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The Role of Digital Leadership and Digital Transformation under the influence of Covid 19

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ABSTRACT :

Leadership plays an essential role in the management of an organization since it would sometimes determines the survival of the organization. Leadership reflects how the leaders of organizations would deploy the resources and manpower of the organizations, and what resolutions the leaders would take in urgent situations. However, organizations encountered a huge hurdle under COVID-19 since it has cast impediments to the operations of the companies.

This paper aims to explore the role of digital leadership in digital transformation during the pandemic. In addition, this paper also explores the way that leaders could push forward the digital transformation to enable the company to adapt new market environment that their companies are in. Therefore, this paper capitalized on the research opinion of Saunders with interpretivism as the research philosophy, and the quantitative method was adopted to enable the execution of an interview.

The paper found that digital leadership and digital transformation can advance the development of organizations, which is mainly demonstrated by the improvement of confidence in digital leadership. Besides, the productivity, self-efficiency, and self-sufficiency of employees would be enhanced, thereby providing more opportunities for employees. This paper also found that digital transformation could drive the digital leadership of organizations. Furthermore, leaders' rethinking was also enhanced so that leaders could figure out what approaches should be taken in an emergency. All of these findings show that digital transformation has a proactive impact on digital leadership.

KEYWORDS: Digital Leadership, Digital Transformation, Covid-19, Employee Self-Efficacy, Self-Sufficiency

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Kun Rahko

Contents

1 Introduction

A leader is defined as a person who takes the whole responsibility in an organization. The leader is also the core of an organization. In the long history of human beings, there are always leaders who lead the common people to do great things. With good leadership, a vision can be created and people make efforts to realize the vision. In this situation, many people show an obsession with leadership, which brings many discussions and research on the importance of leadership.

Digital transformation is the general trend of the whole world, and all walks of life have begun to explore their own digital transformation paths. The exploration of digital transformation in the economic field has experienced from the beginning of a single digital technology application to the optimization of the overall business process, to the construction of a cross-departmental digital platform, and finally to breaking the boundaries of traditional business concepts and realizing the innovation and development of corporate marketing models (Voelpel et al., 2004, p 259-276). The outbreak of the COVID-19 epidemic has catalyzed this process. In the post-epidemic era, the most important proposition for the world economy is how to promote digital transformation during the epidemic.

Covid-19 has heavily hit the global economy, and no country or enterprise can be immune from it. Facing the persistent and interrelated impacts brought by the epidemic, number of firms and businesses teetering on the edge of bankruptcy. This crisis was sweeping over the world. The Finnish economy cannot leave well alone. Uncertain markets, reduced demand, and low profit mainly characterize the impacts of this outbreak on the global economy. Troubled by these similar survival challenges, both large businesses and small and medium-sized companies in Finland struggled to find a way out. The outbreak of the epidemic has caught companies at the intersection of digital transformation by surprise. Lack of reliable references of successful cases, many enterprises are struggling to explore the direction of digital transformation of leadership.

1.1 The Importance of Leadership

The importance of leadership could be represented by key factors, including definitions, types, and operations. Turner & Chacon-Rivera (2019, p 371-382) focused the leadership with personal features and analyzed the functions of leadership. He viewed that this kind of leadership with strong personal characters had a function in the decision-making, especially in the big companies of traditional industry. This leadership with individual charisma optimized the governing administration and brought high efficiency (Turner & Chacon-Rivera, 2019).

When the traits of leaders and employees were consistent with each other, the workplace would be improved. Ciulla (2020) pointed out that leaders' virtue and value could become the core value of companies, they embedded in the structure of companies. These works on leadership draw a clear outline of the function of leadership with personality. It provided a personal perspective on the function of leadership, which offered a new research focus to today's research (Ciulla, 2020). While a considerable body of research had been carried out on the importance of a leader's charisma, much less was known about other factors. In the big companies of traditional industry, this leadership showed its importance, but it had not such importance in the startup in the emerged field (Ciulla, 2020).

A lot of researchers did extensive work on the importance of leadership, some emphasized the influence of the leader's personality, some combined the scientific model to analyze the importance, and others paid attention to the absence of leadership in crisis. Leadership had important functions in the development of companies.

1.2 The Impact of Covid-19 on Finnish Manufacturing Business

Since the Covid 19 outbreak, some traditional manufacturing companies, have avoided all offline meetings, strongly advised employees to work remotely whenever possible,

restricted access to factories, isolated affected employees, and closely monitored the Covid-19 outbreak within their companies to ensure the health and safety of their employees. In addition, a number of manufacturing companies in Finland have expanded their international operations and covid-19 has had a negative impact on sales for these companies.

Due to travel restrictions and embargoes during the flu pandemic, raw materials were in short supply (Paaso et al., 2021). Also, rising transportation costs have increased production costs for manufacturing companies. The global economic uncertainty caused by the pandemic led to market instability for some traditional B2B manufacturing companies (Teräs, 2021).

The pressure to cut costs shifted to other departments within the company. Parts shortages, labor disruptions, transport disruptions, and failure to deliver products to customers are fatal to manufacturing. Therefore, digital transformation is an important factor in whether the manufacturing industry can escape from similar difficulties.

Due to the ongoing impact of the epidemic, plant maintenance closures will continue to be delayed for most Finnish manufacturing companies. In addition, some manufacturing companies have adopted other strategies to address cost issues, including capital expenditures and hiring restrictions. Challenged by declining margins due to the pandemic, traditional manufacturing has had to shift its focus to growing its business. In this case, these companies had to develop new products to improve the group's profits.

Nevertheless, the future of these growing businesses remains murky due to the uncertain markets affected by the global pandemic. It is worth mentioning that these traditional manufacturing companies, too, have started to explore digital transformation. For example, some Finland traditional manufacturing companies had launched online platforms, the digital B2B marketplaces (Pihlajamaa et al., 2021). These systems could support the online packaging business by providing a trading platform where not only

companies could purchase packaging materials, but suppliers could acquire new customers without forming their own digital presence (Pihlajamaa et al., 2021). These traditional manufacturing companies, through continuous exploration and trial and error, are gradually discovering that only by implementing digital transformation throughout the company can they sustain their operations and mitigate supply chain challenges. The traditional manufacturing industry's exploration reminds those traditional manufacturing industries that pioneered the COVID-19 epidemic that they must practice digital transformation to find a way out.

Covid-19 has also hit a number of Finnish manufacturers that are on the road to digital transformation. Although these companies were not as seriously at risk as traditional B2B manufacturing as well, they were also plagued by falling demand and pressure to cut costs (Teräs, 2021). Governments around the world have had to take measures to contain the outbreak of the pandemic, including restricting the international movement of people, closing construction sites, and limiting production or business operations and other business activities that have affected the level of activity in the global construction industry.

Within some countries where travel bans were strictly enforced, the supply chains of some multinational manufacturing companies had even been partially disrupted, and there was a global risk of further disruptions (Chowdhury et al., 2021). The weak business environment has had a negative impact on deliveries and staging, especially in some countries with strict controls.

Finland's manufacturing industry relies heavily on raw materials and transportation routes. Once the market environment changed, Finland's manufacturing industry would suffer unimaginable impacts (Müller & Kazantsev, 2022). These companies had been exploring the path of digital transformation for some time now and were therefore able to react quickly (Huikkola & Kohtamäki, 2020). Some companies have already adapted the way they work to ensure that every employee is connected, engaged, and motivated

through many mobile and visual devices. In addition, these more experienced digital transformation companies have launched online learning platforms to improve the ability to collaborate with employees. To better serve their customers, some elevator manufacturing companies had even built their digital presence and strengthened supply chain relationships by selling and installing with the help of other partners (Huikkola & Kohtamäki, 2020).

1.3 Development of Digital Leadership under Covid-19

Digital leadership plays a significant role in crisis response and decision-making during the COVID-19 pandemic (Altrogge & Parks, 2021). Digital leadership is a leader's ability to strategically use the company's digital assets to achieve business goals (Petry, 2018). Digital leadership can be addressed at the organizational and individual levels (Petry, 2018). Researchers defined digitalization as a major organizational change driven or triggered by public technology that changes the way business is conducted (Bilgeri et al., 2017). It was been common knowledge that companies and organizations needed to fundamentally change the way they do business and the mindset of leading teams (Hartl & Hess, 2017). The unstable world policy and dynamic society brought uncertainties to the economy. Some traditional firms will be eliminated from the market if they fail to transform.

Hit by the Covid-19 pandemic, many organizations and governments had to change their way of working and search for new operating models to survive (Ting et al., 2020). A study found that 75 percent of the informants agreed that the economy benefited from digitization. Besides, 67 percent of people believed that digitization could improve the quality of life while 64 percent deemed that digitization would benefit the community. In fact, over the past decade, technology has significantly changed the ways people live the business run (Gill, 2020). More and more corporations and governments realized that it was important to hug digitalization during the outbreak (Antonopoulou *et al.*, 2021).

The ongoing COVID-19 pandemic had even more critically emphasized the importance of digital skills to leaders and employees (Mango, 2018). Digital leadership could determine whether an enterprise could sail through the crisis, drive business growth and stay ahead of competitors in a dynamic market (Saputra et al., 2021). Especially in uncertain and unstable circumstances, leaders and managers were troubled by some questions that how to build a data-oriented business, how to improve the digital competence of teams, and what the crucial factors of their digital leadership were (Priyono et al., 2020).

The outbreak of the epidemic has caught companies at the crossroads of digital transformation off guard. This is especially true for some traditional manufacturing companies, which rely more on raw materials and traditional supply chain relationships. Digital transformation driven by the epidemic requires that companies' management capabilities also undergo transformation. The lack of reliable references to successful cases makes it difficult for many manufacturing companies to find the future direction of their business. Therefore, digital transformation has been learned attempt the Finnish manufacturing industry in the hope of finding ways to transform the future leadership of Finnish manufacturing companies. This study will provide a reference for Finnish manufacturing companies that intend to undergo a digital transformation or those that are in the process of doing so. It is even hoped that the study will shed light on the transformation of the manufacturing economy in the world as a whole.

1.4 Research Aim

The purpose of this study was to examine the role of digital leadership in digital transformation during the Covid-19 pandemic and how leaders can drive digital transformation to adapt to the latest market environment and changing business needs. This research will study the responses of the leaders of some Finnish companies and

evaluate their measures and reactions. In addition, this study will also explore the role of digital leadership in the context of Covid-19 and its importance to enterprises.

1.5 Research Questions

a) How can digital leadership support digital transformation?
b) How interviewed Finnish manufacturing enterprises cultivate digital leadership and conduct digital transformation?
c) How interviewed Finnish manufacturing enterprises leaders influence enterprise digital transformation by applying enterprise digital leadership?

1.6 Study Structure

This study is mainly divided into five parts, which are the introduction, literature review, methodology, information collected from interviews, and suggestions.

2 Leadership and Digitalization

There are two main themes of this research, one is how leadership promotes digital transformation, and the other is how these companies can achieve digitization. In this research, the literature review is designed to comprehensively reflect the related studies which were performed by other scholars. Firstly, research related to leadership, or the role of leaders, was introduced. In this section, the research focused on the management of the companies in Finland, the importance of leadership, the practice of leadership, as well as the action of leadership under the covid-19 were provided. Secondly, studies related to digitalization were introduced including the role of digital leadership, the impact of digital leadership under the covid-19, digital innovation within corporations, and the application of digital imperatives.

2.1 Leadership Before the Pandemic

This section aims to analyze leadership during the pandemic. The leadership styles and management styles of Finnish companies will be discussed.

2.1.1 Leadership Styles

There were various practices and implementations of leadership. Understanding different practice styles of leadership paved the way for later analysis of digital leadership. Many researchers defined the style of leadership from a personal perspective and believed that the style was deeply rooted in leaders' characteristics.

Turner & Chacon-Rivera (2019) classified the different styles of leadership, he believed that leadership could be transformation-style because the leaders were prone to challenge tradition and achieve innovation. Some styles of leadership could be modest because the leaders had mixed features with humility. This kind of leadership could

create a nice workplace with joined efforts of the leaders and the employees. He also mentioned the difference between autocratic leadership and democratic leadership. It depended on the characteristics of the leaders. The work on the style of leadership gave us a clear definition to us. The standard of dividing different styles of leadership was the personal traits of the interviewed leaders, which provided a personal perspective to identify their leadership.

However, on the one hand, the analysis of this work paid much attention to the leaders' personal features, so the research perspective is limited. Therefore, the discussions and findings of the study could not be applied to universal use. On the other hand, the researchers did not give specific examples of the personal style of leadership in the related industry, which would result in a poor understanding of the whole work. The study of Turner & Chacon-Rivera (2019) helped this research treat these problems with caution and provided a theoretical base for the understanding of interviewed leaders' leadership styles.

Mahmood et al. (2020) mentioned in the journal that in enterprises or companies, there were paternal leadership styles, transformational leadership styles, and transactional leadership styles that can have a greater impact on performance. In the journal, Mahmood et al. (2020) explored the impact of different leadership styles on organizational performance by investigating the leadership styles of different companies or enterprises in the context of Kazakhstan (Mahmood et al.,2020). By developing a structural equation model, the journal evaluated the two variables of different leadership styles and organizational performance, to further test the effective role of leadership in corporate culture on the performance of the organization or the company. Mahmood et al. (2020) developed a structural equation model based on core theory to evaluate the impact of different styles of leadership on the business performance of the company.

Their research results supported the "comprehensive leadership method" as one of the methods for individual managers to improve their leadership ability, to make its contribution to management development and organizational performance. In addition, the journal also suggested that companies or enterprises can cultivate a variety of leadership abilities for managers through research, to improve the efficiency of the performance of companies. This research provided a leadership style and practice that can effectively deal with the impact of the Covid-19 pandemic, which was useful to this study. The three leadership styles of paternal, transformational, and transactional mentioned in the journal provided an explanation and proof of leadership style for the research to analyze and explore the leadership responses of the Finnish manufacturing enterprises, to the pandemic.

Similarly, Wen et al. (2019) showed in their research that since employees are the key driving force of the company and enterprises, their performance can only be improved with the support of strong leadership of managers. With the increasingly fierce business environment, promoting the work efficiency of employees and the productivity level of enterprises increasingly depended on managers to use the correct leadership style. Wen et al. (2019) discussed the relationship between transformational leadership style, transactional leadership style, and ideological leadership style and the job performance of employees in their article. In addition, Wen et al. (2019) adopted the full-range leadership model in the process of exploring these three different leadership styles, which provided a theoretical basis for the analysis of transformational and transactional leadership styles. Compared to Mahmood, Wen et al. (2019) focused on the comparison of three different leadership styles in their research. Through the case study of local companies in Malaysia, the study found that within the organization, fear management could make the company or enterprise achieve certain expected results in the short term.

The motivation transformed by pressure can help employees improve their work performance in a short time, but this motivation can only be maintained for a short time, not in the long term. If the interviewed Finnish manufacturing enterprises management

wanted to maintain or even improve the efficiency of the work of employees for a long time, among the three different leadership styles, the ideological leadership style was more able to instill the concept of trust and information sharing in the open working environment. Yet at the same time, Wen et al. (2019) also showed that the ideal leadership style needed different analyses in different situations to have corresponding effects. Therefore, for interviewed Finnish enterprises, only by correctly evaluating the leadership style suitable for organizational development can we identify the significant relationship between the job performance of employees and this leadership style.

For this research, the study of Wen et al. (2019) showed the specific details and leadership measures of different leadership styles and compares these three styles in different enterprise management at the same time. This could help the researchers find the right leadership style for Finnish manufacturing enterprises. In addition, the detailed description of leadership style can also provide effective information for this research to analyze whether leadership style was an important factor for the Finnish manufacturing enterprises to successfully deal with the pandemic.

However, the whole research proposition of Wen et al. (2019) was carried out based on a literature review. Even though the case study of local companies in Malaysia was mentioned in the study, there was not enough empirical analysis in the whole study. When analyzing ideological leadership, the study has limitations on the scope and breadth of its application, which needed further research. Therefore, the study can only help the research in theory. To further evaluate the three leadership styles, this research needed to further find relevant materials and literature for the empirical test. However, the study provided a solid theoretical analysis for analyzing the leadership styles of Finnish manufacturing enterprises. Therefore, in general, the literature can provide appropriate theoretical help to the research.

The description of the general management style in Finnish companies provided a base for the understanding of Finnish leadership responses in the context of the Covid-19

pandemic. What's more, understanding the management style in Finnish companies was also beneficial to know the thinking way of the leaders of Finnish companies who made leadership responses to deal with the pandemic. Thus, the process of enterprise digital transformation on the basis of basic technology and knowledge management during the pandemic could be further understood.

The basic technology and knowledge management discussed could also make a contribution to this research. Since one of the research objectives was to explore the application of the enterprise digital image of Finnish manufacturing companies and the impacts on enterprise digital transformation, the function of basic technology and knowledge management was significant. Apart from that, basic technology and knowledge management could help to analyze the process of enterprise digital transformation under the influence of the Covid-19 pandemic.

2.1.2 The Management of the Companies in Finland

Finnish managers did not motivate employees with pep talks or routine feedback sessions, as they did in most countries (Kianto et al., 2018). They often delegated tasks that could quantify results and measured them without emotion (Kianto et al., 2018). After a task was delegated, managers did not double-check the progress. In larger companies, big decisions tended to be made by the senior management team rather than by any one person (Kianto et al., 2018). This was because Finns had a history of conservatism, and decisions were not implemented until all interested parties were involved in the decision-making process and the decision was made (Kianto et al., 2018).

Finnish enterprises focused on basic technology and knowledge management (Heimonen & Takala, 2019). Finnish business management tended to be dominated by engineers, so the dominance of engineers in management made Finnish companies have a strong technical orientation (Heimonen & Takala, 2019).

Finnish business management relied on systematic and standardized procedures. Managers were paying more attention to efficiency and order, which played a bigger role in business design and research and development. Therefore, Finnish enterprises attached great importance to enterprise technology and knowledge management. Research showed that pioneer technologies and knowledge were a major source of uncertainty at each stage of a company's development, while core technologies were highly variable at each stage of development (Heimonen & Takala, 2019). In addition, Finnish enterprises relied heavily on basic technology, which was the cornerstone of technology and were highly uncertain, enterprise management was mainly based on basic technology. Enterprise management of the underlying technology was a means to ensure stable delivery to customers (Heimonen & Takala, 2019). Moreover, compared with basic technologies, pioneer technologies accounted for a smaller percentage, which could also reduce the uncertainty and instability of enterprise management (Heimonen & Takala, 2019).

2.2 Leadership During the Pandemic

2.2.1 The Action of Leadership under the Covid-19

The action of leadership under Covid-19 had drawn the attention of scholars. Different industries and companies had different actions of leadership under Covid-19. It could provide experiences for the manufacturing industry.

Some researchers paid attention to the action of leadership in human resource management. Korman and Mujtaba (2020) discussed various challenges and leadership crises resulting from the epidemic and its doomed layoffs along with the epidemic by using instant data on infection and death in the USA. Another focus of the work was the leader's action on the problems produced by the epidemic, such as employee layoffs, company bankruptcy, and work handover. Some leaders of companies did the

management optimization in the sectors and employees. They announced that their operations and facilities would be closed, and hundreds of employees would be fired for preventing companies from going bankrupt (Korman & Mujtaba, 2020).

This study provided many specific examples of leadership actions, especially in employee management, which is conducive to exploring the actions that Finnish manufacturing enterprises can take. It provided the owner and manager of the company with nice practices, models, and recommendations, which have a practical meaning for this study. The scholars drew clear graphs to show the severity of the pandemic and the effectiveness of the leader's action. Based on the data, the researcher can choose the best effective measures to help Finnish manufacturing enterprises. At the same time, the study also helped employees who were laid off find new chances in professional and socially responsible ways, which showed that the study was not only about leader orientation.

However, there were many limitations in this study. First of all, the research focus concentrated on the layoff of employee too much, other fields of human resource management were not involved (Korman & Mujtaba, 2020). The action of leadership on human resource management also included the recruitment of employees, but the scholars ignored this focus. More depressingly, the case of American companies could not be utilized in other cases. For these companies suffered the worse strike by the epidemic, their leaders had to take extreme actions to deal with the difficulty, which was not suitable for other cases.

Concerning the limitations of the study of Korman and Mujtaba (2020), the research should enlarge the scope of leadership and show a broader perspective of leadership actions. Although the limitation of the study was obvious, the value of this study was impressive. To start with, the combination of the statistical analysis and the supporting analysis was clear, which offered models for analyzing employee management in Finnish manufacturing enterprises. What's more, the scholars did a comparison and contrast of

company situations to show the effectiveness of the leader's action, which also gave specific research methods to the research.

Kerrissey and Edmondson (2020) gave a general description of effective actions by good leaders. They took the CEO of the NBA's action as the case and suggested that leaders could do various actions during the epidemic time, including action with urgency, communication with transparency, response to the public, and participation in daily updating (Kerrissey & Edmondson, 2020). After the outbreak of the pandemic, the leader of the NBA did a decision on pandemic control first, the audience could not enter the court and the players were under centralized management (Kerrissey & Edmondson, 2020). At the same time, a series of media conferences were launched to respond to the public and convey the player's voice (Kerrissey & Edmondson, 2020).

This study on the NBA leader's action presented a clear action plan step by step, which showed a good example of crisis management for the Finnish manufacturing business, especially the action of pandemic control, which showed the leader's specific action with urgency. Moreover, there was a contrast between the NBA leader's actions and other leaders, which presented different results of the different actions. By doing these comparisons and contrasts, the urgency of pandemic control could be shown. However, the study had its limitations. Firstly, the research objective was to focus on the sports industry. A sports league was not a general type of company. Therefore, the extensive deployment of these actions was limited, which had little meaning to the research of the Finnish manufacturing enterprises. In addition, the study contained too much description of the contents of the leader's actions and the praise of these actions, which showed the subjectivity of the study.

The study had value to similar research and offered a sample to analyze the problem of crisis management, especially the problem of pandemic control. What's more, there were lots of quotations from the different groups, which could enrich the references and resources. A more direct citations could be adopted when the research on the Finnish

manufacturing enterprises was made. At the same time, the main perspective of the study was from the leaders, which occupied much content of the study. It was helpful to do the focus orientation in the analysis of the Finnish manufacturing enterprises.
Moss (2020) pointed out that the leaders of the companies began to consider sustainability from the aspects of supply structure regulation, technology innovation, and market orientation. The leaders of the companies held the meetings to adjust their commercial goals because the stakeholder had changed under the influence of the epidemic (Moss, 2020).

The study by Moss (2020) presented the action of leadership on the sustainable development of the company. The research perspective was comprehensive, and many aspects of the development were involved. In this situation, the function of the leader's action on the company's development could be seen more clearly. Moreover, the study used the case of Unilever and introduced the specific actions made by the company to achieve new development during the epidemic, which made the study more detailed and reliable.

However, the study had limitations, the content of the study was too short to get further understanding. The scholar outlined the leader's action but further discussion was not provided. At the same time, there was too much information on the specific methods of leadership, and the impact of these actions was not discussed in this study. Therefore, in the research on Finnish manufacturing enterprises, the research should pay more attention to the sustainable development of the manufacturing industry involved in the study of Moss (2020). From this aspect, it was consistent with the aim of the research.

2.2.2 The Impact of Digital Leadership under the Covid-19

The impact of digital leadership under Covid-19 is a helper to elaborate the significant of digital leadership and what these enterprises can obtain through a digital transformation under such circumstances. Antonopoulou et al. (2021) studied digital leadership by

senate members at three Greek universities in the context of Covid-19 and explored the role and impact of digital leadership in the global pandemic. Apart from that, Damayanti and Mirfani, (2021) researched the digital leadership transformation in education in Indonesia. Digital leadership had become increasingly important in the past three years due to the impact of the pandemic.

The global pandemic had been making remote management and working from home more common and frequent, which was putting leaders' skills for digital leadership to the test. Digital transformation was the future for all businesses, regardless of size or industry. Covid-19 accelerated this trend and made digital management a necessity. Because of the alignment of corporate goals and the use of new digital tools, every leader needed to promote the integration of corporate management models with this digitalization (Antonopoulou et al., 2021). Therefore, leaders must have digital leadership skills, such as efficient collaboration with the team in a digital environment, and timely adoption of appropriate management strategies and digital tools for new strategic planning or strategic adjustment in the face of the impact of the epidemic (Antonopoulou et al., 2021).

Research showed that the correlation between digital leadership and leadership outcomes was positive in the context of the pandemic (Antonopoulou et al., 2021). A high level of digital leadership execution led to high levels of performance and satisfaction. Experiments showed that in addition to digital skills, social media, apps and digital tools were all fairly important (Damayanti & Mirfani, 2021). Therefore, the results of the study indicated that a significant proportion of informants attached more importance to the use of cloud computing and big data during the impact of the epidemic (Antonopoulou et al., 2021).

The more digital technologies a company employed, the stronger its digital leadership would be, and the better able it would be to cope with the uncertainties and changes brought about by the pandemic.

A good digital leader was ready for changes and had the digital skills necessary to perform effectively during the pandemic (Damayanti & Mirfani, 2021). In addition, a person with sufficient digital skills and digital leadership was more likely to identify and seize the fleeting opportunities during the pandemic to lead the business to a better future.

Damayanti and Mirfani (2021) elaborated on the knowledge related to the research topic in the literature review section with clear thinking. What's more, a succinct and clear flowchart of the research methodology was represented, which introduced the way authors collected and analyzed the data. In addition, the results and discussion section showed the experiment results and analyzed them in detail. Antonopoulou et al. (2021) also used a large number of bar charts, tables, and pie charts to present the data, analyzing each chart and finally summarizing the results in a clear way. Apart from that, some recommendations were given in the conclusion part, which was helpful to the application of the skills for digital leadership in many fields.

However, in the research of Damayanti and Mirfani (2021), the elaboration of the relationship between digital leadership and the global pandemic was not profound enough. If the connection could be reinforced in the conclusion section, the study would be more relevant to the topic and title. Furthermore, the research was based on the field of education in Greek and Indonesia, which was different from the manufacturing field. Even though Antonopoulou et al. (2021) believed the results were representative and had implications across multiple industries, biases were still inevitable.

Even if there were many limitations and deficits, the studies of Antonopoulou et al. (2021) and Damayanti and Mirfani (2021) were also helpful to complete this research. First of all, the research topic of Antonopoulou et al. (2021) and Damayanti and Mirfani (2021) was the joint application of traditional leadership and digital leadership in the field of education in the epidemic era. Therefore, it was helpful for this research to study the

impact of digital leadership by Finnish enterprises under the influence of the global pandemic and what role digital leadership played in this context.

In addition, a large number of experimental data could also provide a research base for this study. The data showed what happened in different situations with different digital skills and leadership styles, which were the same across a wide range of industries. As a result, these detailed experimental data could provide a solid empirical basis for predicting and studying how Finnish enterprises used digital leadership and the impact that digital leadership would bring.

Apart from that, the researchers analyzed the application of different digital skills and tools. These skills and tools were the same in different industries. Especially in the context of the global pandemic, the need for these skills and tools had been increasing constantly. Therefore, the detailed elaboration and analysis of skills and tools for digital leadership also helped to study the skills and tools used in the process of enterprise digital transformation of Finnish enterprises. At last, the recommendations are given by Antonopoulou et al. (2021) also provided a direction for the researcher to study the perfection and future development of digital leadership in Finnish enterprises. Antonopoulou et al. (2021) recommended incorporating digital leadership into academic environments and mindsets, constantly seeking out the latest digital tools and technologies, and participating in high-quality training programs to continuously improve leadership skills. The advice could also be applied to Finnish companies in the high-tech sector.

2.2.3 The Role of Digital Leadership

Understanding the role of digital leadership is beneficial to know the importance of digital leadership in enterprises. Temelkova (2018) discussed the importance of digital leadership. In addition, Abbu et al. (2020) differentiated the digitalized organization from

the digitalized organization and researched how digitalized organizations completed digital transformation within enterprises.

With the development of technology, more and more jobs would be different. Therefore, individuals should develop their skills and competencies to adapt to the work environment based on Industry 4.0, and enterprises should focus on nourishing managers' digital leadership. The need for digital leaders was increasing. According to statistics, the EU would need to train about 50,000 professionals with high-tech environmental leadership skills every year from 2018 to 2025 (Temelkova, 2018). In total, Europe needed to develop 400,000 digital leaders in eight years (Temelkova, 2018).

The global economy had increased the speed and intensity of technological change, so leaders in the digital environment needed to be more comprehensive. In the digital environment, digital leaders needed to be able to create new business models and tools and use them to manage opportunities and resources to create maximum value based on new economic concepts (Abbu et al., 2020). People with digital leadership skills were needed at every level of business organizations and economies.

The success of corporate strategy and development depended not only on strategic management but also on middle management (Temelkova, 2018). Therefore, leaders with vision and innovation potential, creative thinking, and knowledge of how to optimize human and physical resource management models were especially valuable in the digital environment (Temelkova, 2018). Due to the changes brought about by the fourth Industrial Revolution, today's economic environment required leaders who could manage teams and plan businesses in a global digital environment (Temelkova, 2018). In the coming years, economic activity would increasingly shift to cyberspace, increasing the need for digital leaders.

In the digital environment, the technology and innovation ability of the leader was directly related to the strategy formulation and business development of the enterprise.

In addition, the rapid development of high-tech fields, such as biotechnology and nanotechnology, the fierce competition for industrial products, and the changing market environment had raised the requirements for leaders (Abbu et al., 2020). Leaders needed not only expertise in digital technology, but also the ability to work in a dynamic environment and motivate team members in different locations to work effectively through the network (Temelkova, 2018).

According to Temelkova (2018) and Abbu et al. (2020), there is a shortage of digital leaders in the context of the digital economy because the economic environment continued to shift to cyberspace, and trends in high-tech industries and markets were intensifying the need for digital leaders.

Temelkova (2018) introduced the role of digital leadership in the digital economy and then narrowed the significance down to high-tech territory. In addition, Temelkova (2018) described the role of digital leadership played in the management model and business development of enterprises, which was beneficial to this research. Apart from that, a great deal of secondary data was presented to prove the point of view and provide authenticity.

However, there were limitations in this study. First of all, the research objective of these two studies was too general. Temelkova (2018) took the whole industry of high technology, which drew a whole picture of the deployment of digitalization, but did not do the specific case study of a company. The study ignored the description of the high-technology company so useful suggestions could not be provided. There was too much information on the importance of digital leadership, but the deployment of digital leadership was poorly studied.

Moreover, in the research of Abbu et al. (2020), the analysis of importance focused on the whole economy and did not consider the company factors. Secondly, there were a lot of limitations to using the methodology of secondary research. When the scholar

used secondary research, the data collection was not conducted by the researcher, it was not personally touched. The existing data in the database and recorded in his study were lacking uniqueness, accuracy, and relevance because the digital world was full of changes. Some data collected in his study were out of time. In particular, the data during the epidemic time was naturally missing due to time-limited. In this situation, the study of Temelkova (2018) had little help in the analysis of the digital leadership of manufacturing companies during the epidemic time.

Although there were many limitations in the studies of Temelkova (2018) and Abbu et al. (2020), they could provide referential value for the research on the study of Finnish companies. First of all, the research objective and field of Temelkova (2018) had a close relationship with the industries this research chose. Environmentally friendly materials and elevator manufacturing could both be considered high-tech industries. To be more specific, these businesses had similarities in human resource management, business strategy-making, and the acquisition of digital leadership. In this situation, the study of Temelkova (2018) on digital leadership in the high-tech field could have referential meaning to the research.

In addition, Abbu et al. (2020) provided the research with a more general perspective to view digital leadership because the research samples included more than 500 companies in a few countries. Secondly, the study outlined the knowledge and skills for digital leadership that leaders should acquire for optimal management. It provided professional suggestions in the related field, which was beneficial to this research. Digital leadership was a natural part of the high technology industry, and more studies on this field could improve the digital leadership of Finnish manufacturing companies professionally.

Thirdly, the study of Temelkova (2018) adopted a perspective on the whole industry, which was beneficial to the research on many Finnish companies in this field. The study emphasized the importance of digital leadership in the high technology industry, which would have an inspiring function on the development of the whole industry. In the

research, the researcher could adopt a similar perspective, not only analyzing the digital leadership of the companies but also paying attention to the whole development of environmentally friendly materials and elevator manufacturing. At the same time, there was not a close combination of general perspective and specific perspective, the researcher could treat it with caution in the research on Finnish manufacturing enterprises.

2.3 Digitalization After the Pandemic

Digitalization meant 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 (Brennen & Kreiss, 2016). Digitalization had changed the traditional commercial operating style, and it is close to the development of the Internet and technology. Under the influence of the pandemic, the implementation of digitalization in business was very impressive.

2.3.1 Digital Innovation within the Corporations

Digitalization is an unstoppable way to innovate a wide range of areas in products and services (Yoo et al., 2010). International companies have gradually made adjustments to achieve digital innovation.

Some authors perceived that institutional digitalization was the fundamental part of companies including the organizational form, infrastructure, and building process (Hinings et al., 2018). Other authors have dug into the method to motivate digital innovation within companies by collaborating with start-ups since these companies were capable of catching up with the digital trend and jumping on the wagon boldly (Islam et al., 2016). Islam and other authors hold the belief that if grown-up corporations could learn from small companies in the process of innovation, they could make big progress.

It emphasized the transformation of modernity within companies by learning the flexible and innovative management in the start-ups and there were already examples that corporations showed interest in this collaboration. For example, BMW Startup Garage was a threshold for start-ups, which could influence BMW's innovation (BMW, 2022).

With the reference to other big companies, Finnish manufacturing enterprises could gain a lot of experience from Islam's research like broadening the cooperative programs to stimulate corporal digitalization. Under the rapid pace of technology and information, Finnish manufacturing enterprises have to minimize the impacts of Covid-19 on future development, get rid of the swamp of innovation, and maintain their leading position in Finland. Hence, Islam's research could provide a different perspective for companies to achieve digital transformation and more importantly gain more revenue through innovation.

However, there were some drawbacks to Islam's research as well. The data applied in the paper was too subjective for the reason that the researchers conducted interviews with the employees about their attitudes to cooperating with the newly-established firms. Although there was a large amount of data to verify the effectiveness of the result, informants' attitudes may change as people were easily influenced by outside information. Meanwhile, the research was too interpretative under the restriction of interviews. If other researchers did a similar investigation, there may be different interpretations of the interviews. Thus, these negative aspects should be avoided in later research.

Except for the specific way of cooperation to assist organizations in achieving digitalization, there are other ways to innovate digitalization. Some authors proposed digital acquisitions and mergers to realize digital transformation and innovation within a company and analyzed the feasibility of this method combined with the performance of the automotive industry (Hanelt et al., 2020).

In the development of the information age, digital technology was an important way to produce innovative products and maintain the market position, especially during the period of the pandemic. Hanelt and other authors believed that one of the most direct measures was to acquire or merge digital technology companies that could facilitate the process of transformation (Hanelt et al., 2020). The results in the automobile industry proved that digital acquisitions and mergers could help enterprises improve data management, promote enterprise digital innovation and ultimately affect enterprise performance.

On the one hand, Hanelt's paper was conducive to studying mergers and acquisition information under the background of rapid information development, which was different from other mergers and acquisitions. On the other hand, their paper offered new ideas on how to turn data knowledge into products that would create profits for companies, which was what the Finnish manufacturing enterprises desperately needed.

Although the Finish manufacturing industry has made considerable achievements in its respective areas of expertise, it would like to achieve sustainable development through digital innovation under the continuing impact of the epidemic. It was necessary to innovate products and broaden sales channels with the help of digitization. Digital innovation was something every company required, so the industry could get new inspiration from their research. However, their paper also has some imperfections. Firstly, the scope of the study is limited to the automobile industry, so the suitability of other industries needs to be further studied. Secondly, the author's standard for innovation restrained the number of patents of a company, but innovative ideas often come from individuals. Therefore, further studies on digital innovation and mergers and acquisitions should put more effort into more specific factors that will affect digital innovation.

The above literature mainly reviewed how enterprises realized digital innovation, but the exact impacts of digitalization have not been justified. To strengthen the influence of

digitalization on modern enterprises, some authors analyzed and summarized the mediating effect of digital innovation (Khin & Ho, 2019). Khin and Ho's paper utilized the data from Malaysian IT companies to verify the impact of digitalization on enterprise performance and showed that digital capability was directly proportional to the enterprise's performance as well as other management changes (Khin & Ho, 2019). Their thesis explained how the use of specific digital technologies such as artificial intelligence and the Internet of things innovated products and services and filled the gap between the growth of companies and digital technologies.

It provided a good reference for Finnish manufacturing enterprises in digital innovation. For one thing, these companies can be guided by technological innovation to ensure that the company has strong technical support, which is also conducive to promoting changes in other aspects of the company. For another, their paper also stresses the need to strengthen the ability to control digital technology, which will require the leadership of the Finnish manufacturing enterprises to keep up with the changing times and guarantee that decisions are to achieve product upgrades. At the same time, the rapid decision of the leadership means quickly mobilizing the company's resources and technology and facilitating the innovation process. As a result, their paper provided a more comprehensive analysis of how companies could seize opportunities to expand their business.

Even if their paper contained the analysis of leaders, it had some limitations. Their paper only focuses on digital ability and guiding, leaving other digital-related aspects not addressed. For example, corporate background and technological culture have a strong impact on digital innovation. Moreover, it concentrates on the analysis of the IT industry, which has little industry relevance for manufacturing.

In general, the major literature above affirmed the centrality of digital innovation, and the first two also proposed specific ways to realize technological innovation while the last one mentioned the impact of digitalization and leaders on enterprise productivity.

They have certain guiding significance for this article, but at the same time the shortcomings should be notified and this paper will provide guidance for the subsequent research.

2.3.2 The Application of Digital Imperatives

The imperatives of digitalization have been proved in the application of modern enterprises since more and more enterprises are strengthening digital technologies like the use of big data. Within the scope of the pandemic, international companies could take advantage of digitalization to promote sales and gain more revenue. Research showed that global digital platforms could expand the reach of companies and enable customers around the world to learn more about their products faster and better (Acs et al., 2021). Most importantly, it could overcome barriers to trade between countries at a low cost.

However, some authors also put forward critical thinking on a digital platform, indicating some problems and risks that traditional enterprises may have when adopting the digital platform (Smirnov & Lukyanov, 2020). In the process of digital transformation, most enterprises would exaggerate the importance of digital platforms and invest a lot of money in the establishment of research and development databases as well as innovation, which would increase the cost before entering the market. Digital construction could pave the way for companies to grow, but it did not mean that every company was able to directly dig into it. For the sustainable development of the company, leaders should take a long-term view of digital transformation.

Smirnov and Lukyanov's paper provides a good warning for Finnish manufacturing enterprises that reasonable planning must be done before fully achieving digital transformation to ensure that the company can get the maximum benefits from it, especially under the influence of Covid-19.

In addition, leadership of international companies may have a different understanding of digital transformation, which determines the different degrees of transformation in these companies. The new perspective of global digital platforms will help this paper analyze the influence of digitalization critically. Although Smirnov and Lukyanov's article analyzes digital platforms from different aspects, digitalization is indispensable for Finnish manufacturing enterprises.

Moreover, one drawback of their paper is that companies with asset-light models face significant cost pressures because they have less capital to invest (Varadarajan et al., 2021). The manufacturing industry with a large investment will not face much stress from cost, but the problems mentioned in their paper are also worth paying attention to.

Digitization promotes the transformation of enterprises and will spawn the digital economy as well (Bukht & Heeks, 2017). The imperative of a digital economy is inevitable as most industries are already digitalized (Schreckling & Steiger, 2016). Some authors summarized trends in the digital economy and corresponding transformation approaches, which could provide a methodological basis for the enterprises' development and transformation (Usanov & Usanov, 2021).

With the development of globalization, the traditional management model no longer met people's needs. Usanov combined the viewpoints of previous scholars and put forward the concept of business transformation and general management methods including the forms, principles, and business management of business transformation. Thus, Finnish manufacturing enterprises can get basic and theoretical knowledge from their research, providing guidelines for their adjustment to digitalization.

With the support of technical and theoretical knowledge, it will save the companies a lot of detours. The companies will not only strengthen the digitization process but also urge the company's management level reform by following per under Usanov's

recommendations and methods. Thus, this paper can get some inspiration from it considering business transformation.

The article by Usanov and Usanov (2021) gave a detailed description of the basic knowledge of digital transformation-related management theories and methods. It also provided basic principles and methodological foundations for the digital transformation of enterprises. However, the content of the whole article only stayed at the theoretical level and did not give a detailed description of the application of these methods in combination with actual cases.

Moreover, this article did not study the basic elements and specific transformation processes and steps required for digital transformation, but these two parts are indispensable parts of enterprise digital transformation. Leadership is an indispensable element in enterprise digital transformation management. This research mainly focuses on digital leadership under the needs of digital transformation. In this way, the study of Usanov and Usanov (2021) can be supplemented on the one hand, and on the other hand, it can help to explore the specific steps of digital transformation using digital imperatives based on specific leadership elements.

Regarding the digital imperative, Frankiewicz and Premuzic (2020) put forward a different view. It was well recognized that the most important way to achieve digital transformation was to continuously improve the technology level. However, the argument in this literature is that the essential ingredient to achieve digital transformation is not technology but talent. Frankiewicz and Premuzic (2020) pointed out that the training of employee skills at the leadership level is the key to satisfying the digital imperative. During digital transformation, leaders should invest in employees who can maximize the value of technology, not in technology. The literature also pointed out that digital transformation should be top-down, that is, digital transformation should start from the leadership level (Frankiewicz & Premuzic, 2020). The basic elements of applying the digital imperative were also described in this document. The insights of this

literature demonstrate the relevance of digital leadership to digital transformation and underpin the digital leadership theme of this study.

Although this literature mentioned the necessity of the digital imperative and the key elements to achieve digital transformation after the outbreak of Covid-19 the research of Frankiewicz and Premuzic (2020) still has certain limitations. Although this literature emphasized the role of talents in digital transformation, it focused more on describing the development of employees' skills in using digital technologies and the exemplary role that leaders play to employees in the process of digital transformation. They did not specifically describe how leaders can apply the digital imperative to better enable the company's digital transformation.

In addition to this limitation, although they mentioned the need to achieve digitalization from the leadership level, they did not describe the specific formation process of digital leadership and its specific role in digital transformation. In general, the research of Frankiewicz and Premuzic (2020) was aimed at the specific element of talent in digital transformation, but it did not combine leadership response, digital leadership, and digital imperative well. This research will combine these three points and study deeper based on their viewpoints of them.

To sum up, after discussing the literature on leadership and digitization, the research fully understood the enterprise management of Finnish local companies. In addition, after understanding the importance and practice style of leadership in enterprise management, the research can provide a certain theoretical basis when analyzing the leadership responsibilities of the Finnish manufacturing enterprises. In the face of the pandemic, the leaders of companies or enterprises in various countries had made effective actions to deal with it. Therefore, exploring the action of leadership after the Covid-19 outbreak can help this research provide effective information in making suggestions for leadership responses to Finnish manufacturing enterprises.

In addition, due to the epidemic, digital leadership had become one of the main implementation measures of an unstoppable leadership response. To better understand the efforts made by these companies in digital leadership, the research consulted a large number of documents to explore the role of digital leadership in leadership responses and enterprise management, and the way digital relationships affect the management and business development of companies in the context of the epidemic. In addition, exploring how enterprises and companies were affected by the epidemic to innovate digital leadership and how to apply the digital impact can help the research better analyze the future development of digital leadership by Finnish manufacturing enterprises.

3 Methodology

To better analyze and discuss the response and influence of the leadership responses to covid-19, and the way digital leadership carries out enterprise digital transformation and promotes digital innovation, this research used the method of the interview to collect the primary data of leaders from different departments of Finnish companies. This section will provide the justifications for using a specific research technique, both the method itself and the philosophical underpinnings of the method.

3.1 Research Approach

This part mainly introduces the research philosophy and research methods. In terms of research philosophy, this research mainly uses interpretivism, and the main research method used is semi-structured interviews.

3.1.1 Research Philosophy

A set of attitudes and presumptions regarding the advancement of knowledge is known as research philosophy (Saunders et al., 2012). The foundation of any reliable research philosophy is a collection of well-thought-out, unchanging presumptions. It will direct, facilitate, and even determine the selection of research methodologies, research plans, data gathering and analysis techniques, and other research-related decisions (Saunders et al., 2012).

There are many research philosophies, including positivism, interpretivism, post-positivism, and so on (Saunders et al., 2012). Positivism, which emphasizes that the findings of a study may be confirmed by observation, experiment, mathematics, and logical proof, is typically suitable for quantitative research (Saunders et al., 2012). Due to its emphasis on the fact that study content can be transferred through language,

cognition, and experience and is therefore subjective rather than objective, interpretivism is typically used in qualitative research. Although post-positivism and positivism are both grounded in practice, post-positivism emphasizes that our observations are not always reliable. Consequently, post-positivism can be used in both qualitative and quantitative research (Saunders et al., 2012).

In this research, the philosophy adopted is interpretivism. Finding patterns is not the key to understanding a person's behavior. Putting yourself in the other person's position and comprehending why he/she acts the way he/she does and what that cultural approach entails is better than judging other civilizations according to predetermined norms. This research explores the leadership response and future digital leadership under the impact of covid-19. Through the survey, the researcher learned about the ideas of participants and explained their behavior and viewpoints based on corresponding theories. It makes interpretivism the most suitable research philosophy for this research.

3.1.2 Research method

Numerous methodological benefits of quantitative research include the ability to examine a large number of samples, the use of quantifiable and generalized models and frameworks, and the emphasis on the overall situation (Saunders et al., 2012). A topic or group can be thoroughly investigated using qualitative research methodologies, which can also collect intangible structural factors and evaluate the interactions between several factors rather than just one variable's outcomes. Instead of emphasizing volume, qualitative research gathers data while focusing on the richness of words and language (Saunders et al., 2012).

For research focusing on the quality and depth of data within the interpretivism theoretical paradigm, qualitative research is the appropriate research approach. This research aims to explain and describe the findings from the literature review and surveys with certain explanations. In addition, this research aims to explore questions related to

the behavior, motivation, and other subjective attitudes of target people. In general, qualitative research is the most appropriate research method for this research. This study adopted the interview method. The interview method is a common method of qualitative research (QuestionPro, 2021).

When using this method, the interviewer can have a face-to-face conversation with the research object by asking some open questions related to the research theme, to deepen the understanding of the research object and the research theme. This method can help researchers obtain more reliable primary data and information. Interview methods are mainly divided into structured interviews, semi-structured interviews, and unstructured interviews. The interview method chosen for this study was a semi-structured interview. In this interview method, the main questions and framework of the interview need to be determined in advance. During the interview process, the interviewer can make certain improvements to the originally set questions or raise new related questions based on the research framework. The focus of the interview method is to collect the opinions of the informants, so in the design of the interview questions, the interviewer should preferably design open questions related to the research topic (Young et al., 2018).

The main purpose of this study is to explore the role of leaders and the application of digitalization in crises like Covid-19. Based on the interview research, this paper summarized digital responses and measures of some international companies. To achieve this research purpose, researchers need to collect reliable qualitative data. Therefore, the setting of interview questions needs to have a fixed and comparable framework.

In addition, this research is mainly based on several different companies, so the identities, positions, and backgrounds of the informants are not fixed. Therefore, flexibility is needed during interviews. Based on these two considerations, the semi-structured interview is more suitable for this study, because the semi-structured

interview can not only ensure the certainty of interview questions but also have some flexibility during the interview (Galletta, 2013). In addition, semi-structured interview questions can be prepared in advance, which can provide more time for the preparation and analysis of the study (QuestionPro, 2021). Moreover, the researcher can express the interview questions in the form that the informant prefers during the interview process so that the informant is more willing to express real thoughts, and the collected data will be more reliable and authentic (QuestionPro, 2021).

3.2 Research design

The research design mainly includes interview question design, interview process description, and interview data collection.

3.2.1 Interview Design

Concerning the topics of this research that are closely related to leadership, interviews are primarily directed toward leadership. The purpose of using semi-structured interviews is closely related to the research topic. The first purpose is to understand the specific response of the leadership of Finnish companies in the face of a crisis event such as Covid-19 which has a huge negative impact on the normal operation of the company and the significance of leadership management. The second purpose is to figure out how the company's leadership manages these companies through remote operations in the context of the epidemic and whether digital leadership can help with the digital transformation within the company. The ultimate goal of the interview is to study the role of leadership responses in crisis events and the significance of digital leadership in the future by analyzing relevant information collected from the two companies.

This section will detail the procedure of the interview. The first is the selection of informants. The researchers will select eight company leaders who have worked for

many years in various industries such as manufacturing, IT, energy, and medical care as informants. The eight informants include four male and four female informants selected should be around the age of 40 to ensure they have sufficient knowledge of their industry or company. In terms of interview form, this study developed two interview forms, one is the telephone interview and the other is the online video interview. Each informant can choose any one of the two methods according to personal preference. During the interview, the investigator will use the transcription method.

When conducting a telephone interview, the researcher recorded the whole process after obtaining the consent of the informant, to facilitate the subsequent sorting and analysis of the informant's responses. The video interview was conducted on the ZOOM platform. Similarly, with the consent of the informant, the researcher recorded and saved the whole process of the interview. Finally, when sorting out the materials, the researchers use tools to convert the audio or video recorded in the future into text form. Each interview lasts approximately one hour. Before conducting the interview, 20 open questions related to the research purpose were designed and relevant informants were invited.

3.2.2 Interview Questions

The interview questions are shown in Tables 3&4 in appendix 3&4. The designed interview questions are extended research questions. For instance, to examine the role of corporate leadership responses during the Covid-19 pandemic, the question "How did your company's leadership react during the pandemic?" was designed. During the whole research process, a total of two questions were designed. Questions designed the first time were too large and not focused enough. Informants may find it difficult to answer or give broad answers.

In addition, the first designed questions were relatively weakly linked. Therefore, when the interviews were summarised and analyzed, it is noted that the association between

different interviewers was relatively small. After the first unsatisfactory interview, new interview questions were devised. The new questions are more closely related, and the scope of the questions is narrowed. The second 20 questions follow the logic from simple to deep, so as to dig out the thoughts of the informant step by step.

3.2.3 Data collection

Two rounds of interviews were conducted for this study, each with four leadership employees from manufacturing companies, using different questions. The identity of the informant, the method of contacting the informant, the method of being interviewed, the number of employees led by each informant, and the answers to the interview questions are listed in the following two tables, of which Table 1 (appendix 1) is the information of the first round of interviews, Table 2 (appendix 2) is the relevant information of the second round of interviews.

In the two rounds of interviews, the people who were interviewed were not the same. Two rounds of interviews were conducted to ensure the accuracy of the collected data on the one hand and to enrich the collected data on the other. During the data collection process, each informant's responses were recorded. After the interview, the transcripts of the recordings were aggregated and categorized. For example, when classifying, the informants' answers to the same question were put together to extract the core point of view, and after comparison, all the answers were combined into a comprehensive and concise view. By summarizing, in addition to the basic company and personal position information, the informants' answers on digital leadership and company digital transformation are summarized in the following aspects: self-confidence in digital transformation, improvement of work efficiency, improvement of employee capabilities, self-efficacy, self-sufficiency, and problem-solving skills of employees supported by digital technology.

3.3 Ethical Consideration

Since the method of this research is through literature review and survey, both primary data and secondary data are acquired through this method tool. There is various ethical consideration that should be concerned during the survey.

From the perspective of primary data ethical consideration, since the research incorporates various cultures, it is necessary to determine whether the researcher's moral background, perspective on the subject, and standard of values are appropriate.

Secondly, it is significant to provide informed consent for all participants in the interview to ensure their right to know and to decide. In this consent, the study's goals and the assistance they will require are explained. The participant must permit the researcher to gather their data. The participant's ability to terminate the interview at any moment should also be made clear. Their answers won't be used in the dissertation if they withdraw their consent.

Thirdly, private information from the participant must not be included in the interview questions when conducting the research. A code name or number may be used by informants. Privacy-invading questions shouldn't be included in the form.

From the perspective of collecting the secondary data, the research and studies that are applied in the literature review must be from legal approaches. The citation of the resources should be allowed and authorized.

3.4 Limitations

Firstly, the data collection period is long. The method of both literature review and semi-structured survey cost time easily. On the one hand, the informants' opinions may

change over a long period of time. On the other hand, it may impact the quality of the research since the amount of work required by researchers is excessive.

Secondly, the researcher may impact the results of the research because of the research method of qualitative research. The research's evaluation and summary of the literature served as the foundation for this research. All conclusions are based on individual judgments even though the analysis procedure tries to be as objective as possible. The data collected from the research may exist bias.

Thirdly, the different cultural backgrounds between the researchers and the informants may impact the results of the research. Because of the cultural background or preconceived notions of particular occurrences, the researcher may have biases that compromise the objectivity of the work. Additionally, the researcher could have a prejudice against information and findings that don't concur with expected theories or arguments. The authors of the research should examine whether the questions were presented and whether the data collection method was carried out properly in order to avoid these issues.

4 Findings

In this section, some useful information is summarized from the interview documents. Six points are found regarding informants' answers on digital leadership and company digital transformation.

4.1 Self-Confidence in Handling a Digital Leadership and Transformation

The majority of informants said they were confident in their ability to make the digital transformation.

"I believe I can improve my digital leadership through continuous learning."

In addition, they all agreed that digital leadership played an important role in company management, especially during the impacts caused by the global pandemic. Half of the informants indicated that:
"We had to choose digital transformation and digital leadership because of the pandemic, but we had begun digital transformation before the pandemic."

The first type of informants' confidence in digital leadership mainly came from their confidence in their own abilities, while the second type of informants' confidence came from their already possessed experience and relatively mature transformation planning system. One informant of the second type said that digital transformation was the foundation of digital leadership, and digital leadership can promote the further development of digital transformation. They all believed that they were quick to master the new digital technologies and tools necessary in the process of management and can quickly apply these technologies and tools to the management of the company. However, two informants said that "they did not learn how to utilize digital skills and digital tools systematically".

All informants said employees were receptive to digital office tools, and some were happy to save on commuting costs. However, two informants said employees were reluctant to telecommute. The first informant said:
“Telecommuting with digital tools did not reduce employees' pay, but some employees left because of boredom and lack of incentives”.

In addition, some young employees felt anxious and lonely about having to work from home without going out, which had a certain impact on their psychology. Furthermore, some employees showed resistance to using some digital tools. Both of these factors contributed to the increase in turnover rates at both informants' companies during the telecommuting period. Still, they said they would continue to make the digital transformation and they were confident that future employees would embrace it. This is because they can alternate or combine telecommuting and offline work when they return to normal work.

4.2 Work Efficiency Improvement by Digital Transformation

The majority of informants believed that adopting digital technology can reduce their workload and save costs. Half of the informants specifically cited telecommuting as more productive. Instead of wasting time on the way to each client's office, they can talk to them directly through online meetings.

However, one informant said, “face-to-face meetings were better when it came to negotiating with new clients”.

“We would consciously develop employees' ability to use digital technology and digital tools. We improved our employees' digital skills by reducing their workload and giving them more time to study and assigning them to coaches.”

The results showed that the majority of the informant employees were more productive. However, some employees' workloads had increased because technical problems with digital tools had interrupted their work, causing them to spend time fixing problems. One informant said that when he conducted a survey in his company, most employees said that they wanted to receive more systematic digital skills training to avoid spending more energy on learning by themselves or solving technical problems that were beyond their abilities. Apart from that, all informants reported experiencing frustration and stress during the digital transformation process. Especially during the pandemic, their inability to help telecommuting employees with difficult technical issues and employees leaving due to the company's digital transformation were major causes of frustration and stress.

4.3 Development Opportunities to Enhance the Overall Capabilities of Employees

Of all the informants interviewed who responded to question 5: Does digital transformation help employees, they all agreed that

“The digital office approach is largely empowering for employees.”

This can be found in all the participant videos, for example, the first informant is a product manager of a mobile application, which mentions in the interview that the most direct help is the improvement of employees' office equipment and employees' self-management skills. The majority of informants said that digital transformation was implemented “without advance notice” and that management needed to train a portion of the workforce in relevant skills, such as the issuance and use of IT tools. Almost all informants said that “training for team-related skills in an epidemic situation is necessary”, not only for the work to run smoothly but also as one of the ways to improve the overall capabilities of employees.

With regard to the third question, the impact of the outbreak on the company, the first informant said:

"The management team needs to give some technical support to employees when implementing telecommuting and such technical support is able to promote the efficiency of the team".

Generally speaking, there are two aspects of training that a company can provide to its employees under online working conditions. On the one hand, some procedural skills training is very necessary, this type of training is usually to meet the daily work needs of employees to ensure that the work is carried out properly, such as online meetings, workflow progress clarification, etc. In addition, some additional training can develop skills outside of work, which may meet the needs of the employee's own interests and strengths. Such training opportunities are provided to employees as a motivation for their work and to meet their needs for diversified development plans.

In addition, considering the differences in learning ability and expertise of different employees, leaders in the digital context also need to monitor the learning progress and mastery of different employees, which is also an important way to improve the efficiency of the whole team. Informant 2, a service manager at an IT company, in response to question 19, which describes the relationship between digital leadership and a company's digital transformation, mentioned that:

"My team was experiencing employee turnover in the online context because the mastery of this work skill challenged some people, and the normal work order could not be carried out without their mastery of this skill, which led to their loss of confidence in their work."

4.4 Technology and Equipment Support Enhances Employee Self-Efficacy

For most leaders, surviving the period of digital technology training for employees makes the digital transformation a big success. While employee self-efficacy was not mentioned in the interviews. However, when informants answered questions 9 and 10, about the

difference between telecommuting and traditional work during the epidemic, informant 3 who is an accounting manager, and informant 4 who is a manager of a Finnish multinational company indicated that:

“Digital work methods, supported by technology and equipment, met the majority of employees' daily work requirements. That is, employees could use digital means to accomplish their work progress without the presence of a leader.”

This is another way of demonstrating that digital tools can enhance employees' self-efficacy and help them meet their work demands. At the same time, this also facilitates the digital transformation of the entire organization in its daily operations.

For question 10, whether employees have adapted to telecommuting, and question 11, whether employees complain about it, informants said that most employees have now adapted to working online and that they have few complaints about this way of working. On the contrary, the first informant said:

“Because of the nature of the department's business, employees may be more accustomed to the online office format because they all conduct business in different areas, the team members have adapted to the online office format, and they believe it provides employees with more freedom in their schedules.”

In addition to this, the informants all said that “the online office format retains the footprint of the employees' business development and helps them to find work defects”. This is one of the most important ways to improve employee self-efficacy because it allows employees to re-evaluate mistakes to improve performance and allows leaders to visually see their employees' contributions and relevant results. Of course, some younger employees are not comfortable with telecommuting because the telecommuting format makes them more isolated in the work process, which reduces their productivity and discourages them from working.

4.5 Being Self-supporting

Almost every informant mentioned a shift in employee mindset when it comes to digitizing the workplace.

"Many employees are reluctant to take the initiative to ask questions or present their work results when working online. When working online, employees do not need to face any audience, and all work is done independently."

Without the comparison of colleagues and the supervision of leaders, many employees will become unable to keep up with the pace, or even be left behind. Many informants expressed concerns about employee autonomy when comparing the pros and cons of digital versus traditional management.

Four out of six informants said they noticed a lack of autonomy among their employees in the early days of working online. In this situation, the informants who are team leaders have taken corresponding measures. These informants all encouraged their employees to take the initiative, for different reasons. Leaders take the initiative to carry out relevant training content in the digital office and emphasize the initiative of employees during training.

"One of the things leaders typically do is to initiate conversations about the tools or resources employees might need to do their jobs."

Half of the informants also cited employees' reliance on technical support from their leaders as they go digital. It also means that employees lack autonomy and autonomy when they encounter technical problems, and this lack of autonomy can be frustrating for both employees and leaders. This lack of autonomy in technical problem-solving is one of the main changes in the way things work under COVID-19.

Unfamiliarity with digital workplaces can lead to worse employee performance (Paula et al., 2022). All the informants indicated that before the official start of the digital office, leaders carried out relevant training on the acquisition and adaptation of relevant digital resources and tools, but there are still some employees who cannot adapt to the change in work style. These employees need to be encouraged to take responsibility for learning and actively seek out opportunities as well as training and mentoring resources.

4.6 Re-evaluation of working methods and problem solving

There is no doubt that the way employees work in Finnish companies has changed dramatically during the pandemic, and this change has also driven the progress of digital transformation in companies, which was supported by all informants. One of the informants said that her company had already started digital transformation before COVID-19, and because of this, her company faced much fewer difficulties when the epidemic hit. Some of the informants said:

"A very critical shift brought about by the digital office is that many business decisions no longer rely on the opinions of leaders and executives, but rely on digital calculation results."

This can greatly improve the efficiency of decision-making, but it also means that leaders and employees need to rethink the way work is carried out and problems are solved (Looy, 2021). Half of the informants said that they did not change their thinking quickly in the early days of the digital office, which led to some difficulties at work.

"In the digital-driven decision-making process, both leaders and employees need to adapt to new ways of solving problems and jump out of the original thinking frame, and digital leadership plays a guiding role in it. The leadership level must first adapt to the change in the way of working and solving problems, and then it can better encourage and guide the change in the way of thinking of employees."

This is also the foundation of the digital transformation of enterprises. According to the interviews, almost all informants agreed that digital transformation was very important, especially the remote working model that has survived the pandemic, which made it inevitable. They all had confidence in their abilities and the abilities of their employees that they can quickly master digital skills to be more productive.

Apart from that, half of the informants, whose companies had begun digital transformation before the pandemic, already had the experience to do so. However, the two informants had not systematically studied the use of digital technologies and tools and only expressed confidence in their abilities. In addition, the informants indicated that some employees thought the work content was boring and had no work incentive in the process of telecommuting, and showed resistance to telecommuting and some digital tools.

5 Conclusion

In the context of Covid-19, this study explored the development and role of digital leadership in enterprises under digital transformation, as well as the response of digital leadership to the epidemic. This research mainly discusses four issues: the support of digital leadership for digital transformation, the importance of digital leadership and transformation, the development of digital leadership and transformation, and the significance of digital leadership to the digital transformation of manufacturing enterprises.

In terms of the first research question which is related to digital leadership support and implications for digital transformation, it can be concluded that digital leadership has played a great auxiliary role in helping digital transformation to gain the above achievements. It can provide support for digital projects in many aspects, such as pointing the direction, driving change, and providing support for employees (Antonopoulou et al., 2021; Temelkova, 2018).

To answer the second question, analysis and research based on literature review and interview data were conducted. It can be concluded the significance of digital leadership and digitization transformation is that they can promote the progress of enterprises (Usanov & Usanov, 2021). The majority of respondents were confident in the transformation and development of digital leadership. Digital transformation can help improve employee productivity, create more development opportunities for employees, and improve employee self-efficacy through technology and device support (Verleysen et al., 2015; Klus & Müller, 2020). In addition, digital technology plays an important role in the process of digitization. Communication, social networking, content management, collaboration, and data analysis can all benefit from digital technologies.

As far as the significance of digital leadership to the digital transformation of manufacturing enterprises is concerned, digital leaders are capable of developing creative business models that make use of cutting-edge technological advancements

(Abbu et al., 2020). They recognize the market's creativity and velocity and react to it. They plan and carry out organizational transformation at a pace and in a way that was previously unthinkable. They bring various specialties together to create innovative services, markets, operating models, opportunities, and value (Bilgeri et al., 2017). They encourage and motivate IT specialists in the same way that they involve and inspire practitioners in other specialties. They develop, foster, and implement fresh disciplines that help people and businesses add value.

Regarding the development of digital leadership and digital transformation, in the process of digital transformation, how digital leadership affects employees is crucial. According to interviews and literature research, companies can start from the following aspects to cultivate digital leadership and promote the digital transformation of enterprises: (1) developing digital skills of leaders and employees; (2) improving digital training systems; (3) providing opportunities for employees to develop to promote transformation; (4) enhancing employee efficacy through digital means; (5) leaders cultivating self-sufficiency in employees; and (6) leaders rethinking how to solve problems in the digital context.

The significance and methods of the six aspects are as follows:

Work Motivations and Leaders' Digital Skills Improvement

Appropriate work incentives are necessary. In the theory of job motivation, it is very important for leaders to set appropriate goals for employees. An appropriate goal is one that is challenging, clearly set, and can be achieved with the effort of the employee (Aarts, 2019). Such goals are a great way to get employees interested and motivated to get their work done. After achieving the goal, they can also get a sense of accomplishment and satisfaction from it, so as to achieve the effect of self-motivation (Aarts, 2019). In addition, enterprises should provide material incentives and development opportunities to employees in the process of digital transformation.

Through these incentives, employees are encouraged to actively invest in the process of learning new digital technologies, so as to promote the digital transformation of enterprises.

Apart from that, the second suggestion is to improve leaders' own digital skills and literacy. From the literature review section, it can be learned that in a digital environment, digital leaders need to be able to create new business models and tools and use them to manage opportunities and resources to create maximum value based on new economic concepts (Abbu et al., 2020). Therefore, leaders with vision and innovation potential, creative thinking, and knowledge of how to optimize human and material resource management models are especially valuable in the digital environment (Krug et al., 2018).

However, it can be seen from the interview that some leaders only have confidence in their own abilities, but do not carry out systematic learning of digital skills and cultivation of digital literacy, which is also one of the reasons for the increase in employee dismission rate during the digital transformation of enterprises. Therefore, to drive the digital transformation of enterprises, the leaders themselves must first possess considerable digital leadership and digital literacy.

Establishing A Completed Training System

The majority of informants said the use of digital tools and technologies has increased their productivity, but the process of digital transformation in the enterprise can also put additional burdens on employees' work. Therefore, enterprises should establish a sound and perfect digital skills training system to more efficiently cultivate employees' digital skills, so as to truly improve work efficiency.

According to several research findings, the availability of training opportunities and employee stress levels are negatively correlated (Verleysen et al., 2015). More specifically, when employees' needs for competency are met, stress levels are lower and

competence levels are higher because workers are better able to handle the demands of their jobs (Verleysen et al., 2015). Businesses can train their staff to be more competent and less stressed. Instead of attempting to solve technological issues, this enables workers to focus on performing at the top of their game, reducing stress, and getting on with their duties.

In addition, the idea which comes from the interviews tell us that training focuses on enhancing employees' talents by giving them the time and tools they need rather than putting them in charge of solving complex technological issues on their own. Employees can gain experience by gaining the skills necessary to meet the demands of their jobs with the help of an effective training mechanism. Those who did not have any training opportunities, however, claimed to be under excruciating stress. As a result, it takes a lot of time to focus on improving workflow, which can be avoided if managers are able to offer employees training opportunities and remove obstacles like technological difficulties or slowdowns.

Managers Provide Development Opportunities to Enhance the Overall Capabilities of Employees

Digital training conducted by telecommuting contributes to ensuring employee work schedules, improving employee performance, and achieving organizational production profitability. The degree of digital training of employees is one of the signs of digital transformation of the company and a realistic basis for leaders to achieve digital leadership (Schwarzmüller et al., 2018). Generally speaking, the two types of employee skills training mentioned in the interview are among the requirements for the daily operations of the company and the realization of employee value. However, in the requirements of digital leadership, leaders need to achieve a greater degree of digital mastery for employees who are relatively behind in the digital situation, which helps to maintain a certain degree of digital ratio and promote digital products. At the same time, this also avoids turnover in digital scenarios.

Managers need to develop appropriate measures to streamline digital office processes. In addition, managers should strengthen emotional communication with employees and eliminate the communication gap between managers and employees. This communication mechanism can also be realized in an online way. Communication between superiors and subordinates is an important tool to enhance employees' adaptability and learning ability, especially in case of changes (Zaccaro & Banks, 2004). Finally, the development opportunities of employees in the digital context are safeguarded by enhancing their self-confidence.

Using Digital Tools to Enhance Self-Efficacy

The above-mentioned studies show that employees' self-efficacy can be significantly improved after experiencing digital technology training. In the context of digital leadership, the further realization of digital leadership by managers requires more scientific task assignment mechanisms, as digital technology has reduced a portion of the leader's workload (Klus & Müller, 2020).

First and foremost, managers can improve employee self-efficacy by tolerating and experimenting with employee errors. The leader's mastery of this data can be used as a basis for employee promotion decisions. Second, managers need to set up more rational task assignment mechanisms to match the digital process. As mentioned in the discussion above, digital technology improves employees' work skills and efficiency, while reducing managers' workload.

Being Self-sufficient

In the process of digital transformation, employees will face various difficulties when carrying out their work. Compared with traditional office methods, the core of the digital office is digital resources and tools (Singh et al., 2019). Empowering employees to apply

these resources and tools proficiently to handle work is a key focus of an enterprise's digital transformation.

There are two main ways to solve this problem. The first is that the leaders of the company conduct direct training for employees, which is a way to quickly familiarize employees with digital office skills. However, according to the interviews, almost all of the informants' companies have trained employees when they started the digital transformation, but employees' reliance on leadership's technical support has not decreased. The cultivation of employees' autonomy is the fundamental way to solve the problem.

Digital leadership plays an important role in developing employee autonomy. First, employees must have the basic ability to develop autonomy. After gradually gaining the awareness and ability of self-sufficiency, the role of leadership is no longer to provide technical assistance but to discuss digital work results with employees. In the process of employee self-awareness and cultivation, the role of digital leadership is not reflected in technology, but in encouragement, guidance, support, and achievement acceptance.

Rethinking Ways of Working and Dealing with Problems

Data-driven decision-making during digital transformation is a major shift in the way work is done, as informants said (Paula et al., 2022). In this process, the need to make data-driven decisions can sometimes be very large, so solving the problem of data collection will be a problem that needs to be faced in the process of digital transformation. Employees can reflect on their work and improve their problem-solving skills through the results of the assessment. Emphasizing the ability of employees to reflect is an important way leaders can use to increase the resilience of employees (Englund & Hjorth, 2022). Furthermore, employees were able to respond to their own concerns about the objectives of their work and improve their reflective abilities.

However, while problem-solving skills were considered to improve as a result of the digital transformation, creative thinking was not intended to improve (Englund & Hjorth, 2022). When presenting assessment results, leaders question and challenge employees' mindsets. As a result, managerial intervention can enhance staff resilience by facilitating the ability for employees to consider challenges as opportunities for development as they are given instructions to devise new solutions.

Managerial Contribution

At present, the focus of most enterprises' digital transformation is on the innovation and application of technology, but the focus of this study is different. This study found that, in addition to the innovative adoption of digital technologies, the cultivation and development of digital leadership plays a crucial role in improving employee self-efficacy, resilience, and productivity during digital transformation.

This study pointed out the importance of digital leadership in digital transformation and makes recommendations for the simultaneous development of digital leadership and digital transformation. It is expected to help enterprises, especially manufacturing companies that are in urgent need of digital reform increase their emphasis on digital leadership and give suggestions for the digital development of these companies.

Directions for Future Research

The main direction of this research is to investigate how digital leadership can drive digital transformation by influencing employees. The topic of how digital leadership develops at the leader level has not been examined in detail this time. Therefore, the cultivation of digital capabilities at the corporate leadership level can be taken as a future research direction. The cultivation of digital capabilities at the leadership level is conducive to improving the company's internal digital influence, motivating employees, promoting digital reform, and improving employee productivity.

In addition, one of the limitations of this study is that the period of data collection is too long, which brought inconvenience to the study. Therefore, in future research, it is necessary to formulate a more detailed data-gathering plan and adopt a cross-sectional time horizon to avoid repeated changes in research data to ensure the quality of the data. The subjectivity of interviewees may make it impossible for researchers to objectively evaluate a company's digitalization process. In this study, the selected respondents were from different companies. When sorting out the data, it was found that their answers may all have a certain degree of bias. Therefore, when studying the cultivation of digital leaders at the leadership level in the future, different employees from the same company should be selected to improve the objectivity of the research data.

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Appendices

Appendix 1. Table 1: First Interview

Informant position	Ways to contact informants	Determination of interview time	Interview method	Interview questions	Informant's responses to questions	Number of employees led by the informant
Leading specialist from Energy company	Friend, by phone make sure the interview	Send the questions by email, then make sure the interview time	Online by zoom	First 20 questions	One question unanswered (no.18)	About 12
Productivity Center manager of IT area	Friend, by phone make sure the interview	Send the questions by email, then make sure the interview time	Online by zoom	First 20 questions	Got all answers	More than 20
IT manager from big international company	classmate, by email make sure the interview	Send the questions by email, then make sure the interview time	Online by zoom	First 20 questions	One question unanswered (no.18)	About 10
Lead service Designer in Data and AI	Friend, by phone make sure the interview	Send the questions by email, then make sure the interview time	by phone	First 20 questions	Got all answers	7- 10

Appendix 2. Table 2: Second Interview

Informant position	Ways to contact informants	Determination of interview time	Interview method	Interview questions	Informant's responses to questions	Number of employees led by the informant
Product manager of mobile application	Friend, by phone make sure the interview	Send the questions by email, then make sure the interview time	By phone	New 20 questions	Got all answers	15
service manager of IT company	Friend, by phone make sure the interview	Send the questions by email, then make sure the interview time	Online by zoom	New 20 questions	Got all answers	25
Accounting manager from Finnish company	Friend, by email make sure the interview	Send the questions by email, then make sure the interview time	By phone	First 20 questions	Got all answers	15
Leader of an international company in Finland	Friend, by phone make sure the interview	Send the questions by email, then make sure the interview time	Online by zoom	First 20 questions	Got all answers	More than 50

Appendix 3. Table 3: First Interview Questions

Question Number	Interview Question
1	What is the biggest impact of the sudden outbreak of COVID-19 on your company?
2	In response to the above impact, what kind of response has been made in your company's top management?
3	As the main leader of an important department of the company, how do you respond to or execute the orders of your superiors? Or how did you react to the situation at the time?
4	We all know that the epidemic has also caused some psychological panic, especially for low-level employees. In this case, have the specific measures given by your company's leaders to deal with the epidemic been effectively implemented? What difficulties did you encounter during the implementation?
5	What impact did these measures to deal with the epidemic have on the development of the company at that time?
6	When the epidemic was severe, many companies were in a state of chaos. How long did it take for your company to return to normal operation from the initial impacted state?
7	In the recovery process, what role do you think leadership played?
8	At the height of the epidemic, people could not go out. In order to ensure the operation of the company, all members of the company should work remotely from home. Did you get used to this way of working at first? What troubles did remote work bring to you?

9	How did you gradually adapt to telecommuting?
10	Will telecommuting affect communication between employees? Compared with the normal office work, what impact does telecommuting have on the company's business development?
11	How is your company's leadership leveraging information technology to make telecommuting more efficient?
12	How do these information technology tools help employees to better handle business and meet customer needs?
13	What do you think are the similarities and differences between the digital leadership methods used during the epidemic and ordinary leadership methods?
14	At present, the negative impact of the epidemic has been gradually controlled, and the company's operations have basically returned to normal. Your company is still using digital leadership, why?
15	What are the advantages and disadvantages of digital leadership compared to traditional leadership approaches?
16	What do you think are the key leadership approaches in managing a company?
17	How do you think the above key leadership approaches are reflected in digital leadership?
18	What do you think of the statement that digital leadership is a combination of key leadership approaches?
19	How do you understand the relationship between digital leadership and the company’s digital transformation?
20	As the company’s leader, how will you drive the company’s digital transformation? By applying digitizing imperatives?

Appendix 4. Table 4: New Interview Questions

Question Number	Interview Question
1	How long have you worked in your industry/ company?
2	Can you remember something that had a huge impact on your industry or company?
3	I feel like COVID-19 must have caused a huge buzz in many industries. So what the pandemic has brought to your company?
4	How did your company's leadership react at the time?
5	Is this helpful, for the company or employees?
6	How long did it take for the company to return to normal operations?
7	The pandemic should be a big crisis for the company. What role do you think leadership plays in times of crisis?
8	At the height of the epidemic, people could not go out. How was your working condition at that time?
9	Most companies chose to work remotely, what about your company?

10	Did you adapt to working online? How is this different from working in a company?
11	Will there be colleagues who find it inconvenient to work online? Will there be any complaints in the process?
12	Have your leaders figured out a way to make up for the lack of telecommuting?
13	Do you think it is a form of digital leadership for leaders to manage the company and handle the business in this online way?
14	Now that work has returned to normal, how do you think the digital method during the epidemic has affected the current work?
15	How do you think of the advantages and disadvantages of digital leadership compared to traditional leadership approaches?
16	What do you think are the key leadership approaches in managing a company?
17	Do you think the above key leadership approaches are reflected in digital leadership? And how?
18	Some people will say that digital leadership is a combination of key leadership approaches?What do you think of this view?
19	How do you understand the relationship between digital leadership and the company’s digital transformation?
20	As the company's leader, what can you do to drive the company's digital transformation? By applying digitizing imperatives or other approaches?