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Digitalization as a developer of occupational safety in the Finnish food and drink industry

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Title of the Thesis: Digitalization as a developer of occupational safety in the Finnish food and drink industry
Degree: Master of Science in Economics and Business Administration
Programme: Industrial Management
Supervisor: Ville Tuomi
Year: 2023   Pages: 77

ABSTRACT:

The thesis aims to find out what kind of effects digitalization has on occupational safety and work accidents in the food and drink industry. The study also aims to find out what kind of technological means are used to improve occupational safety, and whether digitalization creates added value from the perspective of occupational safety. Digitalization is strongly present in people's everyday life. Both leisure time and various industries are in the edge of a major change. Digitalization offers great possibilities and opportunities to develop, but with it, challenges, complexity, and competition also increase. The food and drink industry largely consists of the basic principles of the process industry, and repetitive tasks can be a significant part of the job description. Occupational safety plays an even greater role in the strategy of organizations, and companies invest significantly in it. Occupational safety is an important aspect in the food and drink industry, and accidents at work occur more in the food and drink industry than in industries in general.

The thesis consists of five chapters. The first paragraph is an introduction. This part describes the background and purpose of the study, as well as the research questions and structure in more detail. The second chapter is the theoretical background, and it focuses on digitalization, occupational safety, and the food and drink industry. The third chapter describes the methodology used in the study and how the research material was collected. The fourth chapter describes the results of the study. The fifth and last chapter contains analysis, conclusions and discussion of the topic based on the research results and theoretical framework. In addition, the chapter describes the limitations of the study and potential future studies. The study was conducted as a qualitative study and the main data was collected for the study using a semi-structured questionnaire that was sent to Finnish food and drink industry organizations. Based on the answers of eleven professionals in the field, an analysis of the topic was built. A theoretical framework was collected to strengthen the research based on the literature of the subject area and previous studies.

After analysis, the results of the thesis were as follows. Digitalization can bring added value to occupational safety in the food and drink industry, and with it, organizations can achieve better occupational safety. However, its implementation alone is not enough to improve occupational safety, rather it provides tools for success. Its correct application is important, and a critical assessment of its necessity is mandatory. Digitalization must be supported and its acceptance among all employees is essential for success. Changing attitudes to positive ones plays a critical role in the implementation of digitalization and thereby also in improving occupational safety. Technological tools bring added value to occupational safety, but they must be used correctly in order to maximize the benefit. The biggest reasons for non-implementation are lack of resources, uncertainty about benefits, aging employees, layout and factory conditions, and a negative attitude.

KEYWORDS: Occupational safety, digitalization, food and drink industry, process industry, technology

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1   Introduction

"Think first, act later" (Respondent 7).

1.1   Background and significance of the study

Occupational safety should be the first priority of every company. Other aspects of the organization, from productivity to development, have their roots in the environment created by occupational safety. Technology moves forward constantly and creates opportunities for business development, and occupational safety is a big part of that.

Digitalization shapes and revolutionizes the industry with the help of internet of things, data collection and implementation, and predictive analyses (Parida et al. 2019). Industry must respond to constantly evolving technology, and it affects every aspect of the organization, from production lines to sales (Porter & Heppelmann, 2015). New means of training and education could be provided by the use of modern technologies and approaches (Vukićević et al., 2021).

In the past, occupational safety systems have dealt with aspects of the ergonomic, physical, chemical, and organizational environment. However, rapidly developing technology has brought extensive changes to workplaces in the form of sensors, data processing, cloud services and mobile systems. Because of this, occupational safety is facing new challenges. (Sepulveda, 2019)

In 2020, the Minister of Economic Affairs, Mika Lintilä, appointed a steering group to prepare a program of measures to speed up digitalization. The Artificial Intelligence 4.0 program focuses on the development of artificial intelligence and other digital technologies in companies in the manufacturing industry. The goal is to achieve a digital,

efficient, and clean Finnish industry in 2030. The main purpose of the program was a digital and green transition. Vision's development areas included strengthening high-level research, development, and investments. the aim is also to increase and speed up digital capability in industrial SMEs. (TEM, 2022)

There is not very comprehensive research on occupational safety in the Finnish food and drink industry, and even less on the connection of digitalization to the subject, so creating new research is topical and important. The digital revolution and the increasingly strong consideration of occupational safety in the strategy of organizations add to the topicality.

1.2   Research question and objectives

The purpose is to find out what kind of technological aids are used in the prevention of workplace accidents in the food and drink industry. The goal is to produce information to improve occupational safety and to get the perspective created by digitalization in the occupational safety discussion. The research questions for the study are:

1. What kind of technological aids are used to improve occupational safety in the food and drink industry
2. Does digitalization bring added value to occupational safety?

1.3   Research design

The research was done by combining information obtained from semi-structured questionnaire, utilizing the expertise of different companies and different professionals, as well as industry literature, articles, and previous studies. The data used in this study

are the answers from the questionnaire, which were collected from people connected to the food and drink industry. The form of the questionnaire is semi-structured. A semi-structured questionnaire means that some of the questions are presented with ready-made answer options and some of the questions are left open (Tuomi & Sarajärvi, 2018). Chapter three presents the structure of the study in more detail.

1.4 Structure and limitations of the study

The research is limited to the Finnish food and drink industry, but digitalization innovations and solutions have been searched world widely in different databases. In the research, it was decided to study Finland, because Finland is technologically well developed, and the people who were participating in this questionnaire work in the Finnish food and drink industry.

The thesis consists of five different chapters. The first chapter is an introduction to the topic of the thesis. It provides preliminary information on the subject and provides a foundation for the thesis. In addition, the research questions are presented, as well as the scope and structure of the research. Chapter two is the theory part. This chapter discusses about digitalization, occupational safety and the food and drink industry based on theory. In the third chapter, we learn about conducting the research and collecting and analyzing data. The fourth chapter is a presentation of the results of the thesis. In the last chapter, the conclusions of the study and a discussion on the topic are reviewed. The chapter also discusses future research in the subject area.

2 Theoretical background

The central theory of the research is based on existing studies from different academic databases. The theory part introduces digitalization as a concept, as well as the tools brought by technology that improve occupational safety and their benefits. The theoretical part also focuses on occupational safety in Finland and the central principles of the food and drink industry. Key concepts in the research are occupational safety, digitalization, technology, work accidents and the food and drink industry.

2.1 Digitalization

The future seems more unclear because technology has an incredibly significant impact on daily life. Forecasting has become more difficult, and the direction of development cannot be fully identified. Digitalization is one of the most significant developments and its effects in the long term are difficult to predict. Working conditions and workplaces are changing faster than ever. (Hauke et al., 2020)

Advanced IT and technology have driven society towards a digital revolution. There is no one all-encompassing consensus for digitalization, and several different people define it in slightly diverse ways. Often, digitalization is defined to broadly concern the technological revolution of society, and the table 1 below lists the different definitions of digitalization by different researchers. The main focus of the definitions made in different years remains similar, although there are small differences between researchers.

Researcher(s)	Definition
Itkonen (2015)	Digitalization means storing, transferring, and processing information in a form that can be understood by computers. But the concept also refers more broadly to economic and to the social change process that is the result of the development of information and communication technology.
Legner et al. (2017)	Manifold sociotechnical phenomena and processes of adopting and using information technologies in broad individual, organizational and societal contexts.
Gartner (2023)	"Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business."
Prause (2016)	"When data from throughout the organization and its assets is processed through advanced digital technologies, which leads to fundamental changes in business processes that can result in new business models and social change."
Annarelli et al. (2021)	"Organizational capabilities that allow firms to pervasively combine digital assets and business resources, and leverage digital networks, to innovate products, services and processes for organizational learning and customer value creation and manage innovation for ensuring sustained competitive advantage."
Szalavetz (2022)	"Using digital technologies, such as artificial intelligence, big data technology, cloud technology, Internet of Things (IoT), and robotics to execute, control, and/or improve every tangible and intangible activity that together comprise the value chain, create smart products and services, and transform the business model."
Alsufyani & Gill (2022).	"Digitalization is not about only technology adoption, rather, it is about fundamental change that occurs in organizational strategy, business processes, organizational knowledge and the whole socio-technical organizational system."

Table 1. Definitions of digitalization

Modern technology constantly creates new and more efficient machines. The connected devices are able to optimize the industrial line and observe possible dangerous situations. (Porter & Heppelmann, 2015)

2.1.1   Industry 4.0 and 5.0

The fourth industrial revolution (Industry 4.0) is a broad term and cannot be precisely defined. There have been three major industrial revolutions in the world and the ongoing breakthrough caused by modern technology can be considered the fourth revolution. The first revolution was the introduction of mechanical production plants in the mid-1700s, and it was intensified throughout the 19th century. From the 1870s, electrification and the division of labor created the second industrial revolution. The third industrial revolution, the digital revolution, took place around the 1970s. By that time information technology and advanced electronics developed the automation of production processes. Industry 4.0 is characterized by communication between people, machines, and resources, and from centrally controlled production processes to distributed production processes. (Hermann et al., 2016)

Industry 4.0 takes a central view of technology for development, while Industry 5.0 also includes sustainability, resilience, and human-centeredness in the value-creation process (Ivanov, 2023). The European Commission (2021) defines Industry 5.0 with the following description:

> *Industry 5.0 complements and extends Industry 4.0. It emphasizes aspects that will be deciding factors, not just economic or technological, for the place of industry in the future European society. These factors have also environmental, social, and fundamental rights' dimensions. Industry 5.0 should not be understood as a chronological continuation of, nor an alternative to, the existing Industry 4.0 paradigm.*

It is the result of a forward-looking exercise to help framing how European industry and emerging societal trends and needs can co-exist.

Industry 5.0 combines the basic principles of organization and technology by combining them into a resilient, sustainable, and human-centered entity (Ivanov, 2023). The diagram below describes the basic principles of Industry 5.0 and how they are attached to the center.

Industry 5.0

	Resilience	Sustainability	Human-Centricity
Society Level	*Viability of intertwined supply networks*	*Sustainable usage of resources and energy on the earth*	*Viability of human-centric ecosystems*
Network Level	*Supply chain resilience* *Reconfigurable supply chain*	*Supply chain sustainability* *Life cycle assessment of value-adding chains*	*Cyber-physical supply chains* *Digital supply chains*
Plant Level	*Resilience of manufacturing and logistics facilities* *Reconfigurable plants*	*Reduction of CO2 emissions* *Energy-efficient manufacturing and logistics*	*Human-machine collaboration* *Health protection standards and layouts*

Organisation:
Resilient Value Creation and Usage - Human's Well-being – Sustainable Manufacturing and Society

Management:
Viability as Integrative Perspective of Resilience, Sustainability and Human-Centricity

Technology:
Collaboration – Coordination – Communication – Automation – Identification – Data Analytics

Performance:
Efficiency – Productivity – Resilience – Viability

Figure 1. Industry 5.0 principles (Ivanov, 2023).

Industry 5.0 includes three core principles. The first is its coverage in four different areas, which are management, organization, performance, and technology. The second is its three levels, which are society level, network level and plant level. In addition, the third are its three basic principles of sustainability, resilience, and human well-being. The table

reveals their connections to each other and more detailed information about them. However, the overall picture of Industry 5.0 is still unclear and there is still a lot of work to be done in examining its perspectives. It can be applied to different practices in the future and the opportunities it creates in different fields have yet to be explored in more detail. (Ivanov, 2023)

2.1.2   Internet of Things (IoT)

IoT is revolutionizing the IT sector and society and is said to be the biggest step forward since the invention of the Internet. The IoT market is expected to grow from fifteen billion devices in 2015 to 75 billion devices in 2025. This means that every person would have at least 25 IoT devices of their own. Its importance in people's lives cannot be overemphasized and it affects all activities on Earth. The purpose of IoT is to enable communication between people and devices anywhere and anytime. With the help of the devices, significant things can be done and the access to data on various issues has become significantly easier, for example in matters related to the environment, matters related to human behavior and activities and various metrics of industry and many other issues. (Butun et al., 2020)

Digital technology is not only the use of the internet and the electrification of separate things, but it also includes many different devices and their connection. Process technology has developed enormously and communication between objects is growing year by year. Digitalization gives opportunities for new objects and completely new industries to develop on new scales. For example, connecting sensors to devices brings completely new dimensions to them that were previously unimaginable. With digitalization, some sectors and products will also fall out of use, because it is not practical to keep them in use. These reasons can include, for example, economical, safety, sustainability, and ecology. (Saarikko and others, 2017)

The benefits of IoT also include improving product development and the development of its life cycle. The devices can generate data based on the user's behavior and provide information that was not available before. Data from real use is more valuable than just guessing what has had to be done in the past. (Saarikko and others, 2017)

The figure below reveals the flow of IoT from the device all the way to the user. The first step is when the data is obtained from the device applied to the "things". The sensors collect the data and after that the step 2 internet ports transfer them for processing. After this step, they either reach the end user or they are stored, for example, in a cloud service. (Boyes et al., 2018)
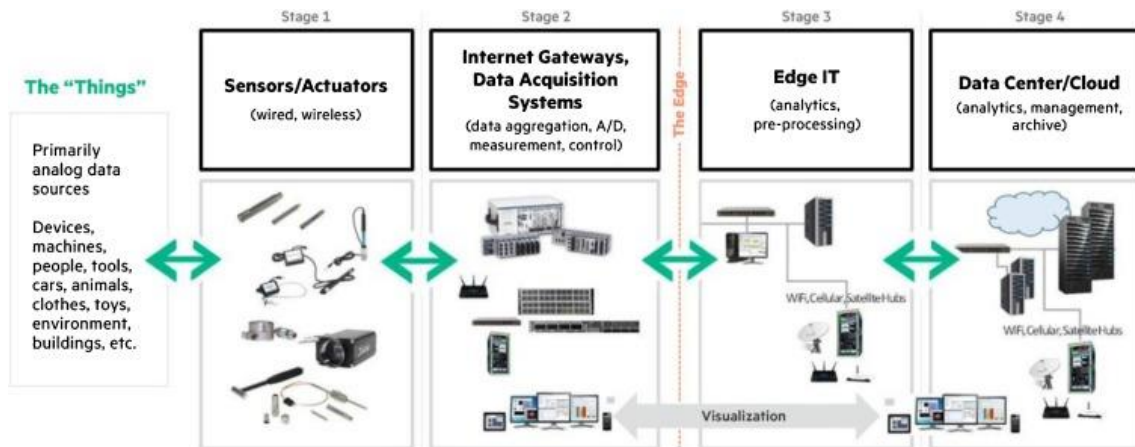
Figure 2. Flow of information (Boyes et al., 2018).

A critical aspect of IoT can be considered its security and its forms and reliability. When developing new devices, safety must be taken into account even more than before. Without security measures and preventive solutions, devices are vulnerable to attacks. People's personal information may be at risk of being hacked. Designers must think carefully about routing, trust management, key distribution, and data integration systems. (Butun et al., 2020)

2.1.3 Big Data

Data is produced by continuous input and its amount is increasing at an accelerating pace. Big data includes all the information that, for example, phones, social media or, for example, genetic sequencing produces. Because the concept is so broad that there is no specific consensus for Big Data. Furthermore, what is concerned as Big Data today probably will not be so in a few years. The information brought by the data is vital for the organization in acquiring value and competitive advantage, as well as improving quality and efficiency. The production of personalized products and services becomes easier with the information collected in the organization. (Wiley et al., 2014)

Big data is a significant technological development step in society. However, there is still relatively little information and knowledge on how to change all this information into a form relevant to companies and people. Big data makes it possible to collect social and economic value. Social value areas include health, education, and safety. In society, for example, data can be used to obtain information about consumption behavior and the formation of employment growth. Economic value can be measured by the increase in productivity and the achievement of a competitive advantage using the means of big data. Simplification of daily operations and optimization of strategy is facilitated thanks to data collection and analysis. Making the decision easier and the aids it creates for setting the price, defining the work task, minimizing errors, and improving quality are significant benefits of big data. (Günther et al., 2017)

In today's competitive environment, companies must adapt to the changing environment. Continuous assessment of the situation and development of the organization's operations is critical for the company's survival. Organizations that are able to analyze their situation and available information, predict possible scenarios and influence their own operations quickly, gain an advantage in their business field. The right tools Converting data into the right format for your own field is a challenge. Changing potential data requires human resources as well as financial resources. (Krumeich et al., 2016)

Big data changes the collection of information and its formation and harnessing in a usable form. Because of this, big data creates a tool for the company to support decision-making. Increased data brings information about risks and previous problems, and based on these, we aim to predict the future and reduce uncertainty. Big data is a particularly useful tool for planning innovation and modern technology. Process development is also possible with the help of big data. Utilizing the collected data requires IT expertise and knowledge. Teaching these skills to the company's employees and creating a digital environment in the organization creates the basis for data utilization and success. (Niebel et al., 2019)

2.1.4   Artificial intelligence

The possibilities of artificial intelligence are growing all the time and it creates opportunities for various sectors of society. Artificial intelligence in its simplicity means computer-made scenarios and actions that mimic human behavior. This includes, among other things, how a person makes decisions, learns, and solves problem situations. Combining artificial intelligence with other opportunities brought by digitalization opens up significant opportunities. The increase in productivity, the decrease in operational costs and the monitoring of the environment can be further improved with the right implementation of artificial intelligence. (Pishgar et al., 2021)

The integration of different technologies creates opportunities for artificial intelligence to achieve results. With the help of data collection, analysis and transfer, artificial intelligence performs actions that previously required people to operate computers. Data-driven artificial intelligence in occupational safety monitors, for example, changes on the line thanks to sensors and robots. It also analyzes the information, calculates the risks, takes the necessary actions, and gives instructions on how to act in an emergency. (Zhang et al., 2022)

The utilization of artificial intelligence in dangerous situations can be identified in four subcategories, mitigation, preparedness, reaction, and recovery. In the mitigation phase, artificial intelligence analyzes processes and data and locates the riskiest parts of the line. With this, measures can be taken even before the damage occurs. During the readiness phase, daily operations and worker behavior are observed. Real-time monitoring also enables a warning when a dangerous situation is forming. In the reaction and recovery phase, artificial intelligence guides the employee to act and helps with decisions and follow-up actions with the help of data. (Zhang et al., 2022)

The possibilities of artificial intelligence in improving factory work safety are therefore significant. Ways in terms of occupational safety and better working conditions are, for example, optimizing the layout of the factory. With the implementation of data and artificial intelligence, the best possible layout can be simulated to enable the safest working. Making optimal evacuation plans is also made easier with the help of artificial intelligence. (Zhang et al., 2022)

In the process industry, a really large amount of data is produced, and various information systems contain it. Too many different systems and data storage locations cause problems for companies. Paper communication is still used in industry, which increases problems. The use and application of information systems is complex, and each system has its own strengths and weaknesses and consists of different data structures. Collecting and analyzing data from the initial stage to the final product is important, and to achieve this, the systems must be synchronized. The help of artificial intelligence as a data integrator is a significant development step, and with it, efficiency and process optimization can be raised to a new level. (Wiedau et al., 2021)

2.1.5 Robotic process automation

Robotic process automation is the replacement of work previously done by humans with work done by robots. Robots are helped by information systems and artificial intelligence to function optimally. Robots are programmed by designers, and they strive to make them as flawless as possible. With the help of robots, it is possible to get rid of physically demanding work tasks that require repetition. Transferring tasks to robots also reduces the number of human errors and helps to calculate costs. (Ribeiro and others 2021)
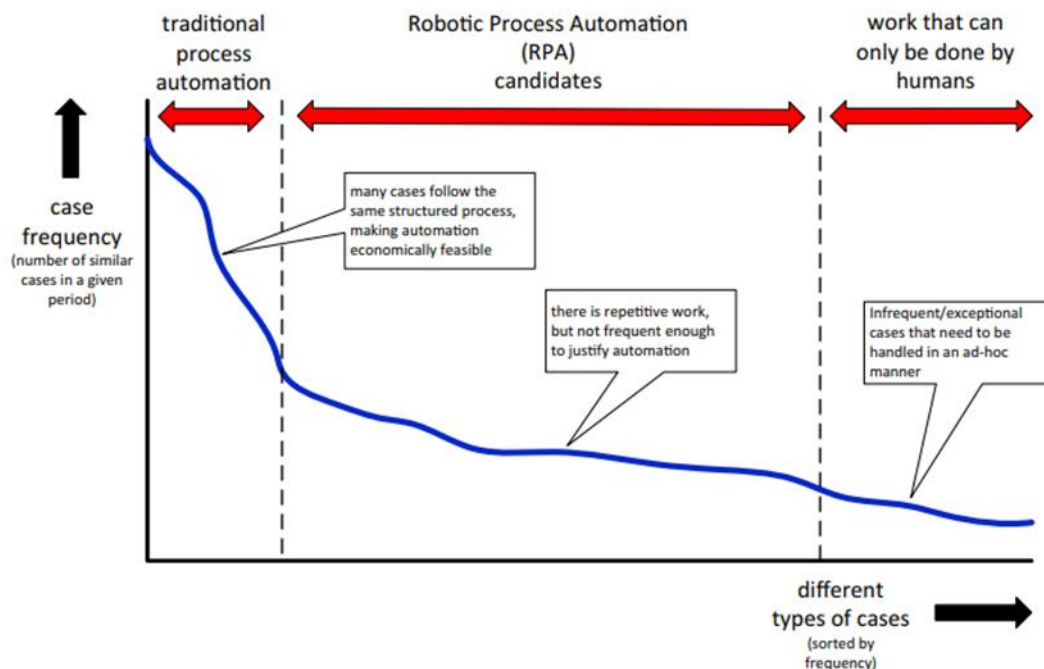
Figure 3. Implementation of automation to processes (Van der Aalst et al., 2018).

The figure above shows how the benefits of automation can be evaluated in an organization. The x-axis shows the diverse types of cases, and the y-axis the frequency of the cases. Automation should not be used if the tasks are not similar, or they occur rarely. It is worth considering the use of process automation and robots when the conditions are suitable for it. Frequently repeated tasks should be automated. If the work has both changing and similar tasks, it is worth looking at automation using robots and looking for

practical solutions. Furthermore, partial automation of the work task can be a profitable and useful solution. (van der Aalst et al., 2018)

Companies must themselves define their needs for process automation. The optimal solution for other companies may not work similarly in another organization. With the help of automation, the organization can achieve, for example, an increase in productivity, an increase in efficiency, data security, shorter lead times and an increase in quality. Often repetitive work tasks are selected to be automated in organizations. Tasks that are sensitive to human errors and require low cognitive ability are also often automated. Commissioning, training, and testing take time, and that is the downside of robots and automation. This eats up resources both personally and financially. Resistance to adopting change is also a disadvantage in implementing automation. Creating a company culture that is open to change and inspiring is important for the success of automation. (Pramod, 2022)

In general, organizations have some sort of experience with robots and the good aspects of automation on a theoretical level, but how to get the most out of it is a challenge for companies. There are many instructions and solutions on the market, but often the information is not from a completely impartial operator. The organization must be prepared to receive change. The most critical changes in automation can be considered to be actors at two different levels, changes at the individual level and changes at the organizational level. On an individual level, employees are talked about changing routine tasks to more important and productive tasks. At the organizational level, improving quality, creating standardization, and supporting decision-making are important. (Syed et al., 2020)

2.2   Occupational safety

According to the official website of the Finnish Occupational Safety and Health Administration, Työsuojelu.fi (2023), the definition of an occupational accident is a sudden, unpredictable event caused by an external factor that results in an injury or illness. An accident at work must happen either at work - i.e., while doing work - or in circumstances resulting from work.

From the figure below, we can see what kind of work task has caused the occurrence of a work-related accident. The majority of work accidents come from handling things, followed by those caused by the person's movement, such as tripping. There was a total of 13,630 workplace accidents in industry in 2021 (Tikku, 2022). The figure does not include accidents on the way to work. The list of accidents shows the dangers facing the industry, and the numbers give an idea of the general danger points in the industry.
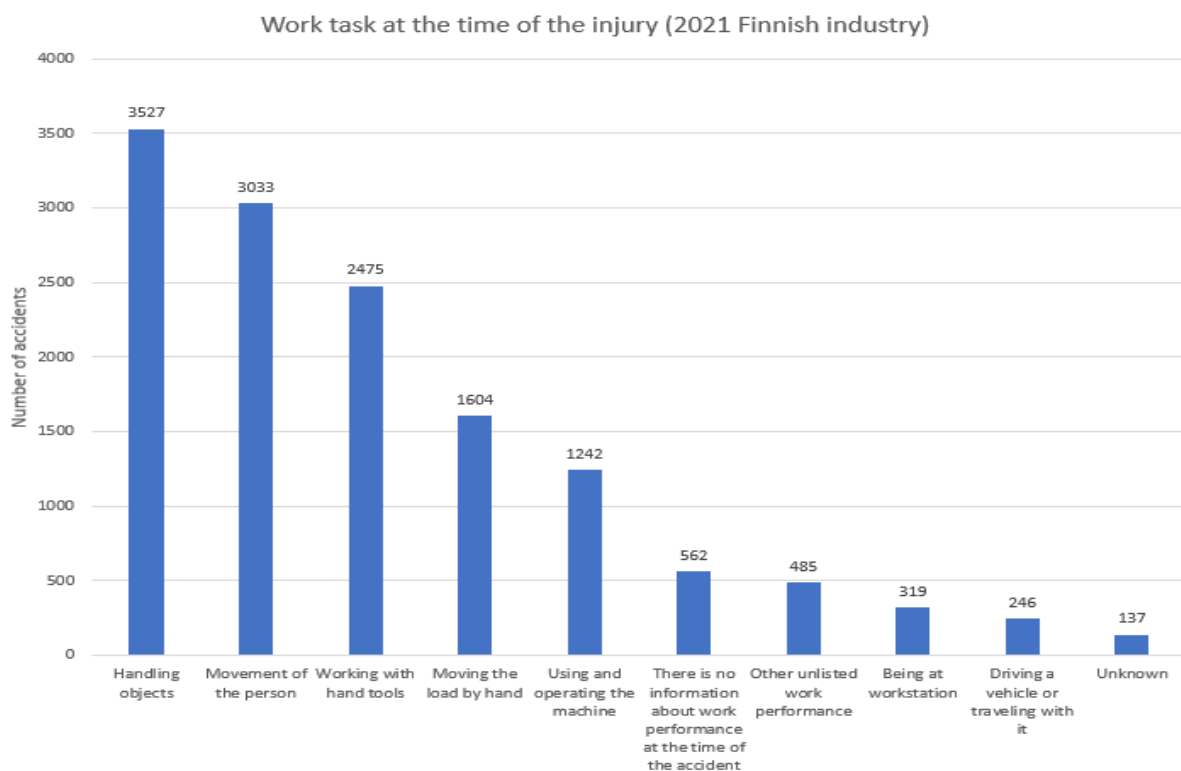
Figure 4. Work task during work accident (Adapted from Tikku, 2022).

Using the same data from TIkku (2022), we can detect the causes of workplace accidents in Finnish industry from the figure below. It is the reason that caused the accident at work. Most of the accidents were caused by a sharp object, followed by a collision with a flat surface. Sudden hits were also a significant cause of accidents. Chemical substances also caused accidents, as well as causes caused by heat and electricity.
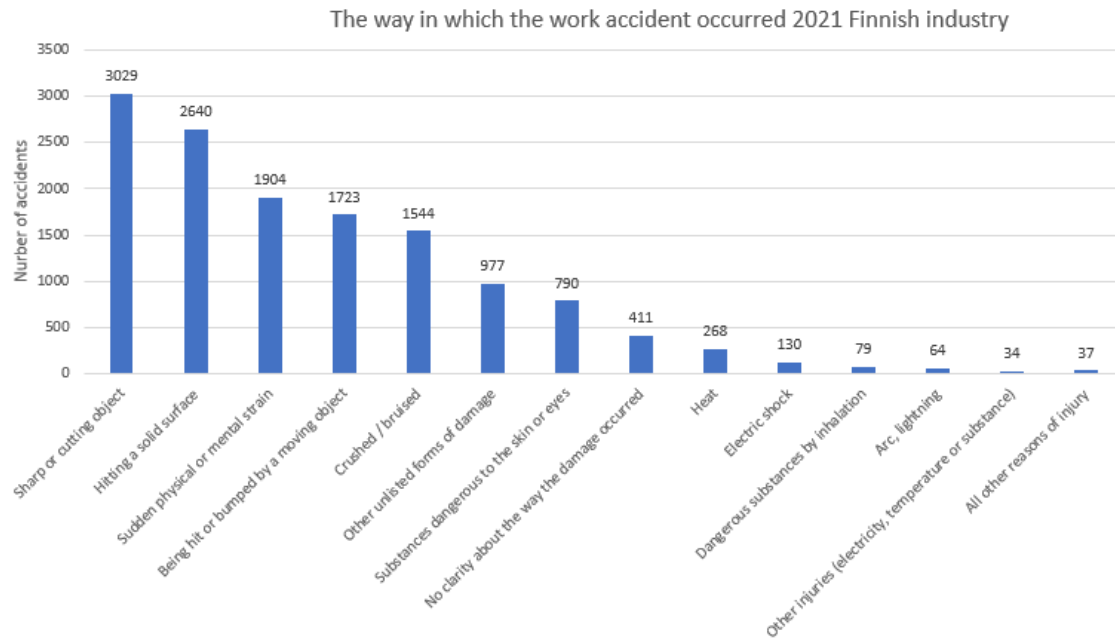
Figure 5. Cause of work accident (Adapted from Tikku, 2022).

In the figure below, we can see how accidents at work per million working hours have changed between 2005 and 2021. The trend in all sectors has remained relatively flat, although there has been a slight decrease in recent years. This may be due to the increase in remote work brought about by the covid-19 virus, which is possible in several fields. Looking at the figure, we can see that more accidents at work occur in the food industry than in industry in general. The trend has been quite downward in industry, although small increases are noticeable.
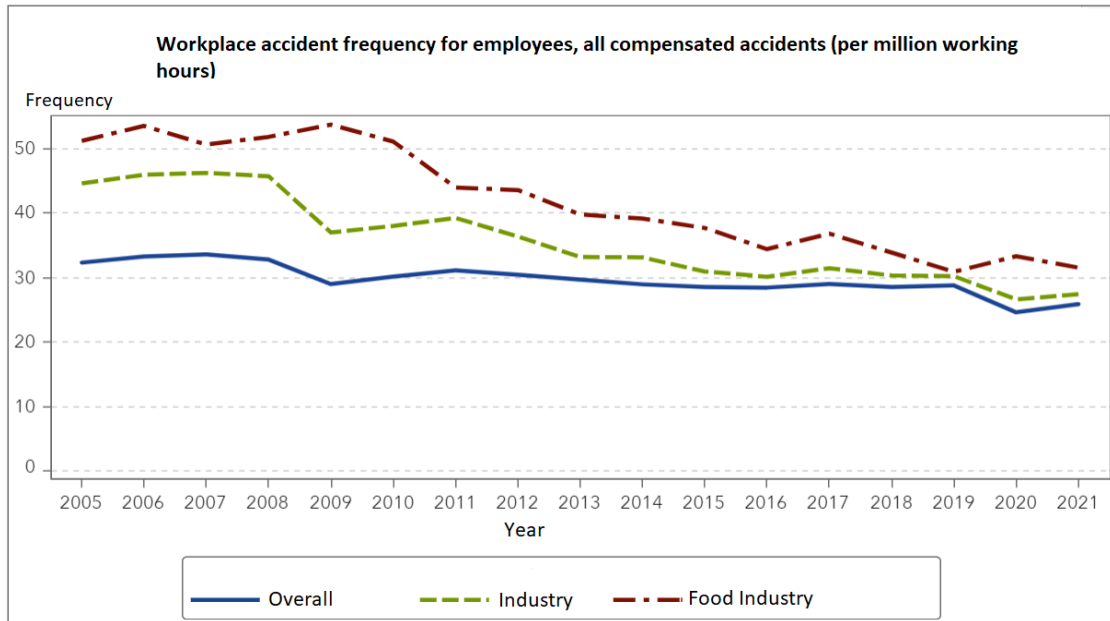
Figure 6. Workplace accident frequency trend 2005-2021 (Adapted from Tikku, 2022).

The frequency of workplace accidents has been calculated by dividing the number of compensated workplace accidents by the million working hours worked. The working hours data are from Statistics Finland's labor force survey. The frequency calculation also includes those compensated workplace accidents that did not cause absence. Work-related illnesses are also included in the calculation. The journey from work to home does not include in these calculations. (Tikku, 2023)

2.2.1 Occupational Safety Act

The Occupational Safety Act primarily defines the areas of responsibility for occupational safety and what kind of measures occupational safety requires. The purpose of the law is to improve the work environment and working conditions in order to secure and maintain employees' ability to work. In addition, to prevent and avoid accidents at work, occupational diseases and other harms to the employees' physical and mental health caused by work and the work environment. (Occupational Safety and Health Act 23.8.2002/738)

2.2.2   Obligations of the employer and the employee

The employer is obliged to take care of the employee's safety and health at work. The employer must constantly monitor the work environment, the state of the work community and the safety of work practices. The employer must also constantly monitor the functionality of the measures taken and that the working conditions in every part of the organization are safe. (Occupational Safety and Health Act, 2002)

The employer must improve the employee's working conditions by means of, among other things, the following:

- The occurrence of hazards and harmful factors is prevented.
- Generally effective occupational safety measures are implemented before individual ones.
- Danger and harmful factors are removed or, if that is not possible, replaced with less dangerous or harmful ones.
- Considering the development of technology and other developments.

An occupational health and safety action program must be drawn up by the employer to promote safety and health, as well as a list of the needs for improving working conditions and the effects of factors affecting the work environment. The goals derived from this program must be considered in the organization's development activities and discussed between different representatives of the organization. (Occupational Safety and Health Act, 2002)

Considering the nature of the work and activity, the employer must sufficiently and systematically investigate and identify the harmful and dangerous factors arising from the work, working hours, workspace, other working environment and working conditions, and evaluate their importance for the safety and health of the employees if they cannot be eliminated due to the nature of the work. (Occupational Safety and Health Act, 2002)

According to the Occupational Safety and Health Act (2002), the employer must provide the employee with sufficient training and information on:

To work and a knowhow to production methods, as well as working conditions.

For work tools, machines and devices used at work and their proper use in work tasks in compliance with safety regulations.

To prevent the disadvantages and dangers of the work and to avoid the dangers that threaten safety.

Training after a change in the work task, work tools or technology, as well as the possibility of obtaining continuous help if necessary.

For repair, maintenance, adjustment, and cleaning work as well as in case of disturbances and exceptional situations.

Figure 7. Obligations of the employer to provide to employee (Adapted from Occupational Safety and Health Act, 2002)

The employee must follow the employer's instructions and regulations in his work. The employee must also observe the order and care required by the work to guarantee the safety of the work and the work environment. The employee must make use of his own experience, education, skills, and knowledge in order to take care of his own safety and the health of his colleagues at work. Defects and deficiencies must be reported to the employer and act according to one's own professional skills to remove the defects and deficiencies. (Occupational Safety and Health Act, 2002)

2.2.3 An occupational disease

An occupational disease is a work-related illness that meets the conditions set in the regulations, based on which the sick person is entitled to receive compensation. Determining an illness as an occupational disease requires a medical examination in which sufficient information about the exposure at work is available and which is carried out by a doctor familiar with the relevant field. The compensation system for occupational diseases is based on the Accident Insurance Act. An occupational disease is compensated like an accident at work. (Harjanne, 2010, p.78)

The number of occupational diseases in Finnish industry in 2021 has dropped to more than a third of the peak year of 2006, when 1272 occupational diseases were registered and 1268 suspected occupational diseases. In 2021, only 340 occupational diseases were registered and 384 suspected occupational diseases. However, occupational disease suspicions in the most recent years turn into occupational disease diagnoses over time. The trend has been downward since 2006, which speaks of investing in occupational safety. (TIkku, 2022)

The pie chart below clarifies the distribution of occupational diseases among different exposures in the years 2005-2021. There was a total of 11,705 occupational disease cases, and most of them, 6,869, were caused by physical exertion. Noise was the most significant physical cause of occupational disease, as no less than 5,208 cases were caused by noise. The next biggest cause was tendonitis and inflammation of the lateral base of the humerus, of which there were 1075 cases. Of the chemical causes, a total of 4,667 cases, the largest was mineral dust, which caused 2,586 cases, followed by other chemical substances in 845 cases. There were only 142 biological causes of occupational diseases and twenty-seven for unknown reasons.

Distribution of occupational diseases in different risk factors
in 2005-2021 (Finnish industry)

142   27

4667

6869

- Physical
- Chemical
- Biologic
- Unknown
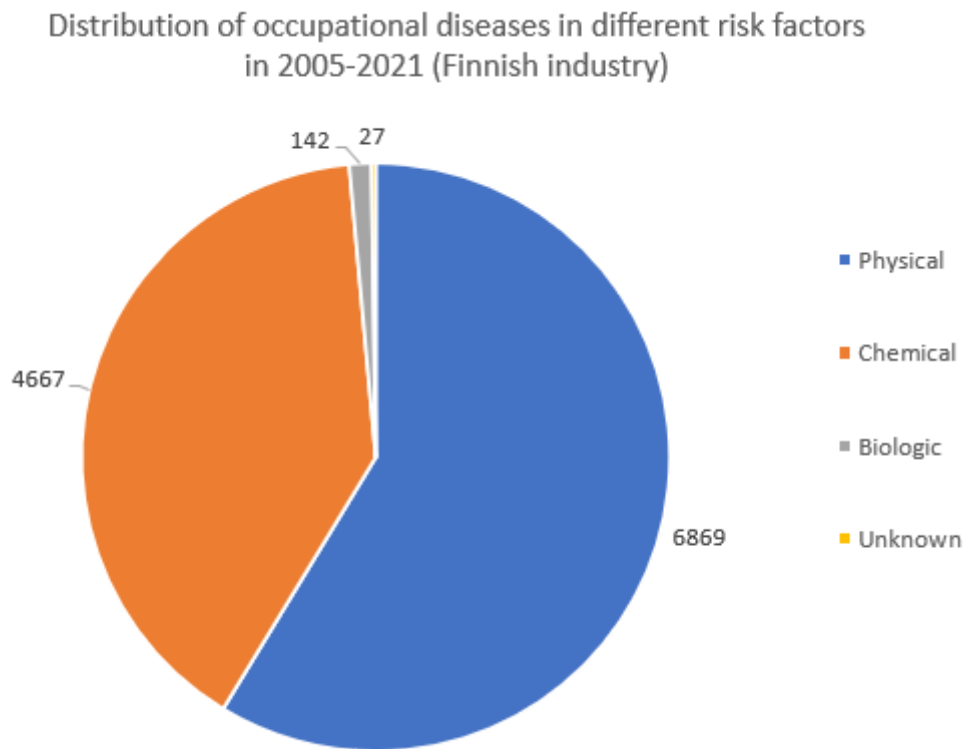
Figure 8. Occupational diseases distribution (Tikku, 2022).

2.3 Food and drink industry

Food and drink industry is one of Europe's largest manufacturing industries which gen-
erates turnover of €1.1 trillion. Industry employs 4.5 million people, and it is big part of
EU economy (FoodDrinkEurope, 2021). The food and drink industry employs 40,000 peo-
ple in about 1,850 companies in Finland, and the indirect employment effects of the
sector are greater than in other sectors; one job in the food and drink industry generates
three other jobs in society (The Finnish Food and Drink Industries' Federation (ETL),
2023). In terms of production value, the food industry is the fourth largest industrial sec-
tor after the metal, forestry and chemical industries, and its share of the turnover of
industrial production in 2021 was 7.8% and its turnover was approximately 11.9 billion
euros (Hyrylä, 2022).

The food industry processes the products of agriculture, forestry and fisheries into human or animal food and produces many intermediate products that are not food as such as products to paper-, chemistry- and medical industry (Saarela, 2010; Tilastokeskus 2008). In connection with the operation, by-products are also often created. The food and drink industry consists of two main industries, which are food production and drink production. Based on industry classification, TOL 2008 (Tilastokeskus 2008), Food manufacturing consists of nine and drinks manufacturing from seven sub-sectors. The industries of the food industry, their sub-industries and industry categories are the following:

Food manufacturing	Drink manufacturing
Slaughter, preservation treatment of meat and manufacture of meat products	Distillation and mixing of alcoholic beverages
Processing and preservation of fish, crustaceans, and mollusks	Production of wine from grapes (Note: cannot be produced in Finland, initiative under investigation)
Processing and preservation of fruits and vegetables	Manufacture of cider, fruit, and berry wines
Manufacture of vegetable and animal oils and fats	Manufacture of other non-distilled beverages by fermentation
Manufacture of dairy products	Brewing
Manufacture of mill and starch products	Manufacture of malts
Manufacture of bakery, macaroni etc.	Manufacture of soft drinks; mineral waters and other bottled water production.
Manufacture of other food objects	
Preparation of animal food	

Table 2. Sub-sectors of food and drink industry (Tilastokeskus, 2008).

Food production is for the most part a process industry, which means that the same product line can produce similar products with relatively minor changes. Attempts are being made to increase large product lots to increase profitability. Manufacturing steps include, for example, harvesting of raw materials, pretreatment, processing, packaging, storage, and transportation. (Saarela, 2010 pp. 14-19)

The food and drink industry business field is strongly dominated by micro-enterprises, which is evident from the figure below. Eighty percent of the companies employ less than ten people. There are one in three operators in the bakery industry but the share of the bakery industry in the total turnover is less than 10 percent. (Hyrylä, 2022)
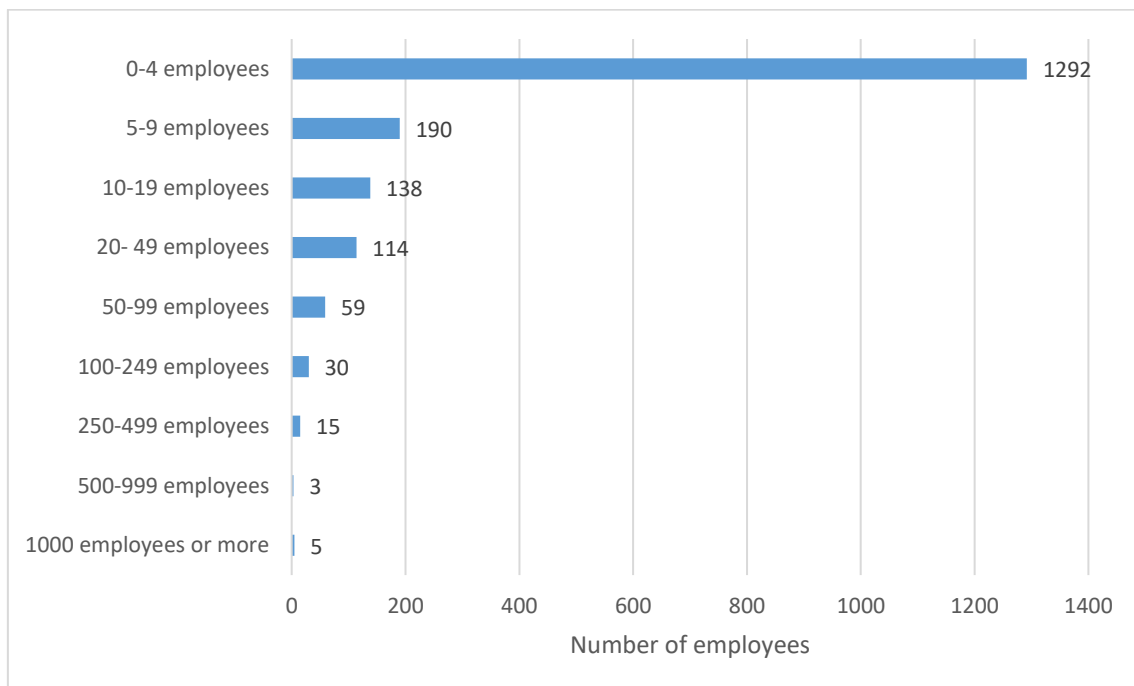
Figure 9. Number of personnel in food and drink industry companies in 2021 (adapted from Hyrylä, 2022).

Listing the largest food and drink manufacturing companies is challenging due to complex company structures and industry classifications. Largest companies in food and drink industry in 2021 beholds: Valio group, HKScan group, Atria group, Fazer group and Paulig group. The importance of the five largest groups is considerable in terms of

employment and turnover formation. The Finnish food and drink industry includes large international industrial companies, but also one-person companies, and their competition and cooperation create a unique business environment. (Hyrylä, 2022)

Large food industry operators are capable of profitable production with branded products and highly automated lines. Small and medium-sized companies are more manual-oriented, although automation has increased in them as well. Processing equipment increases efficiency and the amount of production, as well as reduces the amount of work resources. Adding smart devices to production is important for the future but optimizing one's own resources is one of the most important tasks for the organization. (Saarela, 2010 pp. 14-19)

2.3.1 The state of the industry and the future

In the food and drink industry, investments have been typical of the industry in recent years, which speaks of the industry's willingness to grow and renew. According to Pakarinen (2022), investments in the food and drink industry in 2022 were 1085 million euros, while in 2021 they were 676 million euros. The growth compared to the previous year was up to 60.6 percent. He also states that the green transition and digitalization are the drivers of investments.

In the food and drink industry, machines and equipment wear out constantly, and this causes more investments than in industry on average. It is estimated that about half of the investments will be spent on capacity replacement. In the food and drink industry, there has been a strong investment in the renewal of production facilities. The increase in resource efficiency, the increase in product supply and the safety of personnel have been significant targets of development in the sector. (Hyrylä 2022).

The Finnish food and beverage industry is a strong and traditional industry whose role in the employment and economy of Finns is significant (Hyrylä, 2022). The industry has numerous strengths, but also weaknesses. The SWOT analysis below reveals the strengths, weaknesses, opportunities and threats of the Finnish food and beverage industry.

Strengths:	Weaknesses:
- A traditional and versatile industry	- Low volume growth potential in domestic market
- Logistics systems at an elevated level	- Profitability of primary production and the food industry
- Food self-sufficiency rate	- Rising production costs
- Quality of raw materials, clean soil, air, and water	- Most of the companies are small
- Consumers' interest in food and novelties and appreciation of domesticity, local and organic food	- Low export resources
- Relatively stable market	- Excess capacity, so-called in basic products
- Food expertise, quality and food safety, responsibility, professional personnel	- Operating environment dependent on regulations, taxation
- Continuous development and renewal of operations	- Lack of business expertise in the field
- Occupational well-being and safety culture, risk management	
- Training and educational opportunities	
- Rationalization advantage in large companies, craft advantage in small ones	
Opportunities:	Threats:
- Export and internationalization	- The geopolitical situation
- Development of the bioeconomy, production, and material efficiency	- Economic development and change in consumer buying behavior
- Changes in consumption and lifestyles	- Growing imports challenge the competitiveness of domestic products
- Technology and digital development	- Climate change, loss of biodiversity
- A changing and developing business environment	- Disease risks, Covid-19, and prolongation of crises
- Changes in trade and food services, multi-channel market	- Threats to digital systems
- Trends, premium products, branding	- Food fakes, food frauds
	- Availability of skilled labor

- Strengthening cooperation between industries and the research network - Growing importance of local production - Specialization, increase in processing value, business models	

Figure 10. SWOT-analysis on food and drink industry in Finland (Adapted from Hyrylä, 2022).

From the table above, we can conclude that the food and drink industry will continue to play a significant role in the Finnish industrial field and the future prospects of the industry are reasonably good. Food is needed in everyday life, and Finland's level of self-sufficiency and appreciation for domestic food will also guarantee the industry's need in the future. Foreign competitors, low profitability and rising costs create problems for the food and beverage industry to solve. In the future, the growth of exports and the development of technologies will open up new opportunities for organizations to develop and for new companies to enter the market. In 2023, the geopolitical situation and the growth of inflation will be significant factors for the development of the Finnish economy, and they will also have a significant impact on the food industry. Industry must be able to renew itself and remain innovative in order to achieve its goals and to be able to offer consumers increasingly high-quality products and services.

2.4   Conclusion of the theoretical framework and former studies

The literature review discussed research regarding digitalization, occupational safety and Finnish food and drink industry. Digitalization is a broad concept, and there is no completely unambiguous definition for it in the literature. In this study, digitalization can be defined as the fact that information technology is used increasingly in working life systems. The change affects all of society's activities, from financial matters to logistics. Digitalization makes things possible that were impossible just a moment ago.

Of course, the technological breakthrough has also arrived in the process industry and the food and drink industry. Production lines have become even more automated, and the physical workload is decreasing.

Technology is available for companies to increase occupational safety and prevent accidents, but its implementation is still incomplete in companies. The introduction of technology has its own challenges and future solutions will develop even better. Technology can bring added value to occupational safety now and in the future, but its effectiveness cannot yet be completely certain.

The interest of modern industries in occupational safety has grown significantly, and the reason is both economic and ethical aspects. The development of information and communication systems changes the career structures of employees, including training as well as other work phases. Because of this, occupational safety is also on the verge of a tremendous change. With the development of ICT, the development of the product life cycle has been significant, and employees face different challenges than before. For example, simulations, communication between machines, modeling and the introduction of cloud services change the employee's job description. Many kinds of different techniques have been tried to be applied in enhancing training and learning from the point of view of occupational safety. One of the significant means is the application of virtual reality to trainings. Combining virtual reality and the Internet of Things can produce significant solutions and help to improve learning. (Vukićević et al., 2021)

Different work environments face different challenges and risks, and their identification and risk assessment are particularly important for the health and efficiency of employees. Tools have been developed to improve employee safety and to identify and prevent hazards. These tools include wearable devices and connected worker solutions. Wearable devices help employees recognize changes in their coping and own workspace. For example, smart, on-body accessories and personal protective equipment track the

activities, behavior, and body status of individual workers. These can be used to monitor, for example, ergonomics, lifting positions, sleep quality, recovery, changes in cold and hot temperatures and stress levels. (Patel et al., 2022)

Connected worker solutions, on the other hand, help to produce the necessary information in real time and provide support for decision-making. For example, Intelligent computing, data analytics, and storage platforms act as an aid and produce data from different networks and aim to improve the flow of work, the use of equipment and predicting the future scenarios. Augmented reality, gesture and movement control, and help used to manage work stress are also provided. (Patel et al., 2022)

The fundamental risks of technology are in the implementation of digitalization. Reliability, quality, usability, and availability are important for the application, and deficiencies in these cause problems in practice and can create a deterioration in occupational safety. As a decision-making aid, the information must be relevant, and errors must not occur. Failure modes in identification, processes, and other disturbances in the environment cause safety risks. (Sepulveda, 2019)

Security problems are also caused by human errors made by the user. These cannot be completely turned off when it comes to people but minimizing them is critical. Experience, education, memory, and professional skills greatly influence the decisions a person makes. These are the reasons for the decisions made by the employee. Different people make different decisions in crisis situations and, for example, how they used to do their jobs, and resistance to new practices are significant risk increasers. Deliberately ignoring computer instructions or relying too much on instructions without your own judgment can also increase risks in work and the work environment. (Sepulveda, 2019)

Risks can also increase due to the work environment. Co-workers can have either a positive or negative effect on the use of digitalization and the adoption of secure models. Noise, air quality, lighting and workstation ergonomics also affect decision-making at

work. Workplace culture and management have an impact on people's attitude towards devices brought by technology. therefore, numerous factors affect the whole, and when improving occupational safety, thoroughness plays a critical role. (Sepulveda, 2019)

In the Finnish food and drink industry, serious accidents still occur when using machines. Unprotected machines, insufficient familiarization with malfunctions, maintenance, and emergency situations, as well as the lack of supervision of correct working methods almost invariably come up in the investigation of accidents. Similar factors predisposing to an accident can be found in the background of several accidents, regardless of what and what kind of machine the work was done on. The starting point for the prevention of stress-related illnesses is good planning, which is used to develop systems, equipment, work tasks, work arrangements and work environments suitable for their users. (Työtuvallisuuskeskus, 2023)

Occupational safety in the food and drink industry could be improved with an effectively organized tool. Measurable tools would be used to study and improve the employee's socio-economic, technical, and legal settings in working life. Meticulously organized solutions improve the efficiency of processes, reduce the number of accidents, and improve the use of tools and user experience. (Tikhonova et al, 2021)

If employee have deficiencies in their digital skills, the mental workload increases, and with it, health also suffers. Especially older employees can suffer from this, and organizing training sessions is important. Organizations must be cautious about inventions made in the field of occupational safety and they must be studied significantly before they are put into practice and in the factory environment. (Hauke et al., 2020)

Simulating working conditions and work has been found to be an effective way to identify risks in physical work. Simulation has a particularly positive effect on situations that are difficult to model with old-fashioned methods. For example, reaching that puts a load on the shoulders can be modeled based on different body images and individual

risks can be assessed through that. Through simulations, exhausting work situations can be prevented, and occupational safety managers and employees can be trained. What was found to be important was that employees and occupational safety officials become familiar with technology over time and use it to reduce risks, rather than just reading accident reports and drawing conclusions from them. However, simulating is challenging, and its implementation is not easy. It also requires special expertise and there may be a lack of it in organizations. (Schall et al., 2018)

There are many learning methods that can be used in learning occupational safety. The application of gamification in improving occupational safety has been found to have good and bad aspects. The flexibility, availability and return ratio of digital learning methods are good aspects. Activating learning and "learning by doing" also enhances learning and it is possible through playing. Employees can be allowed to do things in a safe environment that they could not immediately do in real life without experience. However, some specific scenarios cannot be performed virtually and cannot be learned remotely. (Vigoroso et al., 2021)

The changes in work tasks caused by digitalization come with both good and bad changes. The elimination of the handling of dangerous substances, the optimization of the workload and the increase in the work cycle can be counted as good. Challenges can arise, for example, the deterioration of interpersonal communication and communication skills, as well as forgetting work tasks. Too much trust in the machine's abilities is also a problem and can lead to malfunctions and dangerous situations. (Rosen et al., 2022)

3   Methodology

This part of the thesis presents the method used in the research. The first part describes the structure and strategy of the research. The second part presents the data collection and how it was performed. In this section, we delve more into the research and its nuances are brought to the reader's attention. The third part describes about data analysis and what kind of tools were used in it.

3.1   Research design and strategy

Qualitative research was chosen as the research method. The research method consists of those practices and operations with which the researcher produces observations and interprets them (Alasuutari, 2011). This method was judged to be the best method considering the subject area and the goals of the research. The research wanted the respondents' own views and experiences on the subject. It would have been difficult to collect enough quantitative data for the research, so that it would have been possible to produce an effective study based only on it. Different viewpoints from companies of varied sizes were wanted and to produce information about the subject area was particularly important.

3.2   Data collection

In total, eleven different companies answered the survey for the thesis. The questionnaire was sent to a total of seventy-nine food and drink companies. Companies of varied sizes were approached, but the aim was to get larger organizations than, for example,

bakeries of a couple of people, as respondents. The job titles of the respondents differed from each other, and the answers were given by the most qualified person in the company's own opinion. This increased the quality and reliability of the research. The companies are located all over Finland and represent various food and drink industry organizations. The survey was conducted in Finnish, because it was the native language, and it gave the respondents the opportunity to tell all the information they wanted without worrying about possible linguistic incompetence. The answers of the questionnaire were translated into English by the researcher, and the context and the reliability of the translations were tried to be kept at the best possible level.

The survey was conducted in April and May in 2023. The survey is a semi-structured questionnaire in which, in addition to ready-made answer options, open questions were offered to which the respondents could answer in writing as long as they wanted. The survey was conducted using e-mail and a virtual questionnaire. The aim was to get respondents from several different companies and to make the threshold for participation as low as possible. The respondents' own professional busyness was taken into account and plenty of response time was given.

Those who responded to the survey in the thesis were told that the research will be conducted anonymously, and that no one's personal information or company names will be made public in the research. Respondents' answers cannot be linked to answers either. The answers to the survey are only used on a general level to raise awareness of the topic and to develop it. The researcher was responsible for securing the survey and deleting the data after analysis. These methods were used to get more respondents around the sensitive subject area.

The structure of the survey consisted of three different themes. First, there was a general questionnaire about occupational safety and related aspects. Next in the survey were questions about the implementation of digitalization in the organization's operations. In the last point, the respondents were asked to share their own opinions, among other

things, from the perspective of the future of digitalization and occupational safety. The questions are designed to be as easy to answer as possible. The questions also considered the different starting points between the respondents, and too specific questions were tried to be avoided.

The research also collected material from literature and previous studies, in addition to the primary material gathered from the questionnaire.

The sample of the study is partly based on purposeful and partly random sampling. The sizes of the companies in the study varied and the technological development at dissimilar stages was clear. The researcher used his own relationships when seeking respondents from food and drink industry professionals. Participants for the study were obtained from some digitally developed companies, but not enough. After this, the study had to rely more on random acquisition of respondents. Random respondents were obtained by contacting contacts previously unknown to the researcher. However, getting answers from them is more challenging than through familiar professionals. Respondents were targeted at digitally relatively advanced companies, but contact was also made with smaller companies, where it was estimated that the technology had not necessarily been invested in the same way. With this, it was also possible to somewhat map the state of the subject area in different parts of the field. There is a really limited number of large food and drink companies operating in Finland, so this caused some challenges for conducting the research.

3.3   Data analysis

Content analysis can be used as a tool in data analysis. The method aims to create a condensed, clear, and generalizable description of the investigated phenomenon, without losing the information it contains. The logical final result is achieved by first breaking

down the entire material into parts, after which it is conceptualized and finally a new analysis entity is created on the subject of the study. (Tuomi & Sarajärvi, 2018)

The questionnaire answers were read, and the contents were studied. The answers were searched for expressions corresponding to the research questions and then the expressions were simplified. The simplified expressions were searched for similarities and differences. Based on them, the results for the study were formed. The results were used to refine knowledge and techniques for improving occupational safety and increasing awareness for the future.

The research is based on qualitative data and its analysis played a key role in the thesis. Quantitative data was created to show that the research could be continued based on it. The quantitative data presented in the thesis was created to also bring a small perspective from this angle.

4   Findings

Answers to the questionnaire were received from eleven different food and drink indus-
try companies around Finland. The organizations themselves chose the respondents
based on their own judgment. The respondents had many different job titles, such as:
technical manager, head of development, production manager, development manager,
occupational health and safety specialist, occupational health and safety commissioner,
safety director, QEHS manager and warehouse manager.

Respondents were asked about the number of employees in the organization, which
gave an idea of the size of companies that the material for the thesis consisted of. The
food and drink industry consists of micro-enterprises all the way to multinational global
providers, so the industry has a wide range of companies in various stages. The pie chart
below outlines the size of the organizations that responded to the survey. From the
graph, we can conclude that only one organization of less than 26 people responded to
the survey. Large organizations were well included in the survey, and it was important to
get their views on the subject.
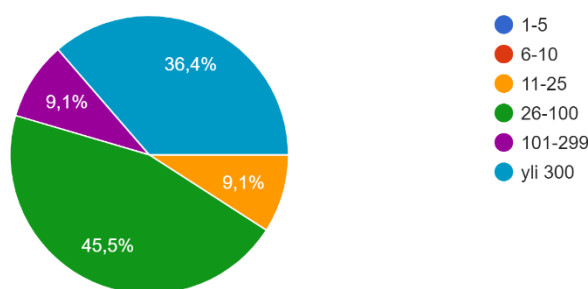
Figure 11. The size of the organizations.

Respondents were also asked how many years they have worked in industry. The aim
was to get information on whether the respondents have accumulated experience in the

field and how familiar they are with the principles and working of the field. The pie chart below reveals the respondents' experience of the industry. 45.5 percent of the respondents have already worked in the industry for more than 30 years and about a quarter of the respondents have been in the industry for 5-10 years. From the statistics, it can be concluded that a lot of experienced respondents participated in this study, and they have knowledge of the field. On the other hand, this information also tells us that there was a smaller number of respondents from young and perhaps more digital generation of people.
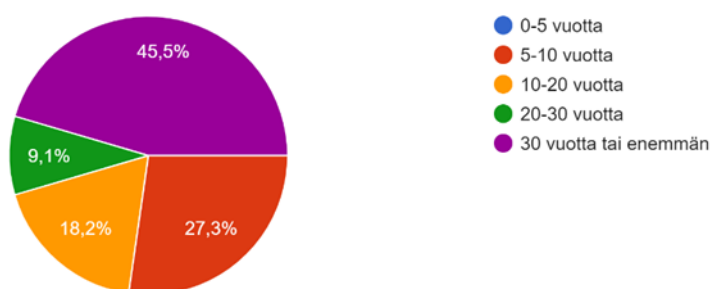
Figure 12. Respondents' experience in years.

4.1   Occupational safety in the food and drink industry

At the beginning of the questionnaire, the respondents were asked about the general state of the company's occupational safety in the form of ready-made answer options. The results aim to obtain background information on the status of organizations and a general mapping of the status of the subject area. The table below summarizes the questions and how the representatives of the companies answered the questions. The percentages are shown in the table and the largest numbers are in bold.

Question	Completely agree	Moderately agree	Neutral	Moderately disagree	Completely disagree
Occupational safety plays a significant role in your company.	**63,6 %**	36.4 %	0	0	0
The attitude towards occupational safety rules is positive in your company.	36,4 %	**45,5 %**	18,2 %	0	0
Occupational safety is monitored sufficiently	**36,4 %**	27,3 %	**36,4 %**	0	0
It is easy to perform tasks safely	9,1 %	**81,8 %**	9,1 %	0	0
There is good cleanliness and order in the work environment	18,2 %	**72,7 %**	9,1 %	0	0

Table 3. Answer percentages of ready-made questions of questionnaire section 1.

From the table, it can be seen that occupational safety plays a significant role in two out of three organizations and one third answered that it is somewhat significant. On the other hand, there was dispersion in the attitude towards occupational safety, and the highest percentage was for moderately agree. The neutral answer option also received responses. The issue of occupational safety supervision caused a relatively even distribution between strongly agreeing, moderately agreeing and neutral. Regarding performing tasks safely, only less than 10 percent answered that they completely agreed. More than 80 percent, however, moderately agreed. The cleanliness of the workstations was generally at a good level.

Respondents were asked about the causes of occupational accidents in their own organizations and problems typical of the food and drink industry were systematically revealed. Problems arising from lifting are a significant problem, as are tripping and slipping. Careless use of tools and hot surfaces also cause problems. Cut wounds are also a problem.

Next, the respondents were asked what they think these risks and work accidents are made of. The reasons were seen to be diverse, such as the work environment and the problems caused by it, such as slipperiness and disorganization. Careless operating patterns in the work community are also a factor in jeopardizing occupational safety.

"Poor orientation and poor information if there are changes to the work environment/working methods" (Respondent 2.)

"Lack of resources, operational culture" (Respondent 3.)

"There are no / it is not possible to use aids for the treatment that would minimize all the risks. Not all hot surfaces can be protected." (Respondent 7.)

"The rush, the disorganization of the work environment" (Respondent 11.)

4.1.1 Developing occupational safety

The development of occupational safety is an important part of the company's development, and the respondents were asked about it. They were also asked about the most central themes of occupational safety that are being developed in the organization. The companies knew how to give extensive answers to the development, and those working around the issue certainly have a clear view of the subject area. The importance of information was highlighted by the answers and its various forms were e.g., e-mail, Yammer-application, information boards and company intra pages. The most valuable tool for developing occupational safety was training events. The training aims to make employees understand the importance of safe practices for their own well-being as well as that of the company. Proactive occupational safety plays an important role in the development of operations. The importance of getting familiar with the job was also emphasized and learning how to complete work tasks safely right from the start is critical. Learning the wrong models and "shortcutting" in the process to speed up the process is something that is hard to get rid of. Communication between different departments is

also an important skill, and smooth exchange of information increases safety in the factory environment.

> *"Occupational safety is developed by involving the entire staff in order to achieve common goals. The focus is on proactive occupational safety." (Respondent 1.)*

> *"... However, safety and quality are very close to each other." (Respondent 4.)*

Making observations is encouraged, for example, with rewards such as gift cards and food vouchers. Efforts have been made to make observations in companies as easy and quick as possible so that employees are motivated to write them down. The regular meeting of occupational safety and health groups and the prioritization of safety issues in joint meetings increase the importance of the theme. It is important for supervisors and safety officers to go around the work environment so that they do not become alienated from what actually happens at work. Interaction and an open atmosphere for the exchange of information are basic prerequisites for the development of safety. Day-to-day management was given a significant role among the respondents.

> *"... The most important theme is: Think first, act then." (Respondent 8.)*

4.2   Digitalization in occupational safety

Respondents were asked about digitalization and occupational safety so that a picture could be formed of the organizations' general attitudes and attitude towards the subject. The table below outlines the questions and the respondents' answers. The largest numbers are in bold in the list.

Question	Completely agree (Positive)	Moderately agree	Neutral	Moderately disagree	Completely disagree (Negative)
What kind of attitude does the workplace have towards modern technology and digitalization on a general level? (1 = Extremely positive… 5 = Extremely negative)	18,2 %	**72,7 %**	9,1 %	0	0
The technology in the factory is up to date?	27,3 %	**45,5 %**	18,2 %	9,1 %	0
The technology in use is sufficient to guarantee occupational safety?	36,4 %	**54,5 %**	0	9,1 %	0
How do you perceive the level of digitalization in your company compared to competitors? (1 = forerunner.... 5 = lagging behind in terms of technology)	10 %	**60 %**	10 %	20 %	0
How important do you think digitalization is as an improvement of occupational safety? (1 = Yes, very important… 5 = No, not at all)	**54,5 %**	18,2 %	18,2 %	9,1 %	0
Does the digital revolution cause resistance to change in your company? (1 = Yes, significantly… 5 = Not at all)	9,1 %	36,4 %	0	**45,5 %**	9,1 %

Table 4. Answer percentages of ready-made questions of questionnaire section 2.

From the table above, we can conclude about the attitudes of the respondents' organizations towards digitalization. From the answers, we can conclude that the attitude in general is positive. Only less than 10 percent of the respondents were less than moderately agree. The status of the technology in the factory was completely up to date in only 27.3 percent of companies. There was also a deviation in a more negative direction. The safety guaranteed by the technology in use also did not convince the majority to fully agree. Respondents were also asked how they see their company's position compared to other companies from the point of view of digitalization. Only 10 percent were completely sure that they were a pioneer, 60 percent somewhat agreed, 10 percent were in the middle stages, and 20 percent thought that technology was moderately lagging

behind. An important question from the point of view of the research was whether digitalization has created an improvement in job security, and 36.4 percent said they completely agree. Dispersion was also found regarding this question, and about 20 percent said that they moderately disagreed. Respondents were also asked if there is any resistance to digital disruption in the company. There were different answers for and against, and it describes different company cultures.

The bar chart below has been created to outline the respondents' opinion on a question important to the study; Has digitalization created an improvement in occupational safety? From the figure, we can see that more than half feel that it improves at least to some extent. There are also neutral and negative answers. Answer options were, 1 = Completely agree, positive… 5 = Completely disagree, negative.
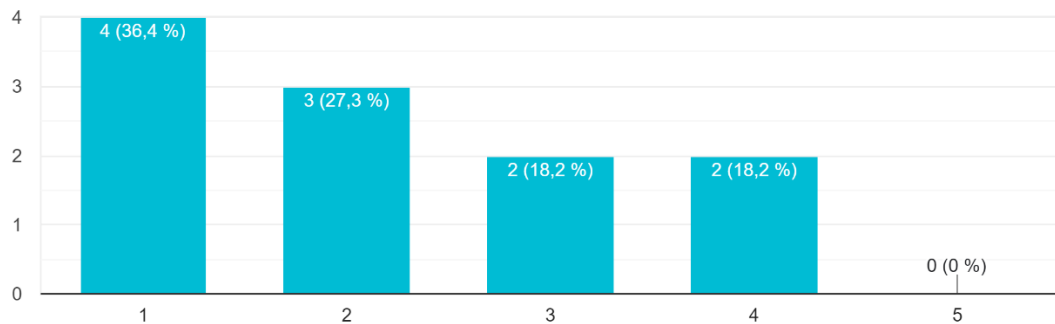
Figure 13. Has digitalization created improvement in occupational safety.

4.2.1   Occurrence of digitalization

Digitalization occurs in diverse ways in different companies, depending on the automation of production lines, product selections, the company's age, financial situation, and the company's operating models and strategy. The organizations in the questionnaire were companies of varied sizes, whose state of digital transformation was in various stages. The central themes of the answers were the reduction of physically demanding

work tasks brought about by automation and, with it, the reduction of physical workload. The automatic stop functions placed on the production lines, for example with sensors, have increased work safety for the production line. To get inside the robot cell, you need to pass through a gate that works with a light curtain, which automatically stops the functions of the line, preventing future work accidents with the robot. A similar solution is to isolate the robot cell with iron fence and the door cannot be opened without shutting down the production line.

"...The renovation of our production facility was completed in 2022, and one of the important themes was increasing occupational safety and efficiency. Modern premises create a good basis for safety, green production as well as efficient manufacturing..." (Respondent 11)

"...Renovations are constantly coming. However, some programs are only replaced when they have already reached the end of their life cycle. And then the introduction of something new can be too fast and cause problems from several angles. However, I think it has been enough." (Respondent 10.)

With digitalization, monitoring the realization of production has also become easier. Automatic systems keep track of completed products, and finding the original product batch, for example in the event of complaints, is much easier. According to the respondents, this kind of monitoring could also be developed from the occupational safety point of view in the future.

"...We have made significant progress, but there is still work to be done" (Respondent 5.)

"Introduction of a new reporting and investigation system -> managing with data. The measures have been sufficient for this stage of cultural development." (Respondent 2.)

"...Our factories are well equipped with first aid supplies. For these reasons, we have paid attention in our internal communication that every employee also knows how to give first aid in the event of an accident. The instructional videos help here, e.g., and the use of eye washes and bandages. The instructional videos are played

from time to time on television screens in the offices, intra and at the safety days organized a few times a year..." (Respondent 6)

With digitalization, some companies have moved from paper forms and manuals to a completely digital world. Some companies have developed digital reporting tools that make it easy and quick to make observations about occupational safety. The widespread use of digital reporting has played a significant role in several companies. The prevalence of applications in production and work tasks has also increased. Among other things, safety instructions have been brought closer to the work, for example with visual systems.

"The renewal of technology has been significant over the past year. We have moved to a new enterprise resource planning system, and this has created both challenges and opportunities. In addition, we have paid attention at the local level to enhancing reporting and campaign monitoring with the help of digital tools. I see our organization as very progressive in the field of technology." (Respondent 11.)

4.2.2 Factors affecting the implementation of digitalization

As mentioned earlier, industrial organizations are vastly different. Due to this, there are also different starting points for the implementation of digitalization in the factory and production. Strategic decisions create long-term plans, but sudden breakdowns or problems can also lead to inevitable changes. Considerably the biggest factors among the respondents were the costs and the benefit obtained from them. Resources are limited and their optimization is important. The people who make the decisions in the organization also have a profound influence on where to develop the company and operations or whether to stick to the old, familiar models.

"Our technical manager is interested in digitalization, and through that the drive to develop exists and moves things forward" (Respondent 8)

"Costs and achievable benefits." (Respondent 3.)

"Aging employees, old facilities, limiting investments due to the economic situation." (Respondent 9)

The layout of the company's workstations and factory bring challenges to the implementation. Using the right equipment in the right conditions is critical to success. The equipment must fit into the factory environment, and often in the food and drink industry, production facilities must be cleaned. Because of this, water and detergents must be used, which causes a risk of splashing. Technological devices must be sufficiently protected and suitable for work. In addition to this, the reliability of the tools also came up among the respondents. The tool has to work in challenging situations, and technology doesn't always make this possible.

The bar diagram below tells about companies' opinion on developing digitalization from the point of view of improving occupational safety. The general perspective on the matter is very neutral, although there were also answers for and against. This may be due to the uncertainty of the financial situation and investment strategies. Answer options were, 1 = Yes, significantly, 5 = Not at all.
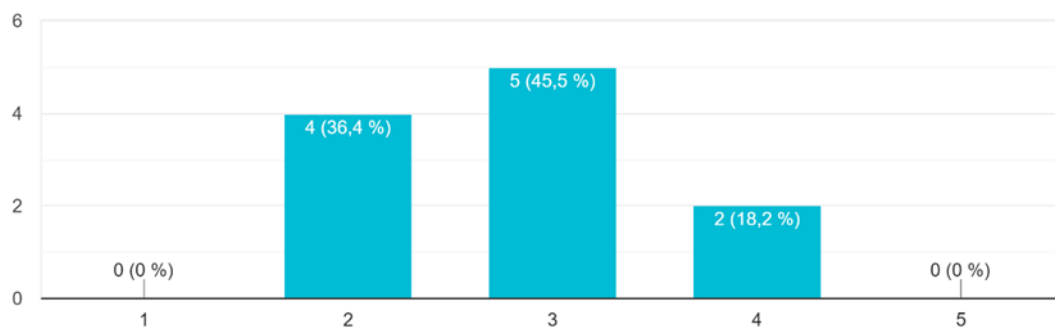

Figure 14. Plans to invest in digitalization to improve occupational safety.

4.2.3 Negative aspects of digitalization

Incorporating digitalization and modern technology into a company can cause problems, and companies have to make difficult decisions around it. Three respondents felt that digitalization does not have adverse effects on job security, but several also had the view that digitalization does not only bring positives. One of the problems was the unexpected breakdowns of technological devices and the resulting dangerous situations. A negative effect can also be forgetting to be alert and relying too much on devices and the resulting problems. When the equipment works too automated, some employees may lose awareness of the process. Also, the challenges of older workers in adopting recent technologies and using them can create risks to occupational safety. The indifferent attitude towards recent technology, especially among older employees, was also brought up, because they do not want to be present in the digitalization process and stay away from technology. Because of this, they do not learn to work properly, and the comprehensive knowledge of the programs remains incomplete. One respondent discussed how digitalization in industry can be scary, especially for older people. An older person can experience change as a threat, and as the fear states increase, the attitude can become even more negative.

"Lack of resources prevents development" (Respondent 1)

"We have clearly noticed that the new changes that have come with digitalization have met with resistance. The introduction of new operating models can "frighten" some personnel, and thus the will to stay with the old system / way of operating is maintained for a longer period of time. When these fears are overcome, it is quickly noticed that the introduction of technology also enables much more than before." (Respondent 6)

Concerns about information security and its coverage were also raised. Storing data in various cloud services can create risks of data leaks. Due to this, misuse of personal data or the spread of company secrets, among other things, is possible. For several respondents, the most important reason was the reasons caused by financial costs. Costs also

include financial costs as well as time and mental costs. Lack of resources is also listed as a reason.

"… When the life cycle of the programs comes to an end, we have to renew the programs. In some cases, the price is not considered to be recouped with the new program." (Respondent 10.)

Resistance to change is also a significant reason why the implementation of digitalization is carefully considered before adding it to the industrial environment. "Getting attached to patterns" is named as one reason, and its importance cannot be underestimated. The technical skills of older people were somewhat questioned among the respondents, and below is a direct quote from respondent 9.

"Many levels of employees from the production workers to the directors. Especially the digital skills of the older generation are not at the level of today's requirements." (Respondent 9.)

4.2.4   Occupational diseases

The Respondents were also asked whether digitalization could prevent the occurrence of occupational diseases. Respondents disagreed on whether it could be useful. This may be due to the different operating models and daily tasks of the companies in question. Some of the respondents were of the opinion that it does not matter, but some think that the possibilities exist. However, longer-term follow-up and data on the subject are needed before the benefits can be directly reflected in the results.

"Possibly. There is a lot of tasting in the alcohol industry, which is also an occupational health risk. Digital tasting could be done in the future. At the moment, there is no applicable technology yet." (Respondent 5)

"Absolutely. In the future, digitalization will also make it possible to work remotely in some tasks. With digitalization, many products, e.g., protectors develop, and the formation of occupational diseases can be prevented. Digitalization is also visible

among first aid products. In the future, the company's hopes are to have replenishment and use as digitally traceable as possible - in that case we are already talking about intelligent first aid…" (Respondent 1)

Among the respondents, connecting digitalization to ready-made working habits and that digitalization in itself is not a sufficient means emerged as a significant answer. Reducing repetitive work is one of the biggest benefits that automation enables.

"…Certainly, if repetitive work etc. could be reduced or removed completely." (Respondent 3)

"Possibly, but it is not a sufficient way by itself." (Respondent 9)

5   Conclusion & Discussion

The main purpose of this master's thesis was to find out the importance of digitalization in the occupational safety of the Finnish food and drink industry. The goal was also to create information about the current state of the matter and whether it has been helpful in increasing occupational safety. The purpose was also to look for different technological means.

The research questions were:

1. What kind of technological aids are used to improve occupational safety in the food and drink industry
2. Does digitalization bring added value to Occupational safety?

The research was conducted by using a semi-structured questionnaire to collect data form Finnish food and drink industry professionals from eleven different companies. Based on these, as well as on the basis of the literature and previous studies in the subject area, the conclusions presented in the thesis were reached.

5.1   Conclusion

Digitalization can bring added value to occupational safety in the food and drink industry. With the means of digitalization, organizations can achieve better occupational safety. Digitalization has reduced repetitive work and the load of physical work. With these means, the organization can reduce the number of work accidents and increase occupational safety. However, there must be interest in the subject within the organization and development is not always a topical issue.

However, its implementation alone is not enough to improve occupational safety, it mostly provides tools for success. Its correct application is important, and a critical assessment of the need is mandatory. Applying the strategy to improve occupational safety is a prerequisite for its continuous development. Digital aids come into use with joint decisions. Digitalization must be supported and its acceptance among all employees is essential for success. The study found that the attitudes of older workers differ from those of the younger generation. Changing attitudes to positive ones plays a critical role in the implementation of digitalization and thereby also in improving occupational safety.

Occupational safety has been increased with the help of digitalization, for example with electronic observation tools, safety videos added to workstations, and the robot cell's light curtains and automatic stop functions. In addition to automation, the aim is also to increase safety with various applications that are added to the work environment. Organizing training for both employees and managers is critical in increasing occupational safety.

The biggest reasons for non-implementation are lack of resources, uncertainty about benefits, aging employees, layout and factory conditions, and a negative attitude. In the food and drink industry, working conditions use a lot of water and detergents, and not all technological equipment is suitable for a factory environment.

Comparing the theoretical framework of the thesis and the conducted survey, it can be concluded that the digitalization of the Finnish food and drink industry in terms of occupational safety has developed to some extent, but there would be plenty of potential for development. With the digitalization and automation of machines, progress has been made, but we are still cautious when it comes to investing in technology. More development steps could be taken, but the industry seems to be a bit skeptical about reforms. Technology would offer opportunities, for example in the form of wearable technology.

In order to promote occupational safety, it would be good to make a strategy to follow. Based on the respondents and the literature, the participation of all employees plays a critical role in improving occupational safety. Adopting a strategy and an enthusiastic attitude can contribute to changing the company culture in a more positive direction. The importance of digitalization has been analyzed using the SWOT analysis below. The analysis shows the strengths and weaknesses of the subject area (current situation) and the analysis of its threats and opportunities (future).

Strengths:	Weaknesses:
- Increasing occupational safety	- Excessive costs (monetary, time)
- Decrease in physical load	- Resistance to change
- Increase general well-being	- Factory layout challenges
- Centralizing functions to one service (e.g., cloud services, intra)	- Not a necessity
- Advanced protective equipment	- Requires professionalism
- Increase remote work opportunities	- Mainly a tool for improving occupational safety
- Fast flow of information and its accessibility (Access to information for everyone)	- Cannot be applied to every work environment
	- Dependence on access to electricity
Opportunities:	**Threats:**
- The end of physical work	- Data security problems (leakage of personal data)
- Creating equal working conditions for all employees	- Technology that is too difficult to understand
- Smoothness of operations	- Negative attitude
- Prevent occupational diseases	- Difficult maintenance if there is lack of digital skills
- Food testing digitally (prevents repeated exposure to the consumption of the product)	- Can cause a serious danger if advice and instructions for use are not followed
- Complete accident-free	- An increase in dangerous situations
- Can be applied in diverse ways to different environments	- Increase in costs (e.g., electricity price increase)

Figure 15. SWOT-analysis on digitalization on occupational safety in food and drink industry.

5.2   Discussion

The survey respondents knew how to give comprehensive answers about how occupational safety is developed in their own company. From this we can conclude that, at least on a theoretical level, occupational safety plays a significant role in companies. Companies have clearly invested in talking about occupational safety. However, it is important to note whether these promises are also realized on a practical level. From the answers of the respondents, it can be concluded that not everyone in the organization is necessarily in harmony about the issue. In addition to whether occupational safety is equally important and tangible for all employees or just fancy words from senior management.

From the results of the study, we can say that older people experience digitalization more negatively than younger people. Taking them into account is important in the transformation of corporate culture. Older employees must be given more training and time to absorb things, and the digital revolution must not be rushed too much if the organization's employees have difficulty adopting modern technology. With the repetitions, aspects of digitalization can also become familiar and the use of a safer way of working becomes increasingly easier. An employee can perceive changing technology as a threat and changing it into a positive orientation is extremely important. Peer support and the possibility of using the Finnish language on digital devices would certainly ease the problems they face.

Excessive consideration of the elderly in technological solutions can also be problematic. If technology is held back too much, it can also stop the development of the organization. Based on the questionnaire, attitudes were somewhat questioning towards old people. From this we can conclude that the company has been driven to develop technology, but perhaps the old employees have been the brake on the development. This can also cause discord between people, which is harmful to the working atmosphere. In addition to this,

bitterness can also appear between people and weakens coping at work and can cause problems from the occupational safety point of view.

The frequent problem of the survey respondents was also the lack of money. There is not too much money to waste, and as a benefit of digitalization, improving occupational safety is not perceived as a necessity. Efforts are being made to develop occupational safety through other means, such as training, educations, and changes on trying to develop general attitude in a more positive direction.

The trainings should be wide-ranging regarding occupational safety. The biggest problem revealed by the respondents is the attitude towards occupational safety rules. Attitudes can be negative if the person is not interested in occupational safety or does not feel that the danger is a realistic scenario. Trainings should focus on creating a better attitude towards the rules, and not just preach strict compliance with the rules. However, changing attitudes is a big challenge and should be part of the absolute core of the company's occupational safety strategy.

The trainings should also concern senior management in the organization. The training of supervisors is as important, if not even more important, than that of a normal employee. Updating management styles is the responsibility of the organization. They should be aware of the risks and opportunities to be able to share their knowledge with their subordinates. Creating a preventive occupational safety culture plays a significant role in improving occupational safety.

Diverse ways to get people excited about occupational safety could be the opportunities created by digitalization. One possibility is to use simulation to show the cause or end result of a work-related accident. The simulation could also be used to show, for example, the right working postures and effective operating models. Some people can be visual learners and with this they would get a better idea about it. Digital instructional videos

for first aid in the event of an accident are also a good method and it was also used in the respondent's company. This is a cheap and straightforward way to raise awareness.

The transition of occupational safety instructions from folders in the corners of the workplace to part of everyday work is a significant addition to improving occupational safety. Especially for changing seasonal workers, the presented information is significant, because when learning something new, you cannot absorb all the information immediately. The number of seasonal workers is large in the food and drink industry, and the arrival of new employees to the company and their induction is usual for the industry. The resulting repetition of information and possible visual guidance is a significant addition.

Electronic observation tools were used in some of the respondents' companies. These will certainly help when making observations and the information can be found in the database after recording. The big question, however, is whether the system has been made easy enough that people want to write their observations there. It is possible that practices that are too difficult reduce people's motivation for making observations. Optimizing these situations is important and technology must not be an obstacle. This can lead to a halt in development. If the idea is developed further, the observation application could have the possibility to video a potentially dangerous situation. Disturbances are easier to detect and correct if their starting points can be addressed in advance. If necessary, the videos could be sent to consultants if the organization is unable to solve the problem. Professionals working remotely would also be easier to reach.

The digital skills brought by new employees could also be used to increase occupational safety. New people could bring new innovative solutions and their potential should not be underestimated.

Continuous development was also one of the key themes that appeared in the answers. Some of the respondents said that their company has taken steps forward, but results can only be achieved with continuous development. Taking small steps forward is

important in terms of strategic renewal, and some of the organizations in the study had a good view that the renewal should not be carried out too radically. Digitally capable, competent, and enthusiastic staff would be required for such a quick transition, and based on the thesis, unfortunately, such staff cannot be found in all organizations.

With digitalization, wearable technology has also been developed to protect and provide additional support to the employee. This is not yet visible on a practical level among the respondents, but a foretaste of these has already been obtained in the literature. However, technological products must be widely accepted, and they must demonstrably improve safety. The aim is to avoid the implementation of excessive technology, so that the risks do not increase.

However, the changes created by digitalization are not only good, and there is still much to improve and develop in the future. The inclusion of digitalization in occupational safety brings its own challenges. The industry professionals do not all agree on the relevance of the connection between digitalization and occupational safety. Because of this, some of the companies that participated in the study do not see it as a particularly important addition.

Digitalization can also create pressure for employees. If you are not familiar with technology, learning new ways and techniques can be mentally and physically taxing. This increases uncertainty in other tasks as well and can cause a negative atmosphere in the workplace. The intensity of the task can increase even though the physical load decreases. Small button presses have a substantial impact, and they may not be able to be fixed as physically as it was done before, and people may start to be afraid to make decisions.

Investments are often extremely expensive, and their total costs cannot be calculated just by the price tag of equipment purchases. Costs also include employees' time, the time needed for learning, the costs of the procurement process, minimizing resistance

to change and updating digital skills. Investments often take a lot of time from every member of the organization and managing it in addition to your own daily tasks can be challenging and exhausting both mentally and physically. Resources are prioritized for things that are more productive in terms of production, even though safety is an important aspect.

Other occupational safety improvers that are alternative to digitalization are, for example, the development of materials. With the help of materials, it is possible to prevent issues that those created by digital technology cannot solve, at least not yet. Among other things, the development of shoes prevents the number of slips, and the development of gloves reduces the number of cuts. Digitalization has not reached this yet. The reduction of mechanical work steps certainly reduces the risks, but as the respondents stated, some work tasks cannot be performed without mechanical handling and physical strength.

With the development of technology, robots and tools have also become more complex. Device repair requires even more expertise, especially in the electrical field. Because of this, companies must have qualified professionals in the field and their knowledge must be up to date. However, there may be a shortage of such employees and the company has to solve the problem somehow.

5.3 Limitations

According to the research ethics advisory board (TENK 2023), the ethical starting points for good scientific research are honesty and care during the research process, use of research methods in accordance with criteria, respect for other researchers, proper referencing, obtaining research permits and ethical pre-assessment, taking care of data protection and informing the sponsor of the research. Responsibility for research ethics belongs to each researcher personally.

Although the researcher used exceptional care and attentiveness in the research, the research has its own limitations. Eleven companies took part in the study, and that is quite a small number of all possible ones. If the number of responses had been higher, the results could be considered even more convincing. Because of this, the results can be questioned due to the small sample size. However, getting answers from all the companies would be really challenging, especially for a student's research.

In addition, the professionalism of the thesis author must be taken into account when reading and researching the research. The researcher does not have comprehensive experience to conduct studies, and the occurrence of human errors is possible. It must also be considered that the respondents' statements are their own, and there may be divergent perspectives within one's own organization. The different background of the respondents can also affect the quality and knowledge of the answers.

As concepts, digitalization and occupational safety are quite broad concepts, and all their nuances may not be covered in the study. Digitalization in particular is developing all the time and the opportunities brought by technology are steadily appearing on the market and knowledge of every possible solution is very difficult.

The written questionnaire used in the study can also be questioned. Respondents are able to give precise answers and think about them carefully, but non-verbal communication cannot be detected.

The sizes of the companies in the study varied, and it can be classified as a positive or negative thing. From a positive point of view, data was obtained extensively from different areas of the field. In the study, it was possible to map the situation for smaller companies as well. The perspective was also broadened, as professionals in small companies are not necessarily as qualified as in large companies, and they may have different opinions. The negative side was that they did not necessarily know how to give proper

answers to digitalization, because it is not considered such an important part of the company. Of course, this is also valuable information from the point of view of research. It is difficult to get broad knowledge of the subject area, and getting the best professionals as respondents is a challenge. Of course, this seems to be a common problem in many theses, especially for inexperienced and unfunded researchers.

5.4 Suggestions for future research

Digitalization is a constantly developing area and its research is always topical. New opportunities are constantly being created and technological aids bring innovations all the time. Occupational safety is even higher on the priority list of organizations, so development steps can be expected in the near future.

There is relatively little research and literature on the effects of digitalization on occupational safety, so there is an urgent need for research. Research should be done more broadly on the importance of occupational safety for employee coping. The importance of understanding technology to increase occupational safety would also be a good research topic. Also, further research topics could be what type of digitalization enables the best occupational safety in the factory and can excessive implementation of digitalization even be harmful in the workplace.

Occupational safety from mental aspect would also be beneficial to research on. The increase in inequality in the understanding of digital devices by different age groups and how it affects working conditions and success at work would be a great subject for research.

In the future, the research could be refined to address the challenge faced by older workers due to digitalization. Old and young people could also be compared with each other and how their opinions on the matter agree or differ. The study could also be done on

whether digital means can influence people's attitudes regarding occupational safety. This could also be expanded to cover companies from different countries and how the issue is treated in other parts of Europe, America, or Asia. For example, Liberty Mutual Insurance (2019) estimates that workplace accidents cost more than a billion dollars a week in America.

It would be interesting to further refine the research regarding other branches of the process industry. Do attitudes vary between sectors and how advanced technology is, for example, in the forestry or chemical industry. The change in the materials to be processed certainly creates its own challenges and priorities for occupational safety.

Collecting data and harnessing it to produce added value is certainly one future theme for preventing work accidents in the process industry. Tools and techniques related to this would be an interesting topic for research.

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Appendices

Appendix 1. Semi-structured questionnaire questions

Yrityksen nimi

Lyhyt vastausteksti

Kuinka monta työntekijää yrityksessänne työskentelee

- ⃝ 1-5
- ⃝ 6-10
- ⃝ 11-25
- ⃝ 26-100
- ⃝ 101-299
- ⃝ yli 300

Ammattinimike

Lyhyt vastausteksti

Työvuosia teollisuudessa

- ⃝ 0-5 vuotta
- ⃝ 5-10 vuotta
- ⃝ 10-20 vuotta
- ⃝ 20-30 vuotta
- ⃝ 30 vuotta tai enemmän

Osio 1. Työturvallisuus työpaikalla

Kuvaus (valinnainen)

Työturvallisuus on merkittävässä roolissa yrityksessänne.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Asenne työturvallisuussääntöjä kohtaan on myönteinen yrityksessänne.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Työturvallisuutta valvotaan tarpeeksi.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Työtehtävät on helppo suorittaa turvallisesti.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Työympäristössä on hyvä siisteys ja järjestys.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Mitkä tekijät ovat suurimpia työtapaturmien aiheuttajia?

Pitkä vastausteksti

Mistä koet, että suurimmat riskit työturvallisuuteen aiheutuvat?

Pitkä vastausteksti

Miten työturvallisuutta kehitetään yrityksessänne? Mitkä ovat työturvallisuuden tärkeimmät teemat?

Pitkä vastausteksti

Osio 2. Digitalisaatio ja teknologia työturvallisuudessa

Kuvaus (valinnainen)

Minkälainen asenne työpaikalla on uudenlaista teknologiaa sekä digitalisaatiota kohtaan yleisellä tasolla?

	1	2	3	4	5	
Erittäin myönteinen	○	○	○	○	○	Erittäin kielteinen

Tehtaalla oleva teknologia on ajan tasalla.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Käytössä oleva teknologia on riittävä takaamaan työturvallisuuden.

	1	2	3	4	5	
Täysin samaa mieltä	○	○	○	○	○	Täysin eri mieltä

Miten koet digitalisaation tason yrityksessänne verrattuna kilpailijoihin?

	1	2	3	4	5	
Edelläkävijä	○	○	○	○	○	Teknologian osalta jäljessä

Miten tärkeänä koet digitalisaation työturvallisuuden parantajana?

	1	2	3	4	5	
Todella tärkeä	○	○	○	○	○	Ei lainkaan tärkeä

Onko digitalisaatio luonut parannusta työturvallisuuteen?

	1	2	3	4	5	
Kyllä, merkittävästi	○	○	○	○	○	Ei lainkaan

Aiheutuuko digitaalisesta murroksesta muutosvastarintaa yrityksessänne?

	1	2	3	4	5	
Kyllä, merkittävästi	○	○	○	○	○	Ei lainkaan

Miten digitalisaatio esiintyy tällä hetkellä yrityksenne tuotannossa ja työturvallisuudessa?

Pitkä vastausteksti

Miten yrityksenne teknologia on uudistunut sinun työurasi aikana ja onko se ollut riittävää?

Pitkä vastausteksti

Mitkä tekijät yrityksessänne vaikuttavat digitalisaation käyttöönottoon tai käyttöönottamattomuuteen?

Pitkä vastausteksti

Voisiko digitalisaation keinoin ehkäistä ammattitautien syntymistä?

Pitkä vastausteksti

Millaisia negatiivisia vaikutuksia koet digitalisaatiolla olevan työturvallisuuteen?

Pitkä vastausteksti

Osio 3. Tulevaisuus

Kuvaus (valinnainen)

Onko suunnitelmissa panostaa digitalisaatioon työturvallisuuden parantamisen näkökulmasta?

	1	2	3	4	5	
Merkittävästi	○	○	○	○	○	Ei lainkaan

Mitä esteitä näet digitalisaation implementoinnissa tehtaaseen ja työympäristöön?

Pitkä vastausteksti

Mahdollistaako digitalisaatio samanvertaiset työolosuhteet kaikille työntekijöille? (Esim. fyysisestä kunnosta johtuvat eriarvoisuudet)

Pitkä vastausteksti

Vapaa sana (palaute, kehitysideat, terveiset tms.)

Pitkä vastausteksti

Suuret kiitokset vastauksista ja oikein mukavaa kevään jatkoa!

Kuvaus (valinnainen)

Appendix 2. Translation of the survey into English

Background information

1. Company name

2. How many employees work in your company

3. Professional title

4. Years of work in industry

Section 1. Occupational safety in the workplace (1 = completely agree... 5 = completely disagree)

1. Occupational safety plays a significant role in your company.

2. The attitude towards occupational safety rules is positive in your company.

3. Occupational safety is monitored sufficiently

4. It is easy to perform tasks safely

5. There is good cleanliness and order in the work environment

6. Which factors are the biggest causes of work accidents? (Open question)

7. Where do you feel the biggest risks to occupational safety arise? (Open question)

8. How is occupational safety developed in your company? What are the most important themes of occupational safety? (Open question)

Section 2. Digitalization and technology in occupational safety (1 = completely agree... 5 = completely disagree)

1. What kind of attitude does the workplace have towards modern technology and digitalization on a general level

2. The technology in the factory is up to date

3. The technology in use is sufficient to guarantee occupational safety

4. How do you perceive the level of digitalization in your company compared to competitors? (1 = forerunner.... 5 = lagging behind in terms of technology)

5. How important do you think digitalization is as an improvement of occupational safety?

6. Has Digitalization created an improvement in occupational safety

7. Does the digital revolution cause resistance to change in your company

8. How does digitalization currently appear in your company's production and occupational safety? (Open question)

9. How has your company's technology changed during your career and has it been sufficient? (Open question)

10. Which factors in your company affect the implementation or non-implementation of digitalization? (Open question)

11. Could digitalization prevent the occurrence of occupational diseases? (Open question)

12. What kind of negative effects do you feel digitalization has on occupational safety? (Open question)

Section 3. Future:

1. Are there plans to invest in digitalization from the perspective of improving occupational safety? (1 = significantly... 5 = not at all)

2. What obstacles do you see in the implementation of digitalization in the factory and work environment? (Open question)

3. Does digitalization enable equal working conditions for all employees? (E.g., inequalities due to physical condition) (open question)

4. Free speech (feedback, development ideas, greetings) (open question)

5. Many thanks for the answers and a genuinely nice continuation of the spring!