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DISSERTATION

GENERATIONAL DIFFERENCES IN DIGITAL LITERACY AND THEIR EFFECT ON ORGANIZATIONS IN LUXEMBOURG

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Generational differences in digital literacy and their effect on organizations in Luxembourg

ABSTRACT

Given the increased digitalisation of the workforce over the past decades, the capability to understand and use digital tools has become an important skill in today's work environment.

Different generations make up the current active workforce, and each generation has had different experiences with digitalisation in their private and professional lives and thus has different digital literacy and digital skill levels. This study explores how the intergenerational differences in digital literacy affect an organization in Luxembourg. Semi-structured interviews with a diverse set of managers from Luxembourg were conducted, to hear from their experiences relating to this subject.

Luxembourg's strong economy, its diverse and multicultural workforce make it an interesting choice to research how its workforce tackles the challenge of digital adoption.

The findings show that digital literacy is an important skill that must be possessed by workers in today's workforce. It also shows that the different generational cohorts have different levels of digital literacy competencies and digital skill levels. The managers address these differences and try to mitigate the generational discrepancies by offering workshops or other support – acknowledging the importance of a workforce that has a high level of both digital literacy and digital skills. An additional finding of the interviews was the importance of informal learning approaches, such as intergenerational learning initiatives that were not formally organized by management but rather by workers themselves out of self-motivation.

The organization adapts easier to changes if its workforce is well-prepared and capable of understanding and harnessing the potential of new technologies.

Keywords: Intergenerational differences, digital literacy, Luxembourg, generations, organisations, digital skills, informal learning initiatives

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1. INTRODUCTION

1.1 Background

As a consequence of the generational diversity in their workforce and the numerous challenges posed by ever-expanding, newly emerging technologies, businesses are put to the test by rapid technological change.

The dynamics of technological adoption, use, and adaptation have emerged as key factors shaping the competitive advantage of organizations as society keeps witnessing the coexistence of different generations in the workplace, such as Baby Boomers, Generation X, Millennials, and Generation Z (Cetindamar, et al., 2021).

When it comes to using and understanding the power of technology for problem-solving, cooperation, and innovation, every age group brings their unique points of view, values, and proficiency levels, whilst simultaneously struggling with their problems regarding technical know-how (Rupčić, 2018).

Luxembourg was chosen as a country of interest for this survey for various reasons. Firstly, Luxembourg is home to a diverse workforce due to multiple immigration waves. It currently hosts over 170 different nations that are working together in this small country, next to a high number of cross-border workers, with '43% of Luxembourg's workforce comes from across its borders.' (Luxembourg's Workforce, 2024)

Furthermore, Luxembourg boasts the highest GDP per capita worldwide, with the finance sector as its main economic sector. Luxembourg's strong economy, its diverse and multicultural workforce make it an interesting choice to research how its workforce tackles the challenge of digital adoption. (Luxembourg's Workforce, 2024)

This dissertation seeks to look into the reasons for and effects of disparities between generations in digital literacy. It seeks to identify the degree to which generational differences in technology attitudes are manifest within organizations and examines their effects on worker productivity and the therein effect on organizations.

This study aims to shed light on the background of generational technological gaps through an in-depth approach using interviews and a review of existing literature. It intends to offer leaders and businesses insights that may assist them in maximizing the technological skills of their multigenerational workforce while promoting an inclusive, adaptable, and innovative culture.

1.2 The Main Problem And Research Question

The focus of the dissertation lies on the generational differences in the workforce relating to digital literacy. The dissertation aims to find out how these differences influence the company's day-to-day business and how managers tackle the issue at hand. To narrow down my research area, the focus of the dissertation lies on the Luxembourgish economy.

The question is the following:

How do generational differences in digital literacy affect an organization in the example of the Luxembourgish economy?

1.3 Relevance Of The Study

By taking a wide-ranging approach involving interviews and a literature review, the research not only aims to identify generational differences in digital literacy but also provides an understanding of how these differences manifest within organizations. The study aspires to offer valuable insights to managers, enabling them to use the technological skills of their multigenerational workforce to cultivate an organizational culture that is to their benefit.

The focus on the Luxembourgish economy narrows the scope, allowing for a more precise exploration of the specific challenges and opportunities within this context. The research contributes to the broader discourse on the interplay between generational differences, digital literacy, and an organization's standpoint in the face of evolving technological landscapes.

1.4 Structure Of The Report

To dive into the research, the dissertation opens with a review of the existing literature to assess the state of the art. Then, a deep dive into the topic of digital literacy, focusing primarily on the workforce – highlighting its need in a modern organization undergoing constant digital transformation, will follow.

Following this, the different generations in the workforce and their different attitudes towards technology will be defined.

Then, a synthesis of the various chapters will follow, highlighting the interplay of the various components of intergenerational differences in digital literacy in organizations in Luxembourg.

Finally, in the second part of this dissertation, there will be a a qualitative data analysis of the current Luxembourgish environment regarding the generational differences in digital literacy and its effect on an organization.

The analysis will be concluded by a conclusion of the work's findings.

2. LITERATURE REVIEW

2.1 Digitalization

2.1.1 Digitalization Of The Work Environment

In the last decades, workers witnessed important changes in their work environment. Digital technology found its way into the offices of the world and has continued to change ever since. From fax machines to printers to cloud technology – since the invention of technology, the digitalization of the work environment has never stopped evolving (Cijan, et al., 2019). The changes that came along with digitalization have forced small, medium-sized and big corporations alike to constantly face and overcome new challenges (Rossato & Castellani, 2020).

Digitalization has found its way into organizations as a means to decrease operational costs while simultaneously increasing income. A digital enterprise is capable of surpassing the limits of physical capacities, as it allows businesses to enter into close contact with stakeholders without the necessity of physical meetings or time constraints (Hooi & Chan, 2023).

Furthermore, Rossato and Castellani (2020) argue that transforming existing business processes into digital alternatives can turn to the business' advantage as it leads to 'more efficient business processes and flows and therefore better firm performance' (p. 621).

In 2019, businesses in the digital sector have experienced much higher growth than their non-digital counterparts. The growth rate in the UK for digital businesses was

twice as high as the growth rate of businesses that do not have undergone the same digital transformation, which goes to show that digitalization can optimize efficiency and reduce cost (Nania et al., 2019).

Digitalization has increased the speed of business, by solving formerly tedious tasks almost instantaneously and making business processes more efficient. This speed has found its way into our private lives as well – multitasking, hyperconnectivity and on-demand availability have been introduced into our personal lives, making our lives busier and more instant than ever before (Cijan, et al., 2019).

Digitalization has entered every aspect of our lives, making digital knowledge an important factor in tackling our everyday challenges (Cijan, et al., 2019).

> *Digitalisation […] is the massive, on-going and profound technological transformation at a societal and industrial level through the implementation and utilisation of digital technology. This creates an impetus for organisations to execute major development and innovation projects in order to maintain their competitive advantage (Lilja, 2020, p. 7).*

The speed of the technological transformation that Lilja (2020) refers to in the aforementioned quote is believed to be without precedent in the work environment. The speed and the vast changes of digitalization have led to the creation of new jobs whilst simultaneously rendering other jobs futile. Furthermore, digitalization has introduced a need for flexibility in many work environments, tearing down rigid hierarchies and changing individual and collective work requirements (Timonen & Vuori, 2018).

The change the work environment has undergone through the uprise of technology is a dividing issue. Although positive effects – such as the creation of new jobs, an increase in the quality and efficiency of work, and the improvement of working conditions for labourers – can be discerned, downsides have caused concern among the workforce. Unethical AI applications, the loss of contact with clients and co-workers and a potential negative effect on workers' mental health are doubts that can be uttered concerning the current and ongoing digitalization of the work environment (Konle-Seidl & Danesi, 2022).

Although the digitalization of the work environment is not a new effect in Europe, it is notable that the European continent has undergone a less drastic change than the US

or China, showing less use of digital technologies in the workspace than the two countries mentioned above (Konle-Seidl & Danesi, 2022).

McKinsey & Company (as stated in Eurofound, 2021) has stated that an outstanding increase in demand for digital solutions was caused by the COVID-19 epidemic, hastening the digital transformation of numerous businesses globally. A McKinsey survey (2020) estimated that 'companies have accelerated […] digitization […] by three to four years' (para. 1). The pandemic made it impossible for organizations to run their daily business the same way as usual – with travelling, physical meetings rendered impossible and costumers changing their buying behaviour for various reasons, such as physical limitations or budget reasons due to unemployment. This forced organizations to move their selling efforts into the digital world, causing businesses to intensify their online presence (Chan, et al., 2021). It can be concluded that 'the COVID-19 pandemic has induced a digitalization push' in the world (Jaumotte et al., 2023, p. 25).

The acceleration was not only felt by businesses. Governments saw themselves forced to make efforts to digitalize their services. A prominent example of the digitalization of government services is the improved digital experience of public employment services. Governments used a bandwidth of digital tools to tackle the two-sided problem of both a high number of job seekers and the restricted face–to–face interactions, that made traditional job interviews unfeasible (Konle-Seidl & Danesi, 2022).

It is notable, that a report for the International Monetary Fund (Jaumotte et al., 2023) has found that digitalization could be beneficial for long-term economic growth whilst making the economy more resilient to shocks. Furthermore, it might have a positive effect on labour participation as it allows workers to have increased flexibility in their working hours due to the possibility to work from home and it increases their living standards i.e., workers do not sacrifice as much time of their day for their daily commute to their work.

Not only does digitalization make labour force participation more resilient to shocks; its benefits are also valued by workers and offer inclusion of i.e., handicapped, or elderly workers who are not mobile. Digitalization could lead to positive long-term effects and thus should be further incentivized by governments, by 'investing in digital infrastructure and helping workers acquire the needed skills' (Jaumotte et al., 2023, p. 7).

2.1.2 Definition Of Digital Literacy

Digital literacy refers to the competence of employees in using digital technologies in private or work-related practices (Cetindamar, et al., 2021).

In 2011, UNESCO defined the concept of digital literacy as 'a set of basic skills required for working with digital media, information processing, and retrieval' (Cetindamar, et al., 2021, p. 3).

Digital literacy comprises an array of elaborate cognitive, tangible, sociological, and emotional skills that users require to perform efficiently in technological settings (Eshet-Alkalai & Yoram, 2004).

To give a further definition, the American Library Association (2009) defines digital literacy as 'the ability to use information and communication technologies to find, understand, evaluate, create, and communicate digital information, an ability that requires both cognitive and technical skills' (para.1).

Digital literacy encompasses both the technical and critical thinking elements involved in choosing, utilizing, and comprehending information technology resources (Klassen, 2019).

Digital literacies give employees the necessary skills to evaluate, analyse and synthesise information originating from different sources. Furthermore, using different software such as Microsoft Office – with its programs PowerPoint, Microsoft Word, etc. – to solve and or optimise industry-related problems does not pose a problem to a digitally literate employee. Digital literacy can vary across industries and organizations – being digital literate in one industry does not necessarily translate to other sectors, positions, or responsibilities (Chan, et al., 2021).

The importance of digital literacy to successfully navigate the digital spheres of the modern work environment remains uncontested (Chan, et al., 2021).

Tinmaz, Fanea-Ivanovic, and Baber (2022) state that to better understand what falls under the scope of digital literacy, UNESCO developed the Global Framework for Digital Literacy in 2018, which includes the following components: 'information and data literacy, communication and collaboration, digital content creation, safety, problem-solving, and career-related competence' (p. 20). This approach is also used for the European Digital Competence Framework 2.0 as part of the European Digital Agenda.

Unlike the definition of traditional literacy in the Cambridge Business English Dictionary (n.d.) – 'the ability to read and write' (1st definition) – it is important to note that all the definitions of digital literacy, to some extent, include the capacity of the digital literate to not only read the information but to process the information as well, important aspects for this are the capabilities to think critically, evaluate and comprehend the digital resources used.

Although the definitions of digital literacy differ and a consensus for one common definition has not yet reached, it can be categorized into the realm of life skills (Tinmaz, et al., 2022).

2.1.3   Importance Of Digital Literacy In The Work Environment

Jones and Flannigan (as cited in Chan, et al., 2021, p. 527) said that 'being void of digital literacies is parallel to handicap in the digital era.'

In a text by the European Commission (2023) it is stated that:

Over 70% of businesses have said that the lack of staff with adequate digital skills is an obstacle to investment [yet] Europe […] faces a shortage of digital experts who can develop cutting-edge technologies for the benefit of all citizens. (Chap. 'Background', para. 1)

Employers invest in new technologies, as those 'make it possible to manage complex relationships among multiple stakeholders, resulting in many benefits to customers and other network stakeholders' (Cetindamar, et al., 2021, p. 2). Since these investments and their subsequent benefits can only come to fruition if employees have the necessary know-how on how to maximize the efficiency of these new technologies, it is of utmost importance that employees possess the necessary digital literacy skills (Cetindamar, et al., 2021).

The real challenge for employers lies in teaching their employees how to sharpen their digital skills – as Nikou, De Reuver and Mahboob Kanafi (2022) state by writing that 'there is widespread agreement amongst policymakers that the existing workforce's literacies are inadequate to meet the literacy demands of the future workplace' (p. 372).

To be prepared for the needed digitalisation of the workplace, digital literacy must be prioritized by employers. Digital literacy is crucial in every realm of the organization and is a needed skill to be considered a productive employee (Nikou, et al., 2022).

Digital technology increasingly finds its way into our private lives and our jobs – making digital literacy a necessity for employees. Furthermore, digitalisation has uplifted physical borders and led to increased job creation. Firms can produce more efficiently while increasing the quality of their products (Bejaković & Mrnjavac, 2020).

Nania et al. (2019) provide various findings that highlight the importance of digital skills in today's work environment. Not only do '75% of job openings at each level request digital skills' (p. 8), but jobs that require a knowledge of the digital world are better paid as well – on average, 'roles requiring digital skills pay 29% over those roles that do not' (p. 8).

Furthermore, the risk that one's job succumbs to automation can be reduced by over half if one possesses specific digital skills vital to a firm which are difficult to computerize (Nania et al., 2019).

The positive impacts of digitalisation on firms have led to an increased demand for digital literacy in employees among employers, who are looking more and more for employees who can understand and use Internet communication technology (OECD, 2014).

It is not only of utmost importance for employees to deal with digital literacy but also for employers to ensure that their employees are involved in the company's digitalisation process, which has positive effects on employee engagement. Employees who feel involved are more likely to speak highly of their employers, remain loyal to the business, and go beyond what is required of their job for their organizations. Employee engagement, as reflected by enthusiasm, passion, and reflection, remains crucial for upholding a competitive advantage in the organization's respective sector (Chan, et al., 2021).

2.2 *Generations In The Workforce And Their Technology Perspective*

The following table shows the different generations that are currently active in the workforce. The years for each generation are chosen according to the work of Berkup (2014). In the paper, Berkup mentions disruptors that have influenced generations most

notably in the West, such as the first spacewalk for baby boomers, the fall of the Berlin Wall for generation X, the 9/11 attacks for generation Y and the rise of social media platforms like Facebook for generation Z (Berkup, 2014).

Table I: The different generational cohorts in the workforce

Baby Boomers 1946–1964	Generation X 1965–1979	Millenials or Generation Y 1980–1994	Generation Z 1995–2009

In most organizations, a diverse culture of generations co-exists, offering multiple perspectives on life and work, opening room for discussion, and sharing. Yet, differences in values, attitudes, and approaches, especially in communication and learning, can impact knowledge sharing. (Rupčić, 2018).

Good functioning among the intergenerational workforce is crucial for an organization to thrive and most importantly survive. The current organization is mainly comprised of four generations: baby boomers, Gen X, Gen Y and Gen Z. Each one of them has their perspective towards technology (Pasztor & Bak, 2021).

Stereotypically, baby boomers are portrayed as goal-oriented, self-reliant, masters of their fate, obedient to authority, devoted to their company, and hardworking in their profession. A Randstad study (2022) found that 62% of Baby Boomers feel themselves committed towards their employer, the highest of all generational cohorts. Additionally, boomers are perceived as competitive and incline to define success in terms of wealth. Boomers have higher levels of personal development values (e.g., accomplishment, power) than the two older generations and Gen Xers. Volkom et al. (2014) found that 'adults 50 and over being the least common users of search engines' and that the older generations are far less likely to be on social media (p. 3).

Recently, Baby Boomers have been struggling to find their place in a progressively digitized society, and they perceive these changes as threatening (Pasztor & Bak, 2021). Older adults are slower to adapt to new technologies and experience more anxiety regarding technology (Volkom et al., 2014).

During Gen X's teenage years, they saw the traditional typewriter be substituted by computers, and they had to adjust to the reality that manual labour will diminish and be overtaken by technological developments (Pasztor & Bak, 2021).

Experiences in life such as economic instability and financial crises left a mark on them. The attitudes and ideals of Generation X have been influenced by the fact that many are the children of relentless workers. Generation X were children where both parents worked, and they spent the majority of their day unsupervised at home. They are perceived as being risk-takers, individualistic, disloyal towards their employer, concerned with work-life balance, and striving for financial independence.

Generation X is more prone to using the Internet and technological devices such as tablets compared to older adults. However, they are less likely to use social media compared to younger peers but is the generation that makes the most phone calls. They are less likely to experience anxiety whist using technological devices or the Internet compared to Baby Boomers but are still experiencing higher anxiety levels compared to younger generational cohorts (Volkom et al., 2014).

Millennials (Generation Y) were born into an age of advanced technology. Workplace safety means less to them, yet the abundance of opportunities contradicts their need for stability. They are the first generation of people whose social interaction has shifted to the internet (Becton, et al., 2014).

Globalization has had a profound effect on their ideals, and it's perceived that millennials appreciate change and diversity. This generation is often associated with a strong desire for meaningful employment, a strong emphasis on lifelong learning and mistrust in organizations. Leisure is more important to millennials than it was to earlier generations (Becton, et al., 2014).

Volkom et al. (2014) found that they belong to the most recurrent users of search engines alongside generation Z. They also have a less negative view on technology than their older peers as they are 'more likely to possess technology-related skills' (p. 3). Furthermore, they and Generation Z have the most friends on average on social media and both generations do the most text messaging, with generation Z leading this metric.

Gen Z is the youngest generation entering the workforce. They are used to technology usage daily – something a lot they have been doing from childhood on and they do not shy away from using new technology, either. Smartphones are used by 99% of those in Generation Z and 89% of adolescents are active on social media, as they seek instant gratification and engagement (Pasztor & Bak, 2021).

It is notable that due to their high use of technology and social media, they are a multitasking generation which can cause them to have difficulties concentrating on one

task for a prolonged time. They highly value feedback from a superior but it is equally important to them that their feedback is heard – criticism is bidirectional for Gen Z.

Generation Z seeks instant gratification in their job, unlike Baby Boomers, GenZers do not want to climb the slow career ladder but would rather change jobs to get a better position. 46% of Gen Z and 41% of millennials believe to be more ambitious than their counterparts, compared to 33% of Gen X and 32% of Baby Boomers (workmonitor, 2024). Similar to GenX they do not highly value job loyalty, and they do not mind changing countries for their workplace. They do not value job stability and, similar to millennials, are in search of fulfilling jobs that offer excitement whilst they shy away from routines and monotone work (Dolot, 2018).

As baby boomers slowly but surely leave the active workforce for retirement, workplaces now comprise mostly Generation X, Generation Y, and Generation Z who are starting to enter the workforce. (Jesuis, 2020). These generations have distinct work attitudes; Generation X values corporate loyalty, while Generation Y prioritizes individual growth using and learning from organizational knowledge. However, Generation Y's hyper-connectivity poses potential knowledge leaks, necessitating managers to stress data security and pay attention to corporate secrets (Rupčić, 2018).

In today's tech-dependent work environment, attention to the different intergenerational software approaches is vital. Gen X delves deeply into software comprehension and resists frequent system changes, as this would require them yet again to dive deep into understanding the new software system. Gen Y, aware of job mobility and frequent system changes, rather explores and experiments with various software, seeking quick fixes to their technological problems through online queries and forums. While Gen Y's adaptability and its search for answers online can expand horizons, it can also create information chaos (Rupčić, 2018).

Furthermore, both generations – Z and millennials, grew up as so-called digital natives, being used to utilizing technology from an early age. Workers from this generation expect a heavily digitalized work setting, where most work procedures are done online (EURES, 2023).

Furthermore, both generations have a high demand for flexibility, 'with 46% prioritizing workplace flexibility and 51% preferring flexible hours when looking for their next job' (workmonitor, 2024, p.23). This is underlined by the fact that both generational cohorts, Z and Y, show the highest demand for 'work-from-home'-alternatives with 48% and 42%, respectively (workmonitor, 2024).

In the digital era, differences might intensify, but each generation offers unique strengths. Young digital natives excel in technology, while senior employees possess deeper business software insights. Effective intergenerational cooperation is pivotal for organizational success, hinging on knowledge sharing (Rupčić, 2018).

2.3 Synthesis

The workplace of today has undergone significant technological change. A single generation has witnessed the change from writing on typewriters to fax machines up to today's powerful computers and Artificial Intelligence. As a result of the digital age, organizations were required to adapt and become a dynamic environment where change is the only constant factor.

The speed of business and our personal lives have simultaneously intensified as technology has spread to every element of our lives. Multitasking, hyperconnectivity, and quick access have evolved into distinguishing characteristics that dictate both our private and our work lives.

This ongoing revolution is an unprecedented technical force that pushes companies to make significant investments in research and development to stay ahead of the competition. Because of how quickly and profoundly this transformation has occurred, new job categories have emerged while others have become obsolete. This requires a new kind of flexibility in work situations whilst also transforming the job market, where digital skills have become a must to be deemed employable. Furthermore, an enhanced proficiency in digital skills can give one more job security and an increased salary compared to peers who are not digitally savvy.

The concept of digital literacy is fundamental to navigating successfully through this digital revolution. Digital literacy sums up people's competence with digital technologies for both personal and professional use. With this knowledge, people can easily use software tools, assess, analyse, and synthesize data from a variety of sources, and solve problems unique to their sector. Digital literacy is crucial for managing the modern workplace, even though its specifics can vary depending on the industry and company.

Digital literacy is an essential need, not just a choice. Employees lacking these abilities are comparable to those suffering from a disability in the digital age, as the

workplace adopts new technology regularly. Employers spend money on technology to manage complex connections between various stakeholders, and this investment pays off for users and other network parties. These benefits, nevertheless, won't materialize unless staff members are equipped with the necessary skills to make the most of all of these technologies. Therefore, to maximize the return on their technical investments, companies must place a high priority on digital literacy.

Digital literacy is becoming increasingly necessary in a world where the acknowledgement of productive employees is based on important developments in digitalization.

Organizations today deal with the changing environment of multigenerational workforces alongside the upsurge in digitalization. Every generation brings its distinctive views, beliefs, and methods to working environments. Many generational perspectives on technology, communication, and learning coexist inside businesses as the baby boomer age gives way to Gen X, Gen Y, and Gen Z.

There are difficulties related to generational diversity, even while it enhances discussions and methods for solving problems. The exchange of information, which is essential to ensuring an organization's survival, can be impacted by differences in values and methods.

To ensure that the organization capitalizes on each generation's qualities managers must carefully traverse these generational distinctions.

It is not simply generational disparities that matter in our technology-driven world, but also how these variations emerge in software usage and comprehension. Generation X, defined by extensive research into understanding software systems, is resistant to frequent change. In contrast, Gen Y, a generation used to job mobility and frequent system changes, takes a more exploring and adaptive attitude, often exploring the internet for rapid solutions. Gen Z is known for being chronically online, and having a similar attitude towards job mobility and attitude as Gen Y.

Knowledge sharing is at the heart of effective intergenerational cooperation, which is critical for corporate success.

In this digital age, where the only constant is change, the organization's ability to use both technology developments and generational diversity will set it apart. The cornerstones of future organizational success are adaptability, innovation, and knowledge exchange.

3. RESEARCH METHODOLOGY AND DATA ANALYSIS

3.1 Methodological Approach And Data Collection

This study aims to investigate the impact of generational differences in digital literacy knowledge on organizations, with a particular focus on how managers from different sectors across Luxembourg observe and tackle these differences. The research design uses a qualitative approach, asking six managers representing different sectors in the Luxembourgish economy open-ended questions.

Semi-structured interviews served as the means to collect data for this dissertation. The interview protocol makes use of open-ended questions which were designed to provoke detailed and in-depth responses from the managers regarding their experiences with intergenerational digital literacy within their organizations.

The questionnaire of the interviews may be found in the annexe, it contains ten questions, that each interviewee has been asked.

The interviews have been conducted either in person or virtually, based on the participants' availabilities and preferences. In total, four interviews have been conducted in person and two were conducted virtually. Furthermore, the interview was held in the participant's language of choice, which in this case has been Luxembourgish for all participants.

Each interview was aimed to last approximately thirty minutes, however, this heavily depended on the length of the interviewee's answers. The consenting participants were informed that the interviews were audio-recorded, or that notes have been taken for accurate data collection later on. The participants were informed of the interview's purpose and that their anonymity would be ensured.

3.2 Selection of participants

To obtain high-quality results, the selection of participants was based on experience and diversity. Each of the six participants holds a position in higher management and is active in a different sector of the Luxembourgish economy. The managers are from different generations – Baby Boomers, Generation X, Generation Y and the youngest Generation Z –, gender and educational background, noting that everyone holds at least

a high school diploma. Numerous people from diverse backgrounds have been asked, with six accepting the interview offer. As these six offer diverse points of view due to their different jobs, experiences, and responsibilities, it offers a thorough view of the Luxembourgish economy concerning the research question.

The interviews lasted several hours in total, offering sufficient material for an in-depth analysis. No crucial findings would have been made with further interviews and data satiety was obtained.

The sample characterisation is presented in the table below. It shows the identifier for each interviewee, their workplace, and their role in the organization. Lastly it shows the generational cohort they belong to.

Table II: Sample characterization

No #	Sector/Organization	Role	Generational cohort
#1	Consultancy	Founder and partner	Gen X
#2	Innovation agency	CEO	Gen X
#3	Ministry of education	Member of the directory board for fundamental education	Gen Y
#4	Finance	Manager	Gen Z
#5	Social services	Director of the largest social service office	Baby boomer
#6	Banking	Head of operations	Baby boomer

As the interviews were conducted under the condition of anonymity, quotes by the interviewees will be cited by their respective numbers indicated in the table (table II) above.

3.3 Interview Structure

The interview is semi-structured. During the research phase, it became clear that a semi-structured interview would be the best fit, as pre-defined questions allowed for a more

efficient analysis of the different interviews, while simultaneously allowing the interviewer to ask additional information to get precise and in-depth answers.

The interviews lasted for 33 minutes on average – giving the interviewees the time needed to answer thoroughly.

The questions that were asked were chosen to paint a complete picture of the participants' view of digital literacy and digital skills concerning a) their organization and b) the Luxembourgish economy as a whole. The answers to the ten questions gave valuable insights into how digital literacy affects an organization which related to the research question.

The ten questions were asked to make the interviewee reflect on the reality of digital literacy in their organization and whether they face problems with digital literacy themselves.

Furthermore, each question addresses a topic that has already been picked up in the literature review, allowing a parallel to be drawn between the existing literature and the interview's findings. Topics that have been simultaneously addressed in the literature review and the interview are the current state of digital literacy, the differences and challenges among generations that have been observed, and what has been done to mitigate the generational differences and improve digital skills in their organizations.

The questions served the purpose of allowing the participant to give a holistic, in-depth answer to the general research question of how digital literacy affects an organization. Each question addressed a different, crucial topic related to the main question, allowing for an inductive analysis (Saunders et al., 2019).

3.4 *Findings Of The Interview*

In order to present the findings of the interview in a coherent manner, the Gioia methodology was chosen. The method allows to bundle statements of participants into overarching themes. This allows for an in-depth analysis of qualitative findings whilst staying true to the statements of the interviewees. The following quote is an explanation of the Gioia methodology, stated by Dennis Gioia, himself:

'In this 1st-order analysis, which tries to adhere faithfully to informant terms, we make little attempt to distil categories. […] We start seeking similarities and

differences among the many categories, a process that […] reduces the […] categories to a more manageable number. We then give those categories labels […]. It is at this point that we treat ourselves as knowledgeable agents. […] When we have the full set of 1st-order terms and 2nd-order themes and aggregate dimensions, then we have the basis for building a data structure […]. The data structure not only allows us to configure our data into a sensible visual aid, it also provides a graphic representation of how we progressed from raw data to terms and themes in conducting the analyses—a key component of demonstrating rigor in qualitative research.' (Magani & Gioia, 2023, p. 7)

The analysis started by extracting statements of the informants that reoccur frequently in the interviews. The data that has been extracted is presented in the language of the participants. These data bits can then be ordered by categories (Magani & Gioia, 2023).

Quotes in the first-order concepts are followed by the respective numbers (#) of the participants (see table above). It is important to note that the first-order concepts should be identical or close to the participants original statements (Magani & Gioia, 2023).

Sifting through the first-order concepts, we can see patterns emerging. The concepts relating to the same pattern are represented in the same box on the left-hand side of the table.

 We then consolidate these statements into second-order themes (Magani & Gioia, 2023). These second-order themes are represented in the middle of the table. They represent the themes that the statements or categories of the first-order concepts belong to – giving a first overview of the data.

Finally, we consolidate the second-order concepts again – into aggregate dimensions. These aggregate dimensions offer the global, holistic categories of our interview findings (Magani & Gioia, 2023). The aggregate dimensions offer the global categories under which all second-order themes and first-order concepts fall under.

The Gioia method offers a graphic, holistic view of the data analysis, allowing for an easy understanding of what has been found during the analysis.

In the following table (table II), the research analysis and the findings of the interviews are presented in the form of a table.

It consolidates about 55 statements, opinions, and experiences of the participants into ten second-order conditions (digital skill diversity, organizational adaptability,

learning approaches, digital literacy in organisations, communication, acceptance of digital tools, digital tool integration, intergenerational digital engagement, digital infrastructure and support, and the future outlook).

Finally, it categorizes these second-order concepts into four aggregate dimensions (organizational and digital transformation, intergenerational digital integration, digital literacy's role in an organization's competitive advantage and development, and future threats and opportunities). The relationship between second-order concepts and aggregate dimensions is shown by colour-matching the second-order themes and the aggregate dimensions. The aggregate dimensions and their underlying second-order concepts are analysed in the following chapter.

The analysis found that digital skill diversity, communication and intergenerational digital engagement fall under the aggregated dimension of intergenerational digital integration (orange).

Organizational adaptability, digital tool integration and digital infrastructure and support fall under the aggregate dimension of organizational digital transformation (blue).

Learning approaches, digital literacy in organizations and the acceptance of digital tools fall under the aggregate dimension of digital literacy's role in an organization's competitive advantage and development (red).

Finally, the future outlook falls under the aggregate dimension of future threats and opportunities (light blue).

In the tables below, the Gioia methodology is explained graphically. One can see the inductive process that is being used to come up with the aggregate dimension that allow for a general conclusion in table III and how the approach was used in this paper to analyse the six interviews in order to find the aggregate dimensions.

Table III: The Gioia Methodology – A theoretical approach (Magani & Gioia, 2023)
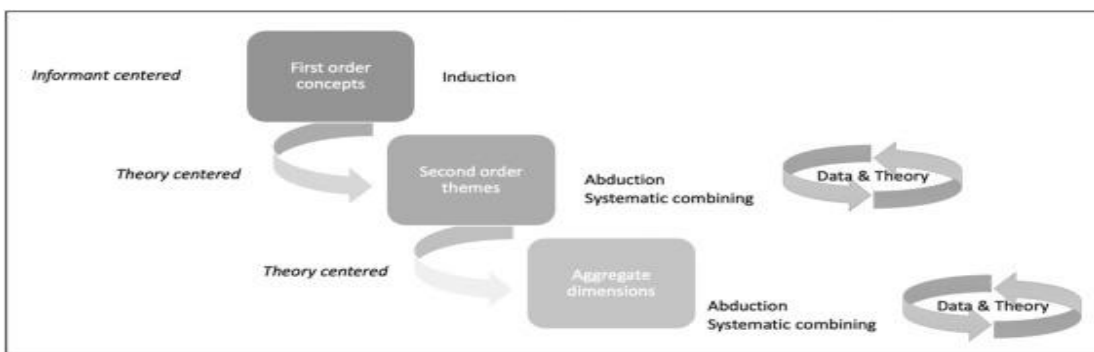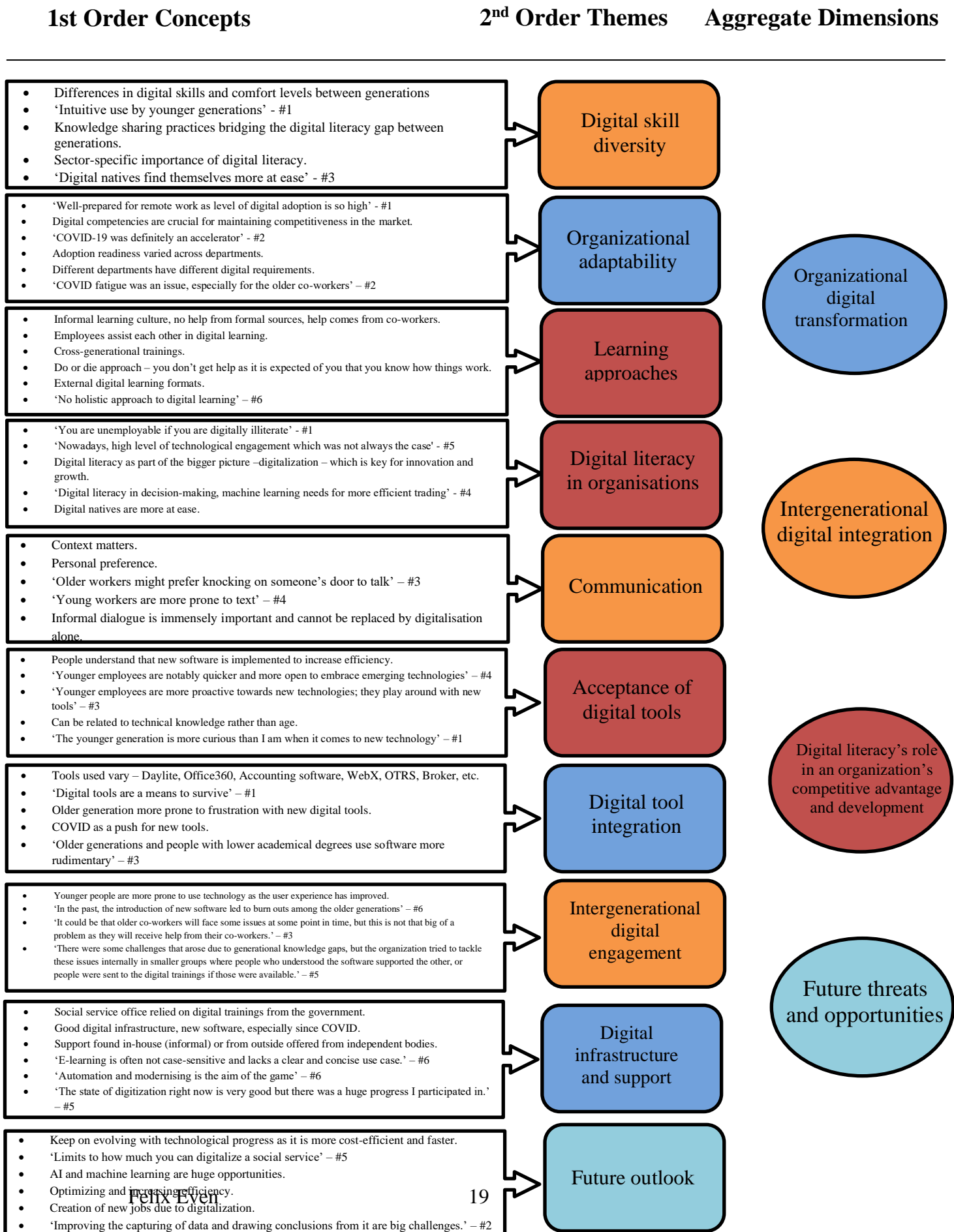
Table IV: The Gioia Methodology – A practical approach

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Differences in digital skills and comfort levels between generations • 'Intuitive use by younger generations' - #1 • Knowledge sharing practices bridging the digital literacy gap between generations. • Sector-specific importance of digital literacy. • 'Digital natives find themselves more at ease' - #3	Digital skill diversity	
• 'Well-prepared for remote work as level of digital adoption is so high' - #1 • Digital competencies are crucial for maintaining competitiveness in the market. • 'COVID-19 was definitely an accelerator' - #2 • Adoption readiness varied across departments. • Different departments have different digital requirements. • 'COVID fatigue was an issue, especially for the older co-workers' – #2	Organizational adaptability	Organizational digital transformation
• Informal learning culture, no help from formal sources, help comes from co-workers. • Employees assist each other in digital learning. • Cross-generational trainings. • Do or die approach – you don't get help as it is expected of you that you know how things work. • External digital learning formats. • 'No holistic approach to digital learning' – #6	Learning approaches	
• 'You are unemployable if you are digitally illiterate' - #1 • 'Nowadays, high level of technological engagement which was not always the case' - #5 • Digital literacy as part of the bigger picture –digitalization – which is key for innovation and growth. • 'Digital literacy in decision-making, machine learning needs for more efficient trading' - #4 • Digital natives are more at ease.	Digital literacy in organisations	Intergenerational digital integration
• Context matters. • Personal preference. • 'Older workers might prefer knocking on someone's door to talk' – #3 • 'Young workers are more prone to text' – #4 • Informal dialogue is immensely important and cannot be replaced by digitalisation alone.	Communication	
• People understand that new software is implemented to increase efficiency. • 'Younger employees are notably quicker and more open to embrace emerging technologies' – #4 • 'Younger employees are more proactive towards new technologies; they play around with new tools' – #3 • Can be related to technical knowledge rather than age. • 'The younger generation is more curious than I am when it comes to new technology' – #1	Acceptance of digital tools	
• Tools used vary – Daylite, Office360, Accounting software, WebX, OTRS, Broker, etc. • 'Digital tools are a means to survive' – #1 • Older generation more prone to frustration with new digital tools. • COVID as a push for new tools. • 'Older generations and people with lower academical degrees use software more rudimentary' – #3	Digital tool integration	Digital literacy's role in an organization's competitive advantage and development
• Younger people are more prone to use technology as the user experience has improved. • 'In the past, the introduction of new software led to burn outs among the older generations' – #6 • 'It could be that older co-workers will face some issues at some point in time, but this is not that big of a problem as they will receive help from their co-workers.' – #3 • 'There were some challenges that arose due to generational knowledge gaps, but the organization tried to tackle these issues internally in smaller groups where people who understood the software supported the other, or people were sent to the digital trainings if those were available.' – #5	Intergenerational digital engagement	
• Social service office relied on digital trainings from the government. • Good digital infrastructure, new software, especially since COVID. • Support found in-house (informal) or from outside offered from independent bodies. • 'E-learning is often not case-sensitive and lacks a clear and concise use case.' – #6 • 'Automation and modernising is the aim of the game' – #6 • 'The state of digitization right now is very good but there was a huge progress I participated in.' – #5	Digital infrastructure and support	Future threats and opportunities
• Keep on evolving with technological progress as it is more cost-efficient and faster. • 'Limits to how much you can digitalize a social service' – #5 • AI and machine learning are huge opportunities. • Optimizing and increasing efficiency. • Creation of new jobs due to digitalization. • 'Improving the capturing of data and drawing conclusions from it are big challenges.' – #2	Future outlook	

3.5 Discussion Of The Findings

In this chapter, the findings of the interviews are presented and explained. The following discussion is organized into the four main categories and their respective subcategories or 2nd order themes.

3.5.1   Organisational Digital Transformation

This category of aggregate dimension refers to the general digital ripeness of the organization. This refers to its readiness for digital adoption, its adaptability, and its capability to respond to digital change.

Part of this aggregate dimension are categories such as **organizational adaptability**. The organisation's capacity to adapt to outward shocks such as COVID-19 was a recurring theme in the interviews. As #2 stated: 'COVID-19 was definitely an accelerator' and 'COVID fatigue was an issue, especially for the older co-workers.'

The participants underlined that a solid digital background and knowledge were key for a well-functioning business during and after the pandemic. They also underlined that the pandemic was a driving factor for a push towards digitalization and a subsequent need for digital literacy competencies and heightened digital skills. This goes to show that the organization of today has undergone a shift towards a more digitized reality where digital skills are crucial.

Furthermore, **digital tools** and their **integration** into the business were an important subject as well. It shows how the employees are using the software in the everyday business. The participants explained the daily software they are using and have shown a vast array of different software they are using, from broker software to excel. During the interview, the participants explained that in today's business environment, digital tools have become indispensable. As #1 said, 'they are a means to survive.' Digital integration has become high, but the interviews showed that the older generation often faces more struggles with the implementation of new software than the younger generation and that they use the software more 'rudimentary', as #3 puts it.

Another subcategory of the digital adaptability is the **digital infrastructure and support**. The digital infrastructure relates to the software used in the organization. All the interviewees said that they are happy with the software that is being used and that

they are making efforts to offer the newest software, especially #6 as the head of operations is always on the watch-out for new software, stating that 'automation and modernising is the aim of the game'. The support proposed by the organizations varied, some offered in-house training, while others used outside organizations, whereas other organizations did not propose support mechanisms at all.

The organizational digital transformation largely relies on three things: a flexible approach to new software, so the organization can adapt quickly to changes, a well-integrated digital software, that is accepted and used by the employees and a solid infrastructure behind the whole digitalisation process, in the form of a well-adapted software and a well-functioning support system if struggles arise.

3.5.2   Intergenerational Digital Integration

During the interviews, the managers were asked to reflect on their digital skills and the **digital skill diversity** among their employees. All the managers agreed that they see a difference in the digital skill set of the different generational cohorts. #1 talks about an 'intuitive use' of the younger generation when it comes to technology. #3 says that 'digital natives find themselves more at ease' with new technology. The comfort and proficiency levels in digital literacy and digital skills were observed to be higher among the younger generational cohorts.

An important factor at play was the **engagement** of generations with technology. Younger generations were observed to be more curious about new software and would play around more with it to get used to it, whereas the 'introduction of new software led to burnouts among the older generations' (#6). The interviewees also talked about how intergenerational differences in technological knowledge and generational interplay affected the work environment. #5 recalled that 'there were some challenges that arose due to generational knowledge gaps, but the organization tried to tackle these issues internally in smaller groups where people who understood the software supported the other.' It goes to show that maintaining a work culture that backs cross-generational learning and the sharing of digital knowledge is crucial to succeeding in digital advancements.

An important factor for successful cross-generational functioning is **communication**. Interestingly, most managers did not experience huge differences

across generations when it came to communication preferences. Most stated that personal preferences played a bigger role in how someone communicates than their age. Still, some differences were experienced, as 'older workers might prefer knocking on someone's door to talk.', as #3 says. #4 has experienced that in his organization 'young workers are more prone to text.'

The intergenerational digital integration highlights the collaboration systems between the various generations within the work environment and focuses on how digital literacy and digital adoption vary across generations. Most managers experienced vast differences in digital literacy levels and digital skills across generations – alongside a higher curiosity for and engagement with new software among younger generations. The communication patterns between generations did not differ.

3.5.3   Digital literacy's role in an organization's competitive advantage and development

This category refers to the role of digital literacy in maintaining and deepening an organization's position in its sector. The interviewees talk about **the role of digital literacy in their organization**, underlining its importance in today's society, with #1 stating that 'you are unemployable if you are digitally illiterate.' Everyone acknowledged that in today's reality of high digital engagement, being digitally literate is a must. In #5's experience 'Nowadays, [there is a] high level of technological engagement which was not always the case.' Digital literacy is not only a set of skills but rather a necessity to be a valuable employee who is capable of adapting, innovating, and excelling in their organization.

An important factor for organizations is thus the strategic digital literacy development. This encompasses different learning approaches that are offered to the employees to guarantee the generational gap in digital literacy lessens. To do so, interviewees elaborated on the importance of digital literacy development. The approaches differed from self-responsibility to cross-generational training and support systems. All interviewees except #1 offered either informal or formal training opportunities for their employees, whereas #1 did not neglect the importance of digital literacy but rather put an emphasis on self-guided learning. All interviewees underlined that the younger generations generally possessed a higher level of digital literacy than

their older peers and that it was of key importance to try and mitigate the knowledge gap between the generational cohorts. The planning around formal and informal training is of utmost importance to ensure that the workforce remains proficient and competitive in a quickly progressing digital landscape. The availability of digital training is an important factor for employees as well. A Randstad study in 2024 found, that 72% of employees wish to improve their skills through training, with an emphasis on AI and IT.

Although the participants underlined that the younger generation has the highest level of digital knowledge, the Randstad study (2024) showed that the demand for training and development is highest among Gen Z (80%), whilst being lowest among Baby Boomers (61%), showing that Gen Z is realising that digital advancements and new technologies will make a solid level of technological knowledge even more indispensable in the future. Additionally, '18% [of employees in Luxembourg] would quit a job if they weren't offered learning and development opportunities to future-proof their skills.' (workmonitor, 2024, p.67).

To increase digital literacy levels and remain competitive, **the acceptance of new digital tools** is an important factor as well. As aforementioned, the higher curiosity for new technologies among younger generations stands out and it was observed by the participants that older generations have to overcome more hurdles to find themselves at ease with new software. Higher levels of digital literacy can decrease these hurdles due to a more 'at ease' approach towards new technologies.

#3 and #4 made similar experiences, stating that younger employees are 'more proactive' and 'more open' towards new technology. A similar experience was made by #1 stating that 'the younger generation is more curious than I am when it comes to new technology.'

However, it must be mentioned that the acceptance or non-acceptance of new digital tools can stem from personal preferences rather than age.

The interviewees saw digital literacy as a key driver for a successful business, as it allows the employees to actively participate in today's work environment, allowing the organization to grow and excel.

3.5.4   *Future Threats And Opportunities*

This category talks about the interviewees' **future outlook** and their organizations' future digital readiness. The participants talk about their organization's preparedness for future digital change and new technologies.

It is noteworthy to mention that the participants' outlook on the future differs. While #3 is rather positive for the digital future, #5 states that there are 'limits to how much you can digitalize a social service'. #2 sees data gathering as massive future potential that they have to utilize – 'Improving the capturing of data and drawing conclusions from it are big challenges.' #1 sees it as simply self-evident and will continue to evolve with time as it makes the business faster and more efficient.

All the participants see the future as non-stagnant; they expect massive digital advancements in our society and there must be some kind of organizational preparedness for these future trends. Emerging technology, such as artificial intelligence, is seen as a big disruptor of daily business and offers untapped potential for their businesses. However, they pose threats as well, with #5 stating that although digitalisation is indispensable, communication among employees is indispensable and the workforce's wish for interpersonal contact should not be neglected. The experienced COVID-19 fatigue showed that a level of digital integration that overextends might hurt employees' morale.

Overall, the participants show a keen interest in the future developments of technology, and they understand the importance of a well-prepared workforce that understands the importance of new, emerging technology and has the digital literacy knowledge and the digital skills to be able to use this new software.

4. CONCLUSIONS

4.1 *Main Contributions*

The dissertation aimed to answer the research question about how generational differences in digital literacy affect an organization in Luxembourg. The interviews gave valuable insights on this subject. The managers all stated that they have observed generational differences in digital literacy levels and digital skills in general.

Furthermore, the analysis of the interviews showed that the state of digital literacy in an organization is interwoven with other key factors, such as digital adoption.

The intergenerational differences in digital literacy are seen by the managers as knowledge gaps that must be filled, as it makes the organization's functioning more inefficient. The managers stated that digital literacy knowledge is of such importance that employees must possess it before they are deemed employable. It goes to show that digital literacy plays a critical role in maintaining an organization's market position, facilitating digital transformation, and increasing efficiency and innovation.

The research showed that offering solutions to mitigate the digital knowledge gap is important to make sure that the workforce remains knowledgeable and proficient in a rapidly evolving landscape.

Furthermore, the research was able to draw parallels to the existing theoretical framework, showing the digitalisation of the workplace, different approaches to new technologies of the generational cohorts and expanding on how digital literacy knowledge and digital skills play a role in the well-functioning of a business.

To conclude, digital transformation has reshaped the work environment irrevocably. To navigate through this newly shaped environment, employees must possess important skills in the digital realm and be able to understand and use new technologies. These digital literacy skills differ across generations as the importance of technology changed throughout the years and the distinct generations use technology differently. The digital natives' ease of tech-use makes them struggle less than their older counterparts, who might not be as knowledgeable as they used it less in their lives.

A person who does not possess sufficient knowledge about digital tools is not fit for the Luxembourgish workplace and would negatively affect the organizations business as a whole. Inefficiencies, created by poor digital knowledge must be addressed by digital training to guarantee a resilient, modern, and adaptable organization, fit for future changes and challenges.

The analysis shows that in the experience of Luxembourgish managers, an organization is negatively affected by a large intergenerational gap in digital literacy knowledge, as it makes working in a workplace – that has undergone a rapid digital change in the last years – much more inefficient.

Burnouts, phases of inertia, refusal of new technologies and a general sense of being overwhelmed by new software are all effects of a lack of digital literacy knowledge, especially among the older workforces. These effects negatively influence

the organization, and time and resources must be spent to mitigate the lack of digital knowledge.

The dissertation is the first to explore the intergenerational differences in digital literacy skills and their effect on organizations in Luxembourg. It found that digital literacy skills are indispensable abilities needed to successfully navigate in an organization of today and that it is a crucial need for Luxembourgish organizations to be more efficient and fit for today's business landscape. Managers in Luxembourg must try to narrow the intergenerational skills gap to ensure that their organization has the necessary expertise to master the challenges of the future, as digitalisation keeps developing. Thus, high-quality, case-sensitive training and cross-generational digital cooperation are valuable tools that must be used by managers to help their workforces.

A workforce that has a high level of digital expertise allows a firm to be more resilient towards an unknown and digitally rapidly evolving future, as it emerges not just as a set of skills but as a key driver for the organization's ability to adapt.

4.2 Limitations Of The Research

The study has potential limitations, such as the generalizability of findings beyond the portrayed realm of cases, which must be addressed.

The study acknowledges the dynamic nature of digital technologies, and the findings may only reflect a snapshot in time. As the digital landscape continues to evolve and expand, the workplace in the future will change and the findings of this research might not represent the reality of the Luxembourgish workforce anymore.

Furthermore, the sample size of the interviews can limit the generalizability of the findings. The sample size can be broadened in future research, not contradicting the fact that in this research, data saturation was reached after six interviews.

4.3 Future Research Possibilities

This wide-ranging methodology aims to provide a rich understanding of how generational differences in digital literacy influence managers across diverse organizational settings with a focus on the Luxembourgish economy.

Future research can be conducted by interviewing managers active in different sectors or shifting the focus of the research question to another country in or outside the European Union or with different generational cohorts in the mid-to-long-term future.

4.4 Ethical Standards

This study follows ethical standards by making sure that the participants' discretion is respected. Furthermore, guidelines on voluntary participation and clear consent were followed. The participants were informed about the purpose of the interviews, their right to stop the interview at any time, and the measures in place to ensure their anonymity.

To ensure the credibility of the study, double-checking procedures have been employed by comparing the findings of the interviews with existing literature on digital literacy, generational differences, and organisational impacts. The participants of the interviews have been given the chance to examine their answers before publishing, allowing them to add further comments and confirm the correctness of their statements. This has been done to ensure the factual correctness of the dissertation.

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ANNEXES

Annex 1:

Interview Questionnaire:

1. How would you describe the current state of digital literacy within your organization, and have you observed any generational differences in the level of digital skills among your employees?

2. Can you provide examples of specific digital skills or tools that are crucial for success in your industry, and do you notice any variations in the adoption of these skills across different age groups?

3. How does your organization approach digital training and development programs? Are there specific initiatives in place to address the digital literacy needs of different generations within the workforce?

4. In your experience, what challenges, if any, have arisen due to generational differences in digital literacy, and how has your organization addressed or mitigated these challenges?

5. Are there any notable differences in the way younger and older employees embrace and utilize emerging technologies within the workplace?

6. How do you perceive the role of digital literacy in driving innovation and competitiveness within the Luxembourgish economy, and how does your organization stay competitive in this context?

7. Have you implemented any strategies or policies to bridge the digital skills gap between different generations? If so, what has been the impact of these initiatives?

8. How do communication and collaboration patterns differ among employees from various age groups, especially in the context of digital tools and platforms?

9. Are there specific industries or sectors within the Luxembourgish economy where digital literacy plays a particularly significant role, and do you observe varying levels of readiness across different generations in these sectors?

10. Looking ahead, what do you anticipate will be the future challenges and opportunities related to digital literacy within your organization, considering the evolving landscape of technology and the workforce?