

The Knowledge Work of the Future and the Future of Knowledge Work: Creativity and Innovation in Action

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ABSTRACT

Purpose: Our paper investigates what forms the knowledge work design on a corporate level in the future.

Design and methodology: The methodology includes 20 in depth interviews with researchers working with these issues in the Swedish telecommunication company Telia and the Norwegian telecommunication company Telenor. These companies make their living from understanding the future of work on a corporate and societal level. The research is multiple evidence based and triangulated.

Findings: The main finding is that AI and robotics will be more advanced, but the main changes will be in management and organizational structure. The work will be done more as distance work and through virtual teams. The management and organization of work through the coronavirus have opened for more work done independent of time and the workplace and in virtual teams. There is also predicted a lack of professionals and all types of employees in the years to come, leading both to compete for talent and increased importance in keeping the employed knowledge workers through internal career pipelines. AI and robotics will not reduce the need for professionals and employees.

The steps will be taken one by one toward an integrated digitalization that makes new opportunities for collaboration, communication, and knowledge work. The fundamental knowledge worker will be using more of his working time on significant business issues. The skills needed are technical, information management, knowledge management, project management, collaboration, communication, rhetoric, virtual team, creativity, and green problem-solving skills. There is a corporate need for ethical, cultural, and sexual awareness. We may summarize the requirements as creative, sustainable, social, and perception manipulation intelligence. The knowledge of the future will be complex, and the knowledge worker will handle multiple skills in different situations. The future work will be dominated by increasingly autonomous workers co-opting automated digital systems to create and capture value.

Discussion: The environmental issues and the climate crisis will be taken very seriously in the coming years. There will be cooperation between the political and corporate economies to do whatever is possible for sustainability in all internal and external processes to work greener and more creative, and innovative. We will experience sustainability driven by green leadership through a green strategy and green business models giving green services and products, reusing as much as possible, and using as few resources as possible to reduce CO₂. The number of bullshit jobs will however increase and the value and content of work itself will be questionable for a new work generation.

Keywords: Future Knowledge Work, Innovation, 4.0 Industrial Revolution, Robotics, Creativity, Artificial Intelligence

1 Introduction

How has digital technology transformed occupations across sectors of the economy in terms of changing tasks and new skills to accomplish the digital transformation? We know that we must perceive digital changes and use our creative and social intelligence to meet the technological challenges of artificial intelligence (AI) and robotics. We also fear the challenges might give us unemployment and a polarized



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working market. The dark side of the changes offered by information technology has always been that we will not be able to handle the changes and that significant parts of the economy will suffer and offer only fear and hope. The literature has focused on the dark side of the moon for consequences. What if the changes provided by AI, robotics, and digitalization were mass employment? What if the literature showing no hope and only fear of unemployment are wrong? What if our creative and social intelligence save all of us from that offering us mass employment and growth? Our research question is exploring and exploiting the work of the future and the future of work through the essential research questions:

- How will digital transformation change the future of work?
- How have digital technologies transformed knowledge work across sectors of the economy in terms of changing tasks and new skills to accomplish new tasks?

2 The literature review

Organizations face new uncertainty and ambiguity in today's increasingly knowledge-intensive and turbulent economy (Ghobakloo, 2020). Many businesses must become more flexible and adaptive to survive in the future (Culot *et al.*, 2020). However, they face an oxymoronic situation where efficiency calls for standardization and routinization, while effectiveness calls for flexibility and tailor-made solutions (Spencer, 2017). These considerations are often treated as separate streams of knowledge in the literature. For example, the KM literature has a bias in considering knowledge as a "thing" that should be distributed through digitalized processes, gaining efficiency through standardization (Beck, 2016). Knowledge is divided into tacit knowledge, as what we do not know, how we know, and explicit knowledge, which is what we know (Pettersen, 2019). Tacit knowledge is hidden but objective in the consequences of using tacit knowledge. We add our experiences and attitudes to knowledge (Olaisen, 1984). Knowledge and competence are not a thing but a learning process (Olaisen and Revang 2017). The learning process cannot be standardized but is open and living (Olaisen and Revang 2018). The data and information processes are digitalized and ready for any case of reuse and systematization in new orders or logarithms (Spencer, 2017). The logarithms are becoming more advanced through AI, robotics, and digitalization. However, technology does not make knowledge, experiences, and attitudes into a thing but is still a secondary process assisting the primary human functions (Dengler and Mattles 2018). A medical technological assistant comes up with many diagnostics, but the decision of how to handle the diagnostic information is done by a medical doctor (MD). An MD does not end up as an industrial worker owing to technological advancements but will be more critical for handling multiple diagnostics and a more complex (Spencer 2017 and 2018, Pettersen 2019).

On the contrary, the literature about professional service firms (PSFs) considers expertise and knowledge as social constructions. The future workplace is not a concrete "thing" but a creation based on subjective speculations about the consequences of globalization and technology on how we organize work in the future.

The first industrial revolution started in England (Taylor, 1911); the second one began in the US with the birth of standardization and the mass market; globalization, technology, and logistics drove the third one, while the fourth one will incorporate the second and the third revolution by adding workable artificial intelligence solutions, as well as life science inventions (Bravermann, 1974). The literature describes this as a coming revolution, but it might also be a smooth transition improving both the quality of life and the working processes.

This literature is about how robots and artificial intelligence will transform working life. The purpose is to understand what the workplace of future will be. The researchers investigating these issues are writing about substantial changes where robotics and AI will take over the work and where society will get a well-educated

elite of 20-30% succeeding. The jobs of 50% of the people will change or disappear. A community where a sizeable portion of the workforce will be without possibilities for work. The literature describes the erosion of the middle class as the almost granted future. (Tuschmann, 2011) Furthermore, Fukuyama wonders if the process is the end of liberal democracies.

“Once the dust has settled from the fourth industrial revolution (4.0), workplaces and professions might be unrecognizable” (Johannessen, 2018:19). A new class sees the light of day: the precariat (Dignan, 2019). The professional elite will live side-by-side with the "working poor" – people with several jobs still cannot meet ends (Ehrenreich, 2001). There will be a small salaried elite consisting of innovation and knowledge workers. Workplaces will be unrecognizable. Robots will have destroyed bureaucratic hierarchies and torn apart the middle classes. What will remain will be contract workers with insecure jobs. Concurrently, the emergence of a new level of knowledge pajama-workers appears– people who can do their jobs in bed or at a café table. There might be a significant transformation in professional environments slightly further into the future. Doctors will be medical engineers; nurses will be nursing assistants accompanied by robots. Robots and holograms might be replacing teachers (Johannessen, 2018).

Moreover, taking this further scenario, robots might diagnose and prescribe. (Susskind, 2016). The standard issue of these articles might be summarized in one word: Mass unemployment (Hammershoj, 2019). Fukuyama (2022) describes the ultimate global use of technology as the end of the liberal democracy in the US and the start of the Chinese hegemony.

While the industrial society caused the middle classes to grow and live in greater comfort, much suggests that the Fourth Industrial Revolution would decimate the middle class. The decimation of the middle class might lead to that power and authority taking over the arena of knowledge management. (von Hippel 2003) Some jobs will change rapidly, some will disappear, and some jobs might be the same. Until now, educated people have been able to find employment. In the future, many educated people will not find jobs. It seems likely that most jobs will be those either at the bottom or the top of the wage scale. We will see the development of the precariat and the working poor, but also well-paid innovation workers and knowledge workers (Zuboff, 2018). Zuboff (2018) and Hammershoj (2019) describe the situation as a polarized job market.

Robots and informants are causing changes in employment structures. Old jobs disappear, and people are laid off. The public and corporate sectors create fewer full-time jobs and more part-time jobs. The experience will be a disrupted and transformed work life. These trends directly affect the transition to the fourth industrial revolution (Zuboff, 2018).

The increasing informational and knowledge-related content of jobs expresses the emergence of a new organizational logic, with its specific characteristic, Lego flexibility. Lego's flexibility means that the production chain is outsourced to several countries by cost, quality, and innovation-and-competence logistics (Johannessen, 2019). Experience design is an innovative management and organizational model that focuses on user experience in the processes and the coupling between the customers and the workers who do what the organization is designed to do, i.e., the people on the front line. Also, the back office may change to a design perspective on organizational work where the back-office work will be the key to success (Pettersen 2019, Von Krogh 2000).

Any social system that fails to balance stability and change and, at the same time, be innovative will not be able to steer the ship at a time of increasing complexity. A key trend is transitioning from information and knowledge-intensive jobs to increasing demand for innovation-intensive jobs (West, 2018). The need for creativity, problem-solving, and collaboration skills will increase Frey and Osborne, 2017; Dingler and Mattves, 2018).

Robots, nano-computers, and information will interact with each other permeating all areas of employment. We figuratively imagine this as neurons communicating in the human brain. Familiarity with contexts and the direct "hands-on" contact required by traditional industrial production will be less critical. The implications for educational institutions and their programs and methods are already apparent. (Hammershoj, 2019, Zsiska, 2018).

A tripartite organization will characterize the robots, network nano-computers, and informants. Firstly, the market is developed for robot operators who will not need background knowledge other than experience in their work, i.e., they are skilled production workers and will receive the appropriate training. The traditional knowledge professions will secondly be developed by reinforcing and translating their knowledge base about the design and development of the informants. Thirdly, new disciplines and trades will be generated that model, build and maintain robotic machines, informants, and nano-computers. Robots, artificial intelligence, and informants are giving rise to such momentous changes that it is difficult to envisage how working life will develop in the future (Turner, 2000). Ghobakloo (2020) describes the situation as the digitalization and integration of the entire value chain of the lifecycles of products and services. Culot *et al.*, (2020) add that globalization will not be reversed at any time. The hyper-capitalism transforming societies and occupations caused by AI, robotics, and digitalization is the 4.0 industrial revolution.

The car industry produces three times as many cars, with one-third of the workers in the last generation. There is a dismissing return on how much we can reduce the number of workers for AI, robotics, and logistics (Zuboff, 2018). Delivering education and health care will anyhow be a work-demanding human employee. Providing services might be more automated but will still be work-demanding. There is no reason to believe that society neither has come to an end with the middle class or the number of people working. There might be more flexibility in the work-life, but in 2030, more people will be working than at any time, and more people will be educated at all levels (Tsoukas, 1996). Zuboff (2018) has concluded that the most significant change will be society's political, economic, social, and climate changes. The corporate changes will be done step by step and handled without substantial changes. Peters (2017), Johannessen (2018), and Ghobakloo (2020) summarized the literature as a wave where AI and robotics will change the way we live and work.

3 Design and Methodology

The study is an explorative study using a survey, literature, imagination, and intuition. The study interviewed five professionals in the future research division of Norwegian Telenor (The world's 7th largest telecommunication company) in March 2019 about their views of the workplace of the future. In March 2019 conducted five interviews at the Swedish telecommunication company Telia's end-work-life department (The world's 12th largest telecommunication company). We followed up in March 2020 and March 2021 with five interviews each year in Telia and Telenor about how the corona situation changed working life. The interviews were conducted in March 2019, March 2020, and March 2021. The interviews were semi-structured, lasted 30-45 minutes, and were done through telephone, Zoom, and Teams.

The empirical data is compared with the results of the literature review. The literature review was done by searching journal articles about future work in four areas and the combination of these areas:

1. Digital transformation
2. The forthcoming 4.0 industrial revolution
3. AI and robotics
4. Remote working and distance work
5. Combinations of 1-4

We found 140 journal articles and eight books according to the title, abstract, and keywords. We sized the selection down to 40, which we read and used for our paper. We have the scientific opinion that the downsizing increased the methodological relevance and, most of all, the study's validity and reliability. The whole content of an investigation is essential compared to only using the title, abstract, and keywords.

4 Findings: What skills are needed in future work?

According to the interviews, the findings are crystal clear for needed skills in future work.

- Technical skills for understanding and handling technological issues
- Information management skills for finding data and making the data into information
- Knowledge management skills for making information into knowledge
- Project management skills for working in temporary organizations and several projects
- Communication skills
- Collaborating skills for teamwork and group work
- Creativity skills for looking at issues from different angles and for creating incremental innovations
- Problem-solving skills for delivering solutions on time
- Virtual skills for distance team and group work

What story does the above description tell about the future worker? The future worker is undoubtedly a multiskilled worker able to handle multiple skills in different working situations. Their future work will need to be a manipulator of different perceptions in their work life. The future worker might be an expert in several professional ways but will certainly also be a generalist with a comprehensive working familiarity and a nodding familiarity with many situations. Learning new skills through the working life phases is required to keep the job and advance.

There will be job polarization with co-workers concerning advancements; there will be competition to advance in the internal pipeline since skills are broad.

A set of more complex awareness skills is needed to advance in the organization.

- Ethical awareness for keeping integrity and truthfulness, and transparency through all operations
- Cultural awareness for understanding and practicing different cultural values and norms
- Awareness for gender and equality issues
- Mobility awareness for serving corporations globally during the career pipeline
- Transformation awareness for learning new skills adjusted to different situations

In addition to these issues, there are environmentalism and sustainability. The future business strategies are green with a demand for greener and more competent work. The business models and the creation and capturing of value will be green. The environmental and climate issues have come to stay. The times of the green lip services are over. The entire value chain of the future life cycles of all products and services will be green. The corporations will not only cooperate with the politicians for a greener future but will be driving forces themselves for sustainability.

These issues are complex and demanding and define the increasingly autonomous corporate woman and the man who handles AI, robotics, and automated and digital systems to create and capture value for the corporation. More autonomous workers co-opting AI and robotic systems will dominate future work to create and capture value.

5 Discussion

Like most of the literature reported, Telenor and Telia have no clear opinion of the future defined as 2030. There is an insecurity with a lot of options or possibilities. Perhaps working people will continue doing more of what people are doing today. Most of the technology development and AI literature says the opposite.

There might include the industrialization of knowledge work with more robust control systems. There will be many people without work through the phase of robotics, and according to traditional Marxististic analyses, they will press down the wages. Globalization will make the competition for a job stronger.

On the other hand, the more technology and AI-based the economy becomes, the more knowledgeable employees corporations and societies need. The corporations will require people with knowledge (i.e., excellent education), experiences, and the right attitudes. Robotics and AI might give a working market with a higher demand for one-third of the workforce.

One-third of the workforce will provide the world with manual production and services. One-third might be without work, and the best solution paid a form of low public salary.

Telenor's solution will be a blue corporate world producing and delivering more than anytime, with a green world taking care of the climate and public services. A yellow world with humanity and dignity and a green world might be a utopia. In a red globe with smaller entrepreneurs and corporations delivering frontend technology, changing the power of the large corporations might be a solution. The clear conclusion is that future work might not be as different from today as many predict.

Loyalty, discipline, trust, and engagement will still be highly demanded. Project organizing and agility have been working well for a generation, and there will be less and less permanent organizational structure, as suggested by Mintzberg (1979).

One-sided literature describes the coming changes as a revolution in how people work and organize (Dignan, 2019). The more empirical research from researchers living the differences tells us about a future like today's situation. There are few changes in developing large global corporations with more power and employees. However, Chinese databases are reaching a critical mass of data, expertise, talent, and capital. The concentration called blue development by Telenor and Telia will continue.

The dominating economic blocks and countries will probably still be China, the USA, the EU, Japan, South Korea, and the UK. However, there will be a more significant focus on environmental issues, including global decisions relating to temperature and carbon use. The more giant corporations will support these issues to a higher degree and contribute to a greener world for all if alerted and enable practices to find new ways.

Telia and Telenor are optimistic about finding solutions for that there will be more educated people working in the global economy than ever. The threat not discussed here is a political threat to the free trade systems. The free trade systems will be necessary for keeping economic growth and more work and welfare than ever.

6 Highlights

The future looks bright from the perspective of the two leading Scandinavian telecommunications corporations. Corporations and societies will gradually adjust step by step towards 2030. The consequences of AI, robotics, and information technology will be manageable. Scandinavia already works as a testing ground for new technology and knowledge-intensive products/services due to its high penetration of education, distributed wealth, technological adoption, and expected trust towards others. The individual qualifications are increasing for knowledge (formal education) — experiences, and the right professional

work attitudes. Social and emotional skills for teamwork will be even more critical. The Scandinavian working arena will have more than 50% women as middle managers and 30% as top managers.

The eye-towards-the-future analyzing the future will be crucial for all corporations.

Bottom-up communication from those handling the most advanced customer needs will also be crucial.

Future analytical studies must be linked to the bottom-up and top-down management to coordinate all the corporation's activities. More and more of this coordination organizes into temporary teams and projects. Less and less of the organization will be a permanent organization. The leader teams might be quick global, national, and local task forces.

Large corporations like Telenor and Telia will be more concerned about environmental issues. Working greener and more innovative will be an essential issue. The cooperation with regions, nations, and national units will be much more robust in improving the environmental matters for customers and their organizations.

7 Future Framework

The key for any organization will be an analytical eye toward the future, where anything happening is analyzed and reported to the top management and coordinated into future deliveries. The key employees will be those implementing AI-based products and services on demand to advance customers. They will have a bottom-up understanding that is not yet common in the eye-towards-the-future and top management systems. The problematic issue for future work is thus the need for bottom-up awareness, sideways understanding, and senior-based strategy and organizational coordination where project teams collaborate. The main finding is the slow change in Telia and Telenor towards an honest knowledge worker using more of his/her working time for significant issues. Where a professional knowledge worker uses his/her qualifications or what s/he This educated for and where his/her professional experiences and attitudes Oare used positively for delivering excellent results. The framework for the future will be ordinary people achieving extraordinary results owing to their combinations of education, experiences, and attitudes and becoming part of the right project. However, it will also be creative specialists (“talents”) and entrepreneurial groups meeting in workshops, cafes, coworking spaces, and elsewhere, in and across organizational boundaries. The future of knowledge work is giving people the opportunities to deliver excellent results and to be single rewarded for these results as a part of their team. To make ordinary people and talents produce extraordinary results in groups is the future and knowledge work.

8 The other way around discussion

Our data do not acknowledge another negative way around these issues neither for the findings in the literature of that 30-50% of people will be out of work owing to AI and Robotics nor that the number of bull-shit jobs will increase dramatic in the years to come demanding two or three jobs to survive. Our data tells us that AI and robotics will make more jobs available and that the ageing of the population will require more social workers. Bull-shit jobs are described by Graeber (2021) as meaningless low-paid routine jobs where Chaplin’s “Modern Times” is re-established through that situation one requires movement one and situation two requires movement two. The jobs do not require experiences, skills or learning and developing attitudes. These jobs are found especially in manufacturing and retailing. Our data suggest there will be fewer jobs like these owing to AI and robotics and that this transition will give more jobs in the private and public service sectors. On the contrary we might argue that these jobs also will be meaningless bull-shit jobs. Alvesson (2022) concludes that it is the nature of jobs that change decreasing the qualifications and the content and the skills needed. The result is lower paid and lesser unionized and protected jobs. In addition, according to Graeber (2021) the public jobs like teachers, nurses, social workers, librarians and

their assistants get lowered payment and status and will be a new underclass of knowledge workers living in low-cost housing and prosperity. The retired population will be growing and living longer on deflated pensions. Graeber (2021) conclude that the underclass living close to hunger and survival might be as many as 50% in USA and UK, 40% in EU and 70% in the BRIC countries by 2030. In this picture Fukuyama (2022) fear for the survival of the liberal democracies and Graeber (2021) discusses the underclass revolutionary potential. The war in Ukraine and the increased energy prices, inflation and interests have given an even darker picture together with an increased number of refugees from Ukraine, The Middle East and Mexico.

9 Conclusion and the Way Ahead

The study has concluded that robotics and AI will be more advanced, but neither the way people work, nor the way people organize work will change much in the years to come. The processing of information and its meaning will be an even more critical work task or integrated into every work task. Every knowledge worker must try to see and think through what will be happening today and tomorrow. The past, present, and future will merge into a practical reality. There will be dynamic scenarios and corporate, team, and individual networks. Those grasping and understanding the situations working in professional and organizational networks will be the winners. They will be the bottom-up needed for corporate success, still working in a top-down hierarchy delivering products and services through global logistics.

The research needs to be expanded to different sectors within products and services. Tele- and communication corporations represent a knowledge-intensive service compared to future views within finance, shipping, property, consulting, and ICT service corporations. The results might be different or similar. There are many opinions about the future and all changes made by AI and robotics.

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