategic sales efforts because of the data they have at their disposal about customer behavior in the customer segments they are responsible for. The rationale for digitization is thus better and more precise customer service along with the efficiency potential of for example the consolidation of customer segments. As with SEB Group, customers are not presented with an “either-or” choice. At the same time as AO Johansen developed its digital customer-oriented user interface, management has reported an apparent increase in the number of customers at its physical locations, although this has not been measured or used as a productivity parameter.

The Intensive Care Unit at Odense University Hospital does not consider quantitative effect parameters to be meaningful, since Talk2Care is a supplement to the many ways that professional health care workers use to communicate with life-support patients, and it is not equally applicable to all patients. One of the Unit nurses has started – as part of a research project – a survey of life-support patients who have been offered Talk2Care during their hospital stay and their assessment of it.

Mørkhøj School has not set any quantitative impact goals for the Innovation Center, and management doubts if this could be meaningfully done, since there currently is no national test of technology comprehension. Qualitatively the school has no doubt of the positive effects. Although Mørkhøj School has not set quantitative impact goals, it is possible that it would be relevant in the long run, as the Center becomes more integrated in teaching processes, to measure students’ learning outcomes and motivation. The OECD among others has indicated that despite massive investments in technology-supported teaching over several years, there is still very limited knowledge about how, when, and for whom the use of digital technologies in fact increases learning in schools, or whether there are cases where the opposite occurs (OECD, 2015).

4. Jobs and competences

All four cases show the importance of organizational embedding and competence development being understood as much more than a question of a few employees learning new competences so they can use some new technology. Both AO Johansen and the SEB Group emphasize that they do not necessarily know what the future will bring and what it will be like to run a business five years from now. But management in both enterprises considers it crucial that they strategically try to mold the future by seizing upon the potentials of new technology and by involving employees as an active resource from the very beginning. As the innovation manager at SEB mentioned several times, the technologies are so new that no one can already be a specialist. Both enterprises point out that employees obtain new competences through their involvement in implementation processes, and these new competences will in the future be in greater demand. Management in both enterprises notes that ICT suppliers to a great degree had a consultancy role and that the implementation process itself can be characterized as agile in the sense that suppliers did not arrive with a turnkey solution; it was developed through an iterative process involving management and employees. This brings up the question of whether this approach to ICT implementation better supports employee development because the implementation process itself becomes a type of on-the-job learning. In contrast the Mørkhøj School project is built upon a well-defined concept that does not directly include employees as a developmental resource, but rather defines them as a group that lacks certain competences if goals are to be reached. Finally, the implementation process at the Odense University Hospital Intensive Care Unit was more or less continuous and with a constant renewal of the

⁶ Churn prediction uses artificial intelligence and its underlying data to predict customer behavior, including the possibility of customers taking their business elsewhere.

patient group. This presents opportunities over time for nurses not yet involved in Talk2Care to be motivated as they over and over see new patients and their families being introduced to the technology.

4.1. Learning through development and implementation

Numerous reports conclude that AI technologies increase both cognitive and social competence requirements (OECD, 2014) (NESTA, 2017) (World Economic Forum, 2016). Nevertheless, enterprises indicate that the challenges of competence development are primarily related to employee motivation and mindset, understood as employees being curious and daring enough to explore the potentials and limitations of new technologies. Motivation is also a precondition if employees are to be able to present proposals for new or improved digital solutions based on their concrete insight into customers and users.

All four enterprises point out the central role played by management in the implementation process. Management has to communicate a vision that employees can recognize as part of their future. What is seen as employee opposition is often a question of insecurity about the individual's job and competences. Management can disarm much of this opposition by involving employees and signaling that they are a resource, and in general by presenting digitization as a strategic transformation project. Recruitment processes in the four enterprises now contain much greater focus on applicants' digital competences, but the enterprises still emphasize how crucial employee motivation is.

On-the-job learning supported by in-house superusers among colleagues is by far the most important source of digital competence development in all four enterprises, and this simultaneously assures organizational embedding. With an organizational framework in place the enterprise can then launch sandbox initiatives where employees can investigate and experiment with the new technologies. This can take the form of a limited pilot project like the internal helpdesk at the SEB Group in Vilnius. During the implementation process the employees at the Aida Centre of Excellence, a cross-disciplinary group, were able to work hands-on with the technology from their respective technological perspectives, and thus built up a unique store of insight and skills in training Aida. Another approach is for experienced employees to work with similar technological solutions, and thus gain practical insight into what works and what doesn't. This was the approach at Odense University Hospital, where previous use of a Norwegian system was the starting point for the nurses' specifications for a system directly targeting life-support patients.

4.2. Employee motivation

The enterprises all realize that new technology can be a challenge for some employees, and therefore embody a "we" culture in their implementation processes. It is not merely a question of new competences; this can also lead to a shift in what the individual employees understand as the foundation of their professional identity. Phrases such as *we don't know what the future may bring, but we know what we are bringing into the future* and *the technologies are so new that this is a great time to become an expert* are designed so that employees can see themselves as part of the transformation process, even if they do not regard themselves as ICT experts. AO Johansen has in its implementation processes very explicitly dealt with employee hesitation and opposition. Among other initiatives was a seminar with a psychologist who taught employees about human psychology and processes of change. The psychologist introduced three "persona" types (green, yellow, and red) so that management and employees could share the same ideas about how to analyze possible insecurities or resistance to new solutions and changed sales functions. At the same time management has pointed out that by involving employees in the implementation process it has been possible to slow down if the process was moving too fast for some individuals, and it has been possible to enter into dialog with those who feel that the implementation

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does not deliver as promised. The central point is that management indirectly makes it clear that employees are a crucial development resource.

AO Johansen included employees from the very start of the implementation process, beginning with workshops where employees could provide feedback about the initial development stages and could speak out “without feeling stupid”. Management appointed and trained local ambassadors who showed special interest in deploying the platform and sales management has also visited all the stores, in order to assure that implementation is embedded throughout the store network. Mørkhøj School also initiated a “training of trainers” model by training learning consultants who would have particular responsibility for assuring that the Innovation Center is integrated throughout teaching. They function as “super-users” who can motivate colleagues and support them in designing their teaching program, and through dialog support teachers in feeling at home in their new teaching role – basically dealing with professional identity and the responsibilities that come along with this changed role.

The Intensive Care Unit also uses a ‘training-of-trainers’ approach where a small supergroup that has been involved in development from the beginning now introduces the technology to colleagues and relatives of the patients, but without any expectation that all nurses even long term will use Talk2Care.

The Anesthesiologic Intensive Care Unit is currently considering how to promote the use of Talk2Care. The nurses realize that it is primarily about perseverance and the presence of those who are ready to take the extra step during a busy hospital working day. They also emphasize that Talk2Care should be seen as one of many ways to approach communication. There are therefore no plans to make Talk2Care mandatory, but when they hire new staff they enquire about the applicant’s digital competences more than previously.

4.3. Enterprise-specific competence requirements - SEB

SEB Group is aware that it is in the market for competences that are in scant supply, and that the Group must rely on continuing education and training in fields such as data science, machine learning, algorithm construction, and big data management and data quality regarding the financial sector. In general, SEB must assure that employees understand the potentials of cognitive banking. SEB Group and IPsoft (NYC) also point to new competence needs in for example the fields of:

- Customer journey and personas
- Linguistics
- User interface – linking to language, psychology, etc.
- Design thinking.

According to SEB and IPsoft, these changes imply new cross-disciplinary job profiles such as cognitive engineering with roots in psychology, linguistics, and data science.

Before the implementation of Aida, IPsoft did not consider that employees would need specific AI competences, but after the first phase this assessment has changed.

The manager of the AI Center for Aida points out that growing use of AI technologies in the financial sector requires other competences to assure an embedding of development and training of a smart agent such as Aida. SEB points to:

- Knowledge and skills in data science, including
- Statistics
- Programming languages (R, Java, Python)

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- Algorithm construction
- Linguistics (especially related to advanced digital agents)
- In-depth knowledge of financial products and relevant regulatory requirements.

It is not a question of one person having all of these competences, but rather that there is a common knowledge base which is prerequisite for cross-disciplinary collaboration. These are new hybrid profiles which will continually change along with technological change. There is therefore a need for a dynamic and flexible continuing education and training offer that can be tailored to new job functions, and it is crucial that all development be based on the most recent data about what enterprises in fact are looking for.

SEB has therefore entered into a dialog with Udacity, because Udacity's approach to continuing education and its organization and supply is flexible in its modular structure and digital delivery structure. At the same time the content is job-relevant, developed in collaboration with enterprises and with teachers who are frontrunners in their knowledge of the digital labor market, and the concept is scalable.⁷ Udacity has currently 1.6 million participants in 136 countries. While digitization at SEB can long-term lead to more highly-developed job roles as routine customer service tasks are automated, the Future Classroom concept and accompanying Innovation Center represents an actual change in professional roles.

4.4. Competence development at Mørkhøj School

Digitization in municipal primary and lower secondary schools is to a great degree driven by the principles of visible learning and the student as co-creator of his or her own learning processes. This is also true for Mørkhøj School. This does not mean there was no frustration during the first phases of implementation; according to one of the learning consultants this was mostly about the transformation of the professional teaching role and related insecurity. One cause of this insecurity, which the Mørkhøj respondents do not deal with, is that on the one hand while new digitization technologies prepare the groundwork for inductive, holistic, and experimental approaches to learning, on the other hand this is not reflected in national tests or final exams; and this leads to a type of "role-schizophrenia", since ultimately the school's teaching quality and the individual teacher are measured by these tests and exam results. Mørkhøj School is determinedly trying to remedy these built-in contradictions. Teachers work in teams of two along with a local learning agent, and together they investigate and discuss student feedback and the design of teacher feedback as a tool to open up the learning process, and also through visible learning to address and discuss target requirements.

At Mørkhøj School the local learning agents (impact coaches) have participated in a program designed so they can acquire particular knowledge about visible learning and about how to support teacher colleagues with visible learning. A key tool in this program is the Visible Learning Impact Cycle, which includes the following processes:

- What are my students' learning needs?
- What are my learning needs in relation to these students' needs?
- Planning and implementation
- Follow up and evaluate the effects of implementation.

In Gladsaxe municipality a total of 100 learning agents have participated in a long-term education program which contains modules on 21st century skills, "learning-to-learn", SOLO-taxonomy,⁸ mindset theories, etc.

⁷ <https://eu.udacity.com/>

⁸ Solo taxonomy progresses from simple to complex, from unistructural to extended abstract.

As mentioned, Gladsaxe Municipality is collaborating with UCC on an education program for its strategic and operational school managers. The program contains the theory and praxis of 21st century competences, technology comprehension, learning technologies, digital literacy, etc. Participants try out play-based learning, virtual reality simulations, augmented reality, 3D printers, image and film manipulation software, and coding. Experience shows that something new is born as soon as managers are given a chance to hands-on experiment with technologies and associate them to learning objectives.

4.5. Competence development - AO Johansen

Even though sales persons in AO Johansen now employ a completely new AI tool which demands a more analytic approach, AO Johansen management does not feel that this has required new competences, since the company has also hired specialists to transform the basic data and present it in an easy-to-use form through the digital dashboard. Training has primarily focused on personal competences in order to create a common mental “platform” for employees throughout the company and within each individual branch. AO recognizes that all employees are not equally ready to make use of the most recent transformations brought about by the new e-commerce platform. Throughout the implementation process the management has created powerful metaphors as an aid to conceptualizing what the transformation process entailed and why it was needed. At the kick-off seminar with all the employees the management had a two-ton iceberg with toy penguins installed in the meeting room with reference to the best seller book “Our Iceberg is Melting” (by John Kotter and Holger Rathgeber). Throughout the implementation process management used visible symbols to create shared images about the transformation but also to signal that it was legitimate – and indeed could be of value – for employees to pose questions and express doubts in the implementation process, since they as front-line workers have important insights about customers. But management in AO Johansen are clear about – just as management in Gladsaxe Municipality – that individual employee’s opposition to the new processes can remain so embedded that the only solution is to part ways.

4.6. Competence development - Odense University Hospital Anesthesiologic Intensive Care Unit

Training in the use of Talk2Care at the Odense University Hospital Anesthesiologic Intensive Care Unit takes place uniquely as on-the-job learning. There are no plans to change this, but perhaps training will be reorganized so that two nurses at a time receive training so that they can spar with each other. Again, it must be stressed that Talk2Care is but a small element in the care of critically ill patients. At the same time, the solution is so simple that new nurses do not need actual training, but at most some personal instruction in how Talk2Care can be used in a range of situations.

5. Perspectives

The four cases illustrate the importance of framing development as something other and more than just another ICT project. Although the four enterprises are in an early stage of implementation, there are common traits that are probably due to the enterprises’ strategic approach to development. The Future of Jobs analysis indicates that enterprises’ long-range perspective on return of investment can collide with boards’ and upper administration’s expectations for technology-driven short-term payroll savings. The four cases have not focused on payroll cost reductions. They have primarily seen the technologies as a potential for business development. This has also meant that implementation has been approached as investigation and experimentation rather than as a typical ICT-lean project. In this context the employees’ mindset is crucial because they are the ones who will actualize the qualitative improvements – and this will not happen if they reject the potentials inherent in technological development.

5.1. Digitalisation as value added - characteristics

There are additional common features in the 4 cases:

- A management that communicates, with focus on its vision
- Digital development as an opportunity for employee job and competence development
- The construction of internal organizational capacity – together we create the future
- Organizational development and learning closely linked – to motivate and develop employee mindsets
- “Talk employee competences up – if you are motivated, you can. These are new technologies, and everyone can become an expert”
- Active employee involvement from the very beginning
- Talk explicitly about employee opposition – as something about professional identity – but also a balance between top-down and bottom-up approaches
- A range of approaches to competence development – hands-on trials, peer support, short practice-oriented courses with focus on knowledge transfer
- If you beforehand have locked into a single business case you can miss out on the real transformative potentials

5.2. Digitalisation as triple-win

The four cases are all potential triple-win cases:

The enterprise and its shareholders:

- Scaling and service consistency
- Development and differentiation of service quality
- Increased agility

Customers/Users

- Service-quality; personalization
- 24/7 availability
- Differentiated channel strategy

Employees

- A more stimulating job
- Opportunities to develop new in-demand competences

5.3. Digitalisation and job impact, strategic choices

English empirical research has pointed to a latent risk that digitalisation can result in what is called digital Taylorism (Brown, et al., 2011). Yet the four Danish cases show a different reality where technology supports the development of stimulating new job roles. The four cases emphasize how important it is to create a greater store of knowledge about the influence of strategic approaches to advanced digitalisation on work organization practices, job content and quality, and competence requirements and demands - as previous analyses for FTF, the Confederation of Professionals in Denmark (Shapiro, 2016) and for HK, the National Union of Commercial and Clerical Employees (Hougaard & Shapiro, 2016) have indicated.

5.4. New roles and functions for education institutions

Respondents indicated the importance in the initial phases of employees having opportunities to work with and test the technologies that they will be applying full-time later on. This is more than just comprehending technology; employees can - through on-the-job learning closely connected to the tasks they carry out - form work processes and their own professional identities. The close link between in-house on-the-job learning and formal further and continuing education sets new requirements to education regarding organization, pedagogics, and insight into fields of business. Partnership models between suppliers and enterprises have been developed within the framework of the Dutch technology pact to support a greater degree of specialization and closer connections between enterprises' research and development activities and continuing education of employees. There are several US examples of community college collaboration with technology suppliers in order to improve the quality of the technological infrastructure at the institutions and thereby function as a hands-on demo-center where in particular small enterprises can test and experiment with new technology. Another learning model linking business and organizational development through digital technologies can be found at the Fraunhofer Institute in Germany. It has implemented a Futures of Work center where enterprises and others can participate in hands-on workshops and development programs, where participants in a facilitated process can test technologies in practice and see what they imply for work content and organization. The Vienna Technical University has developed a model of continuing education of teams in relation to digitization. A cross-disciplinary team is presented with a concrete scenario (problem complex) which they must try to understand and solve by using digital technology. While working with technology, the group also must make decisions about the physical setup and organization of it work, user interfaces, collaboration, etc. (Erol, et al., 2016).

5.5. More real-time knowledge about the labor market can support education institutions' responsiveness

The four case enterprises do not expect to be able to recruit employees with the exact competence profiles that they are looking for. It is just as much a question of preparing current employees for new roles through formal and non-formal learning. Burning Glass (USA) – with its 400 employees, also in the UK, Singapore, and Australia – is a market leader in utilizing real-time data (job ads, resumés) to uncover new job profiles and competence requirements and how to match these. Burning Glass' results indicate that often there are very specific and well-defined competences that can increase an individual's mobility and employability related to new digital jobs; for example the administrative assistant who takes a course in Salesforce, the experienced salesman who takes a course in Tableau, or the middle-aged software engineer who takes a course in agile software development methods.⁹ Real-time data can present an early indication of completely new competences due to digital disruption. The growth in the USA of the use of machine learning and neural networks has led to a notable growth in the demand for employees with R competences. Real-time data methods can strengthen responsiveness of education and adult education and training systems and can improve career counselling quality. But education institutions must also strategically consider what the development of cognitive technologies means for their education programs and offers. For the education sector it is not necessarily a question of completely new programs, but rather the way in which departments collaborate across natural sciences and technology, humanities, and social sciences, and questions about how to create a learning environment so that students acquire knowledge, skills, and competences that enable them to navigate a job market where technology can handle increasingly complex tasks across professions. There has been surprisingly little reflection within the Danish education system about the effects that the development of cognitive technology will have on the organization of education. The president of Northeastern University in Boston has started a discussion with a book called *Robot Proof, Higher Education in the age of Artificial Intelligence* (Aoun, 2017) about how institutions

⁹ <http://burning-glass.com/adding-one-skill-boost-mid-career-salaries/>

of higher education can assure that their graduates are relevant for the future labor market. The book is based on a visionary strategy formulated by Northeastern which implies among other things the message that Northeastern University alumnae should be able to subscribe to further education and lifelong learning. Completely new universities such as Minerva University represent a whole new organization and content pathway for the education institutions of the future.¹⁰

5.6. Innovation needs if SMEs are to be included in transformative digitalisation

It is particularly challenging for SMEs – both for management and their commercial activities – to grasp the potentials of artificial intelligence because of its technological complexity. An experimental venture capital approach, such as SEB has chosen, can be a viable way to innovate a business, but very few SMEs have that kind of financial muscle. One possibility could be for the state or social partners to participate in OPPs to establish “sandboxes” where public and private enterprises can experiment with new technologies such as blockchain or smart bots, because hand-on experimental experience seems to be an important factor for the development of employee motivation, and on the individual enterprise level for the build-up of internal capacity and as a basis for business model innovations and improved competitiveness. The Digital Lab that the Union of Commerce and Trade in Denmark has created could provide the foundation for such a model of innovation, which for example in the financial sector in Israel has shown to pave the way for new ecosystems, which can be of advantage to both the established players- and the new start-ups, and it can provide a new framework for experiential hand-on-learning in communities of practice. Within commerce and trade retail could be one starting point, but also customer support functions, and internal support functions, which could potentially be disrupted by digital technologies provide opportunities for testing out alternative scenarios to the future of work, and how we would like to see it evolve- and along which metrics. It is not a question of either automation or fully human centered services. Technologies can be deployed to automate low value functions in internal and customer centered service functions so that professional staff can undertake those service request that are more complex in nature, and which in fact could make the difference between *good quality in services- and service excellence*. Company strategies- and ultimately whether staff are perceived as a cost- or as a unique innovation asset of a firm frame job quality, skills utilization or under utilization- and opportunities to learn through the job. Short- term firms can gain a lot from investing in automation technologies, provided work processes are redesigned, and workers are trained, but medium term we cannot compete just by automation. Take one look at the investment levels in advanced robots in China, and the number of patents in cognitive technologies by Chinese research institutions and firms. It then becomes obvious that automation and augmentation has to go hand in hand. This has skills implications. But the supply of skills and the responsiveness of education and training system is just one part of the equation. We have a big challenge in Europe to enable that more companies- and board of directors in SMEs gain insights into the strategic transformation opportunities afforded by the range of “smart new technologies” in the market. As the French Innovation director in SEB in Stockholm says “ you have to get your feed wet to understand these technologies and their properties, you need to experiment, and consider investments in pilots much more as a venture cap investment. And you got to involve your employees in the experimentation – in the codesign of their future. The debates in Europe- and in my own company Denmark have unfortunately been dominated by the discourse and the research from the American labour markets with quite different characteristics. In Germany Fraunhofer Institute has for example established a *Working futures Lab*, which companies and groups can visit to get a hand on feeling of the potentials of these new technologies. In Denmark SAP offers a similar a futures design lab- with focus on services. The Danish Union for Commerce and Trade have

¹⁰ <https://www.minerva.kgi.edu/>

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established a Digital LAB in order to experiment with and explore the future with their members, and in Singapore Employers organisations, professional bodies and employee representatives are getting together to create transformation maps for their sectors- as a way to steer their strategic policy interventions- with some clear targets. We cannot predict the future, but we can co-design it in many ways through timely actions and systematic experimentations. The four case studies are early adopter firms, much can be learned from these. There has been a tendency to hype the transformative impact of the new so-called disruptive technologies without having substantial evidence.. Lessons from Denmark for example show that effects of automation medium term are much more complex to capture than what can be done through our main mechanisms for monitoring the labour market. In manufacturing firms that have fully invested in automation technologies, have redesigned their work processes and trained their workforce we begin to see the benefits in terms of a massive increase in job creation, but with growing difficulties to fill the jobs- not only engineers, but even more so skilled workers! The gain in productivity and the standardization of processes having led to improvements in quality have made these firms hyper competitive, and attractive partners and sub-suppliers in global value chains. We need more and better case studies, preferably case studies that follow firms over time- and potentially within their wider eco-system to learn from early adopters, and to feed into our skills anticipation systems and our education and training supply and our innovation policies.

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