A SYSTEMIC THEORY OF KNOWLEDGE MANAGEMENT

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Knowledge Workers in the Future of Artificial Intelligence

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FOREWORD

In this book, we will show exactly which jobs will be uncertain in the innovation economy. However, we would like to point out here that it is our clear view that only theoretical reflections, theories, mini-theories, propositions, hypotheses and systems of hypotheses can help us to understand and relate to practice. Therefore, this book is not a 'cookbook recipe' for which jobs will be uncertain in the innovation economy, but rather a theoretical reflection and concretization regarding which work functions will be uncertain in the future as we move towards the Fourth Industrial Revolution, where artificial intelligence (AI) will be the dominant technology.

We base this presentation on systems theory[1] and systems theory models. This is done so that the practical guide to uncertain jobs in the future will be linked to a basic theoretical reflection. Without such a theoretical superstructure, any proposals would be mere guesswork without any theoretical grounding.

To understand which jobs will be uncertain as we move towards the Fourth Industrial Revolution, we will need to adopt at least three time perspectives. The short-term perspective, 5–15 years. The medium-term perspective, 15–30 years. Few of us are interested in the long-term perspective, but this time perspective extends approximately from 30 to 50 years ahead. In the following, we will try to answer the question of which jobs will be uncertain regarding these timelines. At the same time, our main focus will be on the short- and medium-term perspectives.

We will divide our assessments according to a conceptual model. We have used this model as a basis for reflection in other works (Johannessen, 1990, 2018, 2020a, 2020b, 2020c, 2020d, 2021a, 2021b, 2021c). The theoretical foundation of the model consists of an integration of the work of three theorists, Miller (1978), Beer (1979, 1981, 1985) and Ackoff (1981, 1999, 2006). Therefore, we will term this model the MBA model, that is, the initials of the three theorists.

[1] See chapter on Concepts.

For our purpose here, we will mainly use the model elements developed by Miller (1978), because this can provide a better connection between theory and practice, and thus enable us to be more specific regarding which jobs will be uncertain when AI becomes a part of everyone's working life. When we utilize the work of the two other theorists, Beer and Ackoff, we will explicitly point this out. Miller's theory can be applied in many ways to help us understand competence developments in the future. The theory can provide us with an overview of the work functions and the work processes that can be linked to these. Miller's theory can also be used as an analysis tool regarding future competence development, as well as a tool for diagnosing work processes in an organization, and where and how these work processes are organized and structured. The theory can also be used to show the practical utility value for people, organizations and societies in relation to how AI can affect future competences. In this way, Miller's theory can give us a clue as to which jobs will be secure or insecure in the innovation economy as we move towards the Fourth Industrial Revolution.

There is one thing in particular that seems to be a paradox regarding new technology. Many researchers and politically interested people often discuss the possible consequences of this technology in many contexts before it has been implemented. However, once the technology is implemented and becomes part of our everyday lives, people seem to be only marginally interested in its consequences. One explanation may be as follows. One can imagine that through the discussions people had before the technology became a reality, all conceivable scenarios have been imagined. Thus, when the consequences occur, people are not that surprised. Many people have also taken precautions, and have changed or adapted their competence so as to be able to tackle the challenges of the new technology. In this way, people become ready for changes through the discussions that took place before the technology became a reality in everyday life. The new technology, AI and intelligent robots will probably not be wholly destructive regarding people's competences, but will be experienced more as an evolutionary process one has had time to adapt to.

If the above assumption is correct, then it is important to discuss, reflect, theorize and consider the aspects of practical utility, before a new technology is introduced, and before changes occur in the labour market. One can imagine that this advanced discussion is a type of psychological and sociological competence preparation for what can happen. This forewarning of possible future competences, by means of expectation signals, will enable people to acquire the competences that will be demanded by the new technology. This can be of benefit to students when planning their studies, so they can adapt their education to future changes; it can also be of benefit to schools and

universities, so they can make changes to their curricula. In addition, it will also be of relevance to the authorities, so that they can provide more high-tech education, with a focus on the new technology that is emerging.

CORE IDEA IN THIS BOOK

We will use systems theory to provide practical guidelines for which jobs will become uncertain in the innovation economy.

KEY POINTS IN THIS BOOK

- It is our clear view that only theoretical reflections, theories, mini-theories, propositions, hypotheses and systems of hypotheses can help us to understand and relate to practice.
- Theories about working life show the way to good practices.
- The theories we use are based on systems theory models.
- The purpose of developing scenarios about future competences and uncertain jobs is to prepare people, companies and society for changes.
- When this readiness for change is incorporated at all system levels, competence destruction will not be experienced negatively, but more as a kind of law of nature that needs to be followed.
- Forewarning of possible future competences, by means of expectation signals, will enable people to acquire the competences that will be demanded by the new technology.
- We assume here that the core technology in the Fourth Industrial Revolution will be AI. However, we are fully aware that many other technologies are also emerging, such as Big Data Analysis, intelligent robots, intelligent informats, gene editing, drone technology, quantum technology and quantum computers, etc.

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1

A THEORETICAL REFLECTION

CORE IDEA IN THIS CHAPTER

An organization is understood here as a goal-seeking system that consists of several smaller goal-seeking systems.

KEY POINTS IN THIS CHAPTER

- All the decisions made in organizations and other social systems are limited by their history and the expectations that exist within the system.
- The jobs that will be uncertain in the future will depend on which time perspective we use: short term, medium term and long term.
- Every social system needs some form of boundary that should be 'guarded'. In today's reality, information 'guards' may be more important than physical 'guards'.
- Information stress, which is a result of being presented with more information than we can process, can harm individuals and organizations.
- The processes in a social system are linked to performing the activities that the system is designed to do.
- The conceptual model used in this book is based on 20 critical and essential functions.

A CONCEPTUAL MODEL

This new technology may be related to artificial intelligence, Big Data, intelligent robots, intelligent informats, gene editing, drone technology, quantum technology, quantum computers, etc. However, we are of the opinion that artificial intelligence will be the main core technology in the Fourth Industrial Revolution; the other 'support' technologies will float around this main technology like atoms around a nucleus. We are fully aware of the fact that the 'support' technologies will be of great importance for working life. It is often the case that 'support' technologies can affect the individual's working conditions as much as the core technology.

In order to show which jobs will be uncertain in the innovation economy, we choose here to examine the organizational level. An organization is distinguished from a group by the structure of its decision-making system. The same distinction also applies to the relationship between an organization and a country. Examples of organizations are banks, schools, shops, hospitals, kindergartens, universities, companies, prisons, hotels, ships, warehouses, etc. We thus distinguish between groups and organizations on the one hand, and organizations and countries on the other.

The larger an organization, the more decision-makers will be involved in decision processes. As a general rule, this means that large organizations are also bureaucratic systems. The idea is that if the new technology can be used to remove some of these decision-making stages, then the bureaucracy will be reduced and the decision-making process will be more efficient. Thus, there is a connection between structure and process in the decision-making element in an organization.

An organization is understood here as a goal-seeking system that consists of several smaller goal-seeking systems. The goals of the various systems and system levels are organized hierarchically (Miller, 1978, p. 595).

All the decisions made in organizations and other social systems are limited by their history and the expectations that exist within the system. Both history and expectations have a time dimension regarding decisions, and the processes that precede the decisions. Therefore, we have introduced above the three time perspectives: short term, medium term and long term. The jobs that will be uncertain in the future will depend on which time perspective we use.

Organizations in the global economy are dependent on other social systems for their development and survival. In other words, it is important to maintain relationships between social systems, regardless of technological developments. In historical contexts, one can find organizations that are to a lesser extent connected to other social systems. However, these historical

examples are atypical and of little interest in the global economy; some examples are the roaming bands of marauders after the dissolution of the Roman Empire, migrations, invading armies, etc. The objection to these examples is that they all plunder in one way or another in order to survive. Thus, it can also be argued that even these examples show that there are relationships between social systems, even though some of these relationships are forced.

The examples above show that every social system needs some form of boundary that should be 'guarded'. This boundary can be physical, symbolic, psychological, information boundary, communication boundary, etc. The point is that someone should have a function in the organization and other social systems that 'guards' the boundaries, so that cross-border activities do not happen, if they are not desired by the system. This is shown in Fig. 1 as 'boundary'. This boundary function not only protects the physical security of buildings and people but also prevents the intrusion of any information that can harm the system. In today's reality, information 'guards' may be more important than physical 'guards'. We know that information stress, which is a result of being presented with more information than we can process, can harm individuals and organizations. However, it is not only the increased intensity of information that can lead to information stress but also ambiguous information.

All the critical elements mentioned in Fig. 1 can be understood in relation to two constructs: structure and process. The structure says something about how the elements are organized, how the subelements relate to each other and how each element relates to the other critical elements in an organization. The structure can be further understood in relation to how many people work in the system, how large the turnover is, the number of decision levels, the number of people in administrative positions in relation to those people who perform the activities the system is designed to do and the type of decision-making system, such as authoritarian, feudalist, dictatorial, democratic, anarchistic, etc.

The processes in a social system are linked to performing the activities that the system is designed to do (Beer, 1985). The processes must lead to results that are related to goals and expectations of the system, and/or requirements that are demanded by the system's environment. The processes coordinate the activities so that they operate without too much waste of resources. The processes can be organized in different ways, such as production system, support system, logistics and sales system. However, there are many other ways the processes can be organized. It is imperative for the survival of the system that there is a clear organization of the processes.

The model we use in the book is shown in Fig. 1. We will not elaborate further on the model, but for those who are interested in understanding the

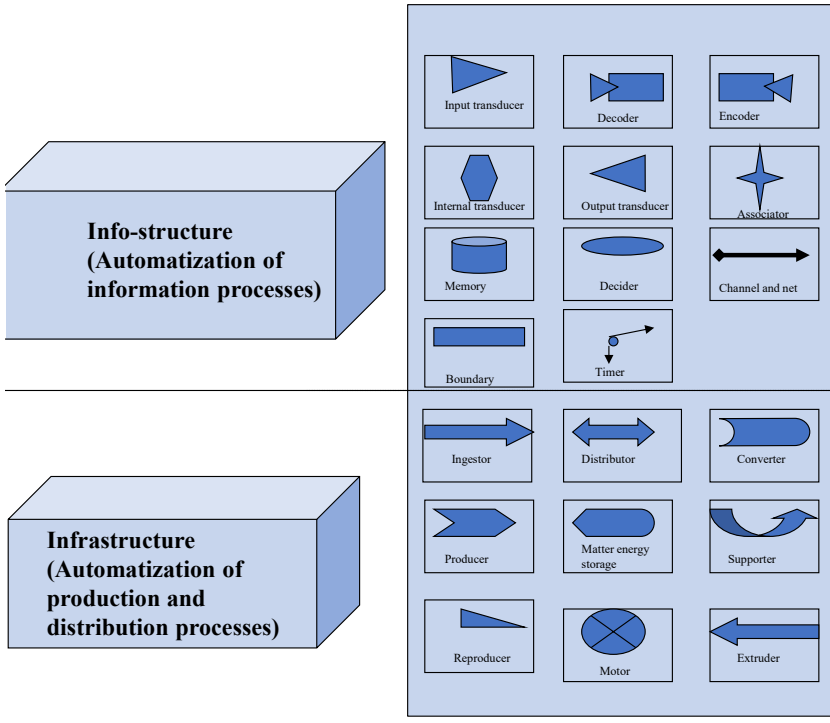

Fig. 1. Uncertain Jobs as We Move Towards the Fourth Industrial Revolution.

model's theoretical basis, we refer to the references given above. The model is based on 20 critical and essential functions that an organization must have access to, either in the organization itself or in relationships with other social systems, in order to survive as an independent system.

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2

INFRASTRUCTURE

CORE IDEA IN THIS CHAPTER

In the short-term perspective, artificial intelligence (AI) applications will not result in redundancy among unskilled and skilled workers.

KEY POINTS IN THIS CHAPTER

- Infrastructure concerns the physical and organizational structures and systems of a society and the relationships between them.
- In the short-term perspective (5–15 years), AI applications will *not* result in redundancy among unskilled and skilled workers.
- Automation processes will flow like a tributary into the main river of production and slowly grow in strength, replacing people's work functions in a medium-term perspective (15–30 years); as well as replacing those competences that do not meet the requirements of the new technology.

Below are the hypotheses for the individual work functions in the applied theory regarding infrastructure:

- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the ingestor function will become increasingly insecure.
- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the distributor function will become increasingly insecure.

- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the converter function will become increasingly insecure.
- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the producer function will become increasingly insecure.
- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the matter/energy storage function will become increasingly insecure.
- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the extruder function will become increasingly insecure.
- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the motor function will become increasingly insecure.
- When a large number of high-tech applications are implemented, and the system is large, the jobs related to the supporter function will become relatively secure.

It is already apparent that new technology related to AI is being developed in the USA, China and Europe.

In the short-term perspective, there will be a shortage of labour, and especially a shortage of labour with the right skills. In the short- and medium-term perspectives, there will be a shortage of all types of labour with skills adapted to new demands. On the other hand, those people with out-dated competences will need to enrol on various types of competence-enhancing courses of shorter or longer duration. The point of this introduction is to emphasize that in the short- and medium-term perspectives, there will be a need for both unskilled and skilled labour, such as electricians, carpenters, joiners, plumbers, etc.

In the short-term perspective, AI applications will not result in redundancy among unskilled and skilled workers. On the other hand, it is highly probable that the automation of jobs will continue within production. Many of the production workers who are made redundant will be able to find work in the service sector. There will be a high demand for truck drivers in both the USA and the UK, as well as parts of the European Union. We know that self-driving vehicles will become a reality in the future transport sector. However, it is unlikely that those working in the transport sector today will be affected

by this new technology. In the long-term perspective, however, the transport sector will most probably be restructured due to this emerging technology.

INGESTOR

Question

In this section, we will examine the following question: Which jobs related to the ingestor function will become insecure in the innovation economy?

Definition

Ingestor is the function in an organization responsible for importing and exporting matter and/or energy into and out of an organization (Miller, 1978, p. 611).

Examples

The examples here are many: warehouse workers, port workers, employees in purchasing departments, commercial suppliers, receptionists, company guides, the HR department's recruitment function, doormen, etc.

Structure

This function will largely be organized in relation to departments, such as the purchasing department and the HR department. The ingestor function often has overlapping functions and activities together with the boundary function, described below.

Process

These are the work functions connected to transporting input materials into a business, company or organization. These are mainly materials that are to be used separately or together with other materials to produce the company's products and services.

Work tasks in this function can involve the sale, transport and administration of the intake of materials. Thus, the ingestor function is connected to all the work tasks that are involved in the intake of materials, which are needed in the company's production.

In the short term, these jobs are completely dependent on the level of economic activity. If the demand for a company's products is high, then the demand for competence to perform the work functions related to production will also be high. However, automation and digitization have already resulted in the redundancy of some of the work functions related to the ingestor function.

In the long term, it seems reasonable to expect that technology related to transport and administrative systems for moving materials from one point to another will be automated, thus making workplaces within this function very insecure. In the short term, it seems reasonable to assume that automation will increase productivity within this work function, but jobs will not be destroyed overnight. In the medium term, however, these jobs will become insecure.

The description above applies to highly industrialized countries, that is, largely the Organisation for Economic Co-operation and Development area and some areas in China. However, China is a special case, because the country is so large (1.4 billion people) that there will be economic pockets that are high-tech, and other economic pockets that are still in the development stage.

Hypothesis

The greater the focus on the production of goods as opposed to the delivery of information and services, the greater will be the importance of the ingestor function.

Typology

The typology shown in Fig. 2 is based on the above review of structure, examples, process and hypothesis.

Conclusion

In this section, we have examined the following question: Which jobs related to the ingestor function will become insecure in the innovation economy?