
Working smarter and greener in the age of digitalization: The corporate knowledge work design in the future

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Abstract: This paper investigates what forms the knowledge work design in the future on a corporate level. The future is 2030. 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 are both companies making their living of understanding the future of work both on a corporate level. We did the interviews in April 2019 and during the Coronavirus in April 2020.

The findings:

1. Artificial Intelligence (AI) and robotics will be an incremental revolution introduced step by step.
2. The Coronavirus has reorganized work as online work at home, and a more significant part of the online work will organize as online digital work at home and virtual teamwork.
3. Video conferences have come to stay, giving less business traveling.
4. Greener national supply-chains will partly replace the global supply chains.
5. The workforce will be more disciplined and loyal, have better competence (knowledge, skills, and attitudes), and more women as middle managers and top managers.
6. The incentive system will be based more upon an internal corporate pipeline.
7. The corporations will take a more energetic responsibility for greener solutions and the climate.
8. The households will be using more reused goods, traveling less, and have a greener living focus.

The difference between April 2019 to April 2020 is that online homework is the actual work situation in March-April 2020, and the interviewed believe that 50% of the work will be done online outside the workplace. The corona crisis changed the way we are working for the future. Digital online work done outside the workplace increases productivity and gives greater flexibility, better motivation, better learning, and better meaning for the employees. The age of digitalization is on the road.

Keywords: Corona crisis, Future knowledge work, Innovation, Digitalization, Robots, Artificial intelligence

1. Introduction

In today's increasingly knowledge-intensive and turbulent economy, organizations are facing new levels of uncertainty and ambiguity. Many businesses must become more flexible and adaptive to the future. However, they face an oxymoronic situation where efficiency calls for standardization and routinization. Effectiveness calls for flexibility and tailor-made solutions. In the literature, these considerations often are treated as separate streams of knowledge. 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). The corona crisis has given us a new perspective on the dependencies between corporations and society. The national dependencies have been more robust, and the global dependencies lesser. Globalization will probably never have the same meaning as before the corona crisis. The workplace of the future is not a concrete "thing." Still, a creation based upon subjective speculations about the consequences of globalization, technology, and the corona crisis for how we are organizing work in the future.

The Coronavirus has so far (June 2020) closed down most countries and cities, forcing a large part of the workforce to work online. The calculation from the IMF shows that the world economy will decrease in 2020, with five percent of the BNP. We have anyhow kept the output very high during what is called the worst economic crisis since 1929. The growth in three of the world's largest economies China, Japan, and South Korea, is still positive for the first quarter of 2020 (IMF World Outlook June 2020). For Scandinavia, the subject of this study,

the first quarter showed a growth of the BNP of 0.5% (Swedish Work Institute 2020). All this tells us that working online from home has worked well concerning handling all information-based work either individually or in virtual teams. In Scandinavia, the workforce in knowledge-based professions reported to their leaders at least every week. The leadership and management have to build upon mutual trust and not upon control. Brekke, the CEO of Telenor, announced that 50% of all work would be done online outside the workplace. According to Brekke, profit and productivity increased significantly in the first five months of 2020 due to online digital work outside the workplace at home and in virtual teams (Brekke 2020).

The corona crisis had to be handled as fast as possible with a closedown of corporate and societal activities. Solutions and capabilities were more important than professional ranks and positions. The political parties, the trade unions, and the owners cooperated in Scandinavia.

This literature is about how robots and artificial intelligence will transform working life. The purpose is to understand what the workplace of the future will be. The researchers investigating these issues are writing about substantial changes where robotics and AI will take over the work and where the society will get a well-educated elite of 20-30% succeeding and where the jobs of 50% of the people will change or disappear (Johannessen 2018). 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). A lot of the job losses in the corona crisis will not come back, and the crisis might contribute to the faster growth of people out of work than predicted.

While the industrial society caused the middle classes to grow and live in greater comfort, there is much to suggest that the Fourth Industrial Revolution will decimate the middle class. The decimation of the middle class might lead to that power, and authority takes over the arena of knowledge management. (von Hippel 2003)

Robots and informants are causing changes in employment structures. Old jobs disappear, and people are out of work. The public and corporate sectors are creating fewer full-time jobs but more part-time jobs. The experience will be a disrupted and transformed work life. These trends are a direct outcome of the transition to the fourth industrial revolution (Zuboff 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 a direct "hands-on" contact required by traditional industrial production will be less critical. The implications for educational institutions and their educational programs and methods are already apparent. (Zsiska 2018).

The robots, nano-computers in networks and informants, will be characterized by a tripartite organization. Firstly, the market develops for robot operators who will not need background knowledge other than experience in the work they perform, i.e., they are skilled production workers and will receive the appropriate training. The traditional knowledge professions will second be developed by reinforcing and translating their knowledge base about the informants' design and development. Thirdly, new disciplines and trades have 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). To predict the future is anyhow difficult as the Coronavirus has demonstrated, Nearly all predicted we would get the worst stock market crisis since 1929, but as of the June 12th the stock market is up 25%

2. Propositions

The study propositions are:

- (1) The corporate changes owing to AI, robotics and new information and communication technology (ICT) will be smaller than anticipated and done by a step by step change with more knowledge workers than ever implementing the changes over time.
- (2) The Coronavirus has forced the workforce to work at home using software like zoom to communicate and cooperate. We will continue the distance work independent of the workplace, time, and geography.
- (3) The environmental issues will be handled more seriously both by corporations, nations, the EU, and global cooperating agencies, increasing the reduction of the global temperature and CO2 gases.

3. Study design and methodology

The study is an explorative study using a survey methodology (20 in-depth interviews) together with the literature, along with our interpretation, imagination, and intuition. We interviewed five researchers in the future research division of Norwegian Telenor (The world 7th largest telecommunication company) about their future workplace views. We also conducted five interviews at the Swedish telecommunication company Telia. Future work-life department (The world 12th largest telecommunication company). We followed up in April 2020 with ten telephone interviews in Telia (5) and Telenor (5) about how the coronavirus situation changed the working life. The reflection and dialogue with the Telenor and Telia researchers represent a clarified subjectivity of a future possibility.

4. Corporate findings for the future of 2030

We have in the following concluded the results from Telenor and Telia. Both companies state the need for knowledge about different future scenarios, a dynamic understanding of the market, and the importance of corporate and professional networks.

4.1 The Scenarios for the future less critical in the corona situation

Scenarios of the future. The future scenarios describe continuing as before, the worst scenarios, and the best situations and the consequences of these scenarios. The scenarios are the eye towards the future every company needs. The interviewed in April 2019 were sure that scenarios for the future would be an essential tool. However, in April 2020, the interviewed have changed to that scenario of the future might be a harmful tool overwhelming the creativity and situational action-based solutions.

None of the corporations had an eye or scenario for the corona situation and had no scenarios to meet the virus. The workers managed through online homework and collaboration with all tasks. The work performed through self-confidence, engagement, new solutions, and the spirit "you do what you have to do in this situation." The corona situation has no planned scenario, but demand a whole new condition to be solved without a planned script.

4.2 Leadership and organizational structure

The corona crisis demand conditions for online work at home. Especially in the large cities in Scandinavia, a large proportion of jobs occupied with information and knowledge work. The findings before and under the corona crisis correlated since we found that a more involving, engaging, and democratic leadership would also be needed to let more women and men working at a distance to handle the double working dilemma with two jobs, children and old parents. The corona crisis allowed online home-working than ever experienced—more than eighty percent of the information- and knowledge-based work done at home in Scandinavia. We got more equalness between managers and employees where the managers had to be interested in the situation at home. The corona situation has changed the organizational structure forever, showing that work can be handled independently of place and time. Solutions and self-confidence became more important than rank, position, and age. Human curling leadership became more important than control and governance,

4.3 Societal usefulness and market dynamics

A dynamic understanding of the changing market is needed, including delivering greener and smarter products and services. There will be different aspects of the market, and there will be a reused market supporting the sharing economy. There will be a high-end delivery on demand for the most advanced solutions where the key employees form the future together with key customers. The communication here will be a bottom-up connection both to the eye-of-the-future department and the top management group. The corona situation required not a market understanding, but somewhat operational management where the solutions were the key to survival. Implementing an interest rate cut for their bank customers was crucial not only for the customers but also for the society in itself. The link between the usefulness both for the community and the market and the employer became essential.

4.4 Networking

Networking platforms have many individuals, team, corporate, and professional networks relating to each other. The systems will both be including and excluding members.

They are grounded in these three premises – scenarios, dynamic markets, and networking platforms, the paper elaborates on why and how they may unfold in the future work organizations.

The corona situation proves the use of networking technology like never before. The platforms work using new and old software was used. The corona case proved that networking is essential for any private and public institution. Under the corona crisis, people handled both new hardware and software according to their needs.

5 The future corporate systems

5.1 The future as a part of the supply chain

The problem for future work is the need for bottom-up knowledge, sideways understanding, management strategy, and organizational coordination, where the project teams work in collaboration. The successful organization will be an organization combining top-down for efficiency, bottom-up for innovative market solutions, and sideways team working.

The corona situation has documented that we are doing what we need to do when changing. We use technology hardware and software through all software functionality. The technology is creating collaboration between workers in thousands of homes, helping each other find solutions, and helping customers and students get their services.

5.2 The future workplace

The robotics and AI will surely be more advanced, but neither the way of working nor the way of organizing and manage work will change much in the years to come. The processing of information will be an even more critical work task either in itself or integrated into every work task. Every knowledge worker will have to 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 together with the corporate, team, and individual networks. Those grasping and understanding the situations working in professional and organizational systems 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 a global logistics. The consumers are already prosumers in services like banks and shops and for IKEA like products. As it looks like the presumption will continue to get even lower prices, but there will also be a reaction promoting that the local small and green is beautiful.

The employees in the foreseeable future will be working smarter and greener, accepting new technology like robotics, and digitalization AI solutions. The future in this kind of portrayal is brighter for knowledge workers than anything seen or documented anytime. Zooming into what is already in the making, according to informants in Telenor and Telia, we may capture brighter and darker sides, which both are worth unveiling. The darker side of the corona situation is the high unemployment rate and whether the unemployment rate will stay very high due to AI and robotics solutions in the production of goods and services. The US Fed stated on June 11th that the US's unemployment rate would stay at 10-15% during 2020.

5.3 Education

The workforce will be better educated than before, and in Scandinavia, half of the population will at least have a Bachelor's education in 2030. The women will be significantly better educated than men, and the women's education level will result in more women as middle and top managers. The executive training will be mainly internal, securing a tailor-made education for the corporation. Lifelong learning or reeducation will be the situation for all employees. The corona crisis has documented that top-down executive management is not what is needed. What is required is self-confidence for mastering the case and learning by doing. Learning by doing created a culture of collaboration, participation, and engagement. Executive teaching should change to learning by doing and action-based learning following corona experiences. Our findings indicate that internal executive education will be growing while formal external executive education will be in less demand.

5.4 Attitudes

The workforce will have knowledge, skills, and attitudes defined as competence. The attitudes are critical for the performance and changes. Loyalty, trust, engagement, and discipline will be even more essential than today. Our findings indicate that discipline in performing according to expected standards will be an essential part of the employment and delivery process. Online homework requires another kind of discipline than at work. According to our findings, there are more significant differences in discipline and delivery during the corona crisis than expected. Those over 50 deliver better than expected, and those less than 30 deliver less than expected. The older workforce has better discipline during the corona crisis.

The working hours will be more flexible with the possibility of working at different sites and hours. A disciplined work routine will be more critical, with more flexible hours and more distance work. To both keep and recruit professionals with these attitudes will be necessary. Employees will have to be able to govern their availability to avoid 24/7 burnout and stress.

5.5 Teamwork

The employees will be working more in teams, either on-site or virtually. The collaboration will be a critical success factor. Solutions and results will be a reward in itself where the team will be more rewarded than today. The conclusion is that more knowledge-based employees perform on itself, but are more satisfied with a team performance reward. Solution-oriented team project working people will be necessary.

Social and emotional competence will be in higher demand for mastering collaboration and communication at all levels. The teams will be more diverse, consisting of more nationalities, and many of the units will be virtual teams working globally. For the corporations, it will be more important to get a synergy of all global knowledge worker resources. The corona crisis has shown that global video conferences are working, and there will be less traveling and more local virtual teams in the future.

5.6 Less traveling working smarter and greener

The interviewed in April 2020 labeled the corona crisis as the death of regional, national, and global flying. They believed that virtual teamwork and online zoom conferences would replace more than 50% of the work flights overnight. Between Oslo and Stavanger, Bergen and Trondheim, there were 20 flights daily until March 12th, and there are now two flights daily, and everything works as of June 12th. There will undoubtedly be a significant decrease in domestic and international flights since the digitalization has created the tools for online work without traveling.

5.7 Organizational structure and project work

The project organization form will dominate with less permanent organizational forms and more short-term organizational forms. Most of the work is temporary projects in teams and working groups. A smaller part of the corporation organizes permanently, and a more substantial part organizes as projects and task forces. The best project-leaders will be used in different projects and will learn up and discover new project leaders. The corona crisis has organized the work as project work delivered from home reporting milestones in the projects every week. Knowledge work in the future organized as temporary projects with a leadership group formed as a temporary task force.

5.8 The pipeline

There will be an administrative and a professional pipeline not only to the best management but to secure that the professionals have their career pipeline. Recruit the managers will work through internal success and less through external success. The corporations will make a pipeline where all employees are working their way through the corporation, managing themselves and others. To recruit and learn up people is expensive, and the corporations will make a lifelong pipeline for wanted employees either they are working their way through the professional pipeline or the managerial pipeline. There will be entrepreneurial and innovative corporations in the company circulating employees through creative work sites. The corona crisis has proved the need for a loyal

and disciplined workforce, the Best way to secure a loyal and disciplined workforce is through internal recruited pipelines which get higher responsibilities during many years in the corporation.

5.9 The working landscape

There will be no (or less) single offices, but shared workspaces for sharing and collaboration. The workplace will be more aesthetics and artistic decorated for inspiration. Art management will include well-decorated and inspiring workplaces. The corporations will support online homework through hard- and software, making the workplace a great place to come for knowledge sharing, social gathering, meetings in knowledge-intensive corporations. At the same time, most production and service companies will have their work-related value chain as before.

There will be more single women and single men working while there will, at the same time, be more possibility for parents concerning daycare and flexible hours through online homework. The link between the workplace and the home workplace will be more reliable. The delegation of work tasks will allow more employees to work from their homes. The working landscapes will include any kind of networking, allowing task collaboration and professional updates and social issues. The global workers might not need to physically meet to have excellent cooperation through their technological networking platforms. The corona crisis has even demonstrated a well functional zoom socializing eating tapas and drinking wine. Our data indicate higher participation than ever in home zoom meetings and socialization zoom events. More people than ever during the corona crisis are streaming cultural events discussing the events afterward in zoom meetings. According to our data from Telia and Telenor, the amount of streaming in Scandinavia in March 2020 tripled. The corona crisis created another work and cultural landscape. Temporary or permanent? Nobody knows.

5.10 Working greener

The employees will be working greener, traveling less, and thinking greener and smarter in all service and product production. The critical professional story will include working smarter and greener. There will be no (or less) parking spaces. People will as much as possible, be walking, biking, and traveling through public transportation. The Coronavirus has so far stopped all distance moving domestic and foreign. The driving distance for cars in Norway sunk in March with 65%, and public transportation in Denmark sunk with 54% in March. The worldwide consumption of oil is reduced by 38% from March 2019 to March 2020. The reduction in oil consumption is more significant than the total oil production in Russia and Saudi Arabia. The Co2 reduction is noticeable and might keep up since Scandinavia's working life has functioned satisfactorily without traveling. The video conferences and zoom conferences have worked well and will probably keep on after the Coronavirus. The paradox is that the corona crisis gave us a greener world. Temporary or permanently? We certainly hope for a permanently greener world.

5.11 Future incentive systems

The incentive system will change to be less individualistic and more team and project-oriented. The project team might get incentives according to the short- and long-term results—a transformation from individual to collective team rewards. Innovative solutions, learning by doing, and deliveries in time will be more rewarded than rank and positions. The paradox will be to form an incentive system giving more innovation and creativity together with a more disciplined and loyal workforce.

5.12 Leadership

The employees may need more leadership (follow up and directions along which to work) and less management (control), but work may unfold in virtual and distributed ways. The leaders must both be charismatic and visionary and have authority. To be able to tell the corporate story of the future, pictures and animation will be an essential leadership attitude.

Change and transformation leadership will be more important than transaction leadership. The top management team will be a temporary task force trying to use the task force form to be more innovative. Leadership in the corona crisis has been a balance between giving directions and less control. Balancing leadership and management might be the critical success factor in the future?

5.13 Living greener

The households will be using more reused goods and more short-traveled produce and goods. We will reduce professional traveling, and there will be a sharper focus on local and regional issues. The internet trade might increase to 50%, and internet trading reduces the need for shopping malls. During the corona crisis, net shopping increased by 40%, and a more significant part of shopping will remain net shopping. The new working generation in Scandinavia has a significant focus on greener living and will focus on their working and network environments.

6. Discussion

Telenor and Telia, like most of the literature reported, 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 be continuing to do more of what people are doing today. Most of the technology development and AI literature are saying the opposite. There might include industrialization of knowledge work with more reliable control systems at all levels. There will be many people without work through the phase of robotics, and according to traditional Marxist analyses, they will press down the wages. Globalization will make the competition for a job stronger. The corona crisis might be the end of globalization and the start of more influential nations taking over global production. The high unemployment rate in the corona crisis might last owing to the use of AI and robotics in the production of goods and services. The unemployment rate in Scandinavia tripled from 4% to 12% in June 2020, and in the USA, UK, France, Japan, Italy, and Spain, the unemployment rate also passed 12% in June 2020 (Swedish Workforce Institute 2020, IMF 2020). These unemployment rates and even higher rates might be permanent. According to Telia and Telenor's future research, as much as 50% of the unemployed will never be back owing to AI, Robotics, internet trading, and less demand, especially for traveling services. The corona crisis might have given the world a longtime unemployment rate.

On the other hand, the more technology and AI-based the economy becomes, the more knowledgeable employee corporations, and societies need. The corporations will require people with knowledge (i.e., excellent education), skills, and the right attitudes. The robotics and AI might give a working market where there will be a higher demand for perhaps one-third of the knowledge workforce. Half of the workforce might provide the world with manual production and services. As much as 15-20% might be permanently unemployed, and as the best solution paid a form of low public salary. How far away is the scenario – 2025, 2030 or 2035?

Telenor's solution will be a blue global corporate world producing and delivering less than today with a green world taking care of the climate and the reuse of goods. A yellow human world is taking care of public services. A yellow world with humanity and dignity, together with a green world, might be a utopia. A red world with smaller entrepreneurs and corporations delivering front-end innovation technology and changing the power of the large corporations might be a solution. To have and have not may get a new meaning.

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

There is one-sided literature describing the coming changes as a revolution for the way people are working and organizing (Dignan, 2019). The more empirical research work from researchers living the differences tells us about a future very much like the situation today. There are a few changes in the development of more giant global corporations with more power and more employees. The concentration called the blue development by Telenor and Telia might come to a halt after the corona crisis.

Against these conclusions might be the future researcher's evaluation of the consequences of the corona crisis. The researchers all hold the possibility that the corona crisis might be the end of globalism. The idea of one global world knitted together through culture, education, production, partnerships, and conventional markets is a young idea. The value of local, regional, and national togetherness might come out of the corona. The researchers believe that corona has formed permanent changes both in the way we are working and making the global situation less attractive and may also lead to a permanent drop in global trade focusing upon local, regional and

national solutions. The researchers believe strongly that the interconnected globalism will be strengthened as a benefit for almost all of us also with a global consensus for a greener future.

7. Future framework

The future looks bright in April 2019 and less bright in April 2020 from the perspective of the two leading Scandinavian telecommunications corporations. The 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 and discipline. The individual qualifications are increasing for knowledge (formal education) — experiences and, most of all, 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 key corporations will be those implementing AI and robotics-based products and services. The problematic issue for future work is thus the need for bottom-up knowledge, sideways understanding, and senior based strategy and organizational coordination of project teams working in collaboration at work and at home and in virtual teams. The Coronavirus might have changed the way we are working forever. The optimistic view of the future in April 2019 has changed to a more realistic view in April 2020. Disciplined and loyal knowledge workers are working for years in the corporate pipeline in the future. What the researchers in Telia and Telenor call "the long roads corporate man and woman" which are "bred and trained in the same corporation" as "a part of collaborative virtual teams" with "a stronger corporate control and governance". The fear of a more significant proportion of unemployed knowledge workers has come to stay.

The main finding is the slow change in Telia and Telenor towards a real knowledge worker using more of his/her working time to significant knowledge issues. The framework for the future will be ordinary people achieving extraordinary results owing to their combinations of education, skills, and attitudes, as well as 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 rewarded for these results as a part of their team. To make ordinary people, as well as talents, produce extraordinary results in teams is still the future of knowledge work even if the whip of a disciplined and loyal workforce has come to stay. Our prediction of the future is however based upon knowledge-intensive corporations

8. Conclusion and the way ahead

The study has concluded that robotics and AI will be more advanced, but the way people are working and how people are organizing work will change in the years to come due to the corona crisis. We are into the digital age where AI and robotics will be introduced step by step as an incremental revolution.

We will continue to work more online from our homes and outside the workplace. The digitalization of work has come to stay and many workplaces as Telia and Telenor will continue to organize half of the work outside the workplace. The professional traveling will be significantly reduced allowing the employees to use video conferences and virtual teams. We will work smarter in the digital age and we will be more concerned about finding greener solutions both for corporate work and for private living.

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