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THE RISK OF DIGITALISATION IN CAPITAL-INTENSIVE INDUSTRIES

MAXIMILIAN WALTER EPPLEN

Work project carried out under the supervision of:

Prof. Aman Asija

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Abstract:

Despite the prevalence of digitalisation, the real estate industry has demonstrated significant resistance to this transformation. Therefore, this study examines digitalisation in capital-intensive industries, focusing on commercial real estate. Based on interviews with high-level executives in Germany, the study focuses on the inherent challenges of digital transformation, which can pose significant risks and have received little attention in the literature. The digital resistance is influenced by its heterogeneous nature, risk aversion and digital literacy deficits and a fragmented data landscape and lack of standardisation compound these barriers. However, the study emphasises that digital transformation is not merely about technology adoption but a collaborative, integrated, dynamic and digital risk-aware approach. While the study focused primarily on real estate, the findings could resonate across capital-intensive industries, highlighting the need for continuous adaptation to ensure industries remain resilient and competitive in this evolving landscape.

Keywords:

Capital-Intensive, Digitalisation, Real Estate, Risk

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Abbreviations

AUM

Assets Under Management

ESG

Environmental, Social, Governance

SME

Small and Medium sized Enterprises

1. Introduction

As the global economy moves further into the 21st century, digitalisation is increasingly emerging as a defining force, driving a multitude of industries into an era of unprecedented transformation. This evolution, fuelled by rapid technological advances, introduces a dynamic set of opportunities and risks for companies. Internationally, capital-intensive industries, such as real estate, are deeply involved in this transformation. As the world's largest asset class, real estate holds a pivotal role in the global economy (Braesemann and Baum 2020). According to CBRE (2022), worldwide commercial real estate investments reached a record annual total of US\$1.3 trillion in 2021. In Germany, the real estate industry contributes nearly 23% of the country's overall gross value added, surpassing vital industries, such as automotive, and demonstrating comparable importance to manufacturing (DeStatis 2023; Haila 2000). In addition, the real estate industry employs around 10% of the national workforce and accounts for over 26% of its businesses (Arbeit 2023). Given this significance, it would be reasonable to infer that real estate takes a pioneering role in digitalisation. However, the industry presents a striking paradox in its digital adoption. A survey conducted by the European Investment Bank (2023) underscores that this industry is falling behind in digital investments, particularly digital research and development, besides lagging industries such as agriculture and healthcare (Fielke, Taylor, and Jakku 2020; Kraus et al. 2021). Reinforcing this paradox, surveys by McKinsey (2020) and KPMG (2023) reveal that these industries have not yet fully embraced new digital technologies, even if the long-term benefits are significant. Construction, for instance, spent less than 1% of its earnings on research and development in 2016, while industries such as automobile and aerospace spent between 3.5% and 4.5% (McKinsey 2016). It is, therefore, necessary to delve deeper into the reasons why capital-intensive industries, and real estate in particular, have not yet embraced the digital transformation and why these barriers may, in the long term, develop into challenges and risks that companies should be aware of.

1.1 Digitalisation in Capital-Intensive Industries

The rise of digitalisation has become a compelling megatrend and is commonly defined as the use of modern technologies to process and distribute information (Just and Matzen 2018; Vornholz 2021; Faber 2019). This digital journey forces businesses to reassess and enhance their capabilities to ensure efficiency, effectiveness, and sustainable value creation with a competitive edge (Porter and Heppelmann 2014; Grover, Kohli, and Ramanlal 2018; Verhoef et al. 2021). In this journey, digitalisation affects the functioning of processes, entire departments, and corporate elements such as organisational structures (Kretschmer et al. 2022; Warner and Wäger 2019; Yoo, Henfridsson, and Lyytinen 2010; Chesbrough 2003). The present academic literature regarding digitalisation primarily addresses the conceptualisation of digital business models, mainly focusing on consumer-facing companies (Foss and Saebi 2017; Verhoef et al. 2021; D.J. Teece 2010). However, capital-intensive industries are often not as widely investigated. Those industries, such as manufacturing, healthcare, and real estate, often adopt digitalisation transformations more slowly (Humphreys 2020; Deppner et al. 2023). Despite the theoretical insights provided by corporate behaviour literature indicating specific challenges for organisations connected to their context, industry and environment, as well as barriers, such as inertia and resistance, there is a lack of comprehensive analysis specifically focused on strategic digital transformation (Gao and Hakanen 2021; Björkdahl 2020; Autio et al. 2014; Zahra, Wright, and Abdelgawad 2014). Nonetheless, given their economic significance, understanding the potential challenges and risks of why the respective companies do not embrace digital transformations is crucial (Humphreys 2020; Deppner et al. 2023; von Ahlefeldt-Dehn, Cajias, and Schäfers 2022; Günther et al. 2017; Buck et al. 2023; Trindade and Almeida 2018). Particularly in capital-intensive industries, this digital transformation raises significant strategic and organisational considerations (Geltner et al. 2001; Loonam et al. 2018). Characterised by long-standing traditions, enduring legacies and stable market conditions over long periods, these industries rely heavily on a substantial capital base and require significant

investment in non-digital resources (Gao et al. 2019; Vishnevskiy et al. 2017). In the context of capital-intensive industries, therefore, these considerations manifest in a unique way and may include the disruption of existing business models and different ways of creating, organising, and delivering value (Favoretto et al. 2022; Tavoletti et al. 2022; Björkdahl 2020). However, limited research exists on the negative effects of digitalisation on capital-intensive industries (Manyika et al. 2013; Vigren, Kadefors, and Eriksson 2022; Loonam et al. 2018). While a growing body of research is beginning to shed light on the potential negative aspects for companies (Ahmadova et al. 2022; Buck et al. 2023; Ullah et al. 2021; Malik and Froese 2022), this study will support these efforts by further investigating the challenges and risks of digitalisation for capital-intensive industries.

1.2 Dark Side of Digitalisation Within Real Estate

In the realm of digital transformations, it is crucial also to acknowledge and address the associated challenges and risks that can be considered as the "dark side" of digitalisation (Ahmadova et al. 2022; Buck et al. 2023; Ullah et al. 2021; Malik and Froese 2022). Shifting towards a more technology-centric mode of operation requires a separate analysis within the real estate industry, distinct from other industries, due to its unique characteristics, such as its sensitivity to local market conditions, long project life cycles, and property immobility (Singh, Klarner, and Hess 2020; Just and Maennig 2012). In doing so, digitalisation can impact several practices, such as property development, investment and asset management (McKinsey 2020; Starr, Saginor, and Worzala 2021). The prevailing academic literature suggests segmenting the digitalisation in the real estate industry into three domains: the company, the tenants, and the property. The company has to evolve and digitalise its business processes (Marr 2015; Starr, Saginor, and Worzala 2021), the tenants need to shift their communication preferences to online platforms (Preuß and Schöne 2022), and the property has to be remodelled using, for instance, smart building technologies, that can improve energy efficiency, operational performance, and ultimately project development practices (Azhar 2011; Vornholz 2021). Therefore, this study

will investigate the challenges and risks of digitalisation for capital-intensive industries, applied to the use case of real estate companies in the German market.

2. Methodology

Given the multifaceted challenges of digital transformations within capital-intensive industries, this study aims to answer the research question of which challenges and risks the digitalisation in these industries, particularly the real estate industry in Germany, creates. As elaborated, the investigation of digital transformations in the capital-intensive real estate industry is a nascent yet emerging field of research, as emphasised by Gao et al. (2019), Pfnür and Wagner (2020) and Wang et al. (2013). For comparatively unexplored topics, qualitative research is considered particularly appropriate due to its capacity to gather extensive and in-depth insights to uncover contextual understanding and holistic perspectives (Eisenhardt and Graebner 2007; Graebner, Martin, and Roundy 2012; Creswell and Poth 2016; Denzin and Lincoln 2011). Accordingly, this study adopts a mixed-methods qualitative research approach, combining secondary and primary investigations. The secondary research includes a comprehensive literature review, focusing on academic publications and industry reports, while the primary research consists of qualitative semi-structured interviews (A. Rubin and Babbie 2016). This type of interviewing combines both the advantages of a predefined interview guide and the flexibility to explore new perspectives without reservation (Merriam and Tisdell 2015; Patton 2002). The sampling procedure targeted participants with relevant experience and expertise around their active roles in the digitalisation transformation efforts of their respective entities. As a result, the interview sample consists of 19 diverse participants, all based in Germany, ranging from senior managers and department heads, such as CIOs and CEOs. These participants represented national and international investment organisations, project developers, asset managers, consulting firms, and PropTech companies with significant market presence. Notably, the project developers unite assets under management (AUM), totalling

approximately €64 billion, while the investment organisations possessed a real estate asset value of around €445 billion. Their perspectives provided a comprehensive understanding of the perceived challenges and risks associated with digital transformation in this crucial industry (Solarino and Aguinis 2021; Foss and Pedersen 2016; Welch et al. 2002).

2.1 Data Collection

The data for this study was collected from both primary and secondary research. Firstly, an in-depth literature review was conducted to identify critical areas of inquiry (Merriam and Tisdell 2015). Semi-structured interviews were then used to explore these areas in more depth. The questions were formulated to explore the elite participants' perspectives on the role of digitalisation in industry transformation and the associated challenges they face in their roles and as a company (H.J. Rubin and Rubin 2011). The predefined questions covered three main areas: an introduction, their experience with digitalisation as well as the challenges they faced within this transformation. The interview guide was subsequently reviewed and refined through pilot interviews to ensure clarity and relevance. This approach acknowledged each represented organisation's distinct characteristics and core competencies, ensuring diverse viewpoints. The interviews were conducted via video call in the second quarter of 2023 and lasted between 27 and 60 minutes. The total discourse, spanning nearly 12 hours, holds a vast array of insights within it, further detailed in table one. Prior to the discussions, interviewees were briefed on the study's purpose, the voluntary nature of their participation, and the confidentiality of their responses. Verbal consent was secured from all participants, and the collected data was securely stored and anonymised.

Table 1

Interviewee Background

No.	Position	Type	AUM (in bn.)	Duration (in min.)
IO1	Key Account Manager	PropTech	n.a.	35
IO2	Associate Investment Director	Investment	39	31
IO3	Senior Manager Corporate Development	Development	6*	42
IO4	Digitalisation Development	Development	n.a.	32
IO5	Senior Real Estate Manager	Development	6.5	37
IO6	Head of Leasing	Consultancy	n.a.	27
IO7	Senior Projectmanager	Development	6.6	34
IO8	Head of Real Estate Research Europe	Investment	31.4	34
IO9	Projectmanger	Development	*	52
IO10	Fund Manger	Investment	26	44
IO11	Investmentmanager	Investment	46.8	32
IO12	Head of Real Estate Management Europe	Investment	73.6	35
IO13	Digital Real Estate Manager	Development	51	60
IO14	Senior Associate Director	PropTech	n.a.	33
IO15	Chief Executive Officer	PropTech	n.a.	40
IO16	Chief Information Officer	Investment	120	35
IO17	Managing Director	Property Management	23	37
IO18	Consultant	Consultancy	n.a.	30
IO19	Senior Transaction Manager	Investment	79.1	29
* same mother company			Σ 509	699
			Ø	36.8

2.2 Data Analysis

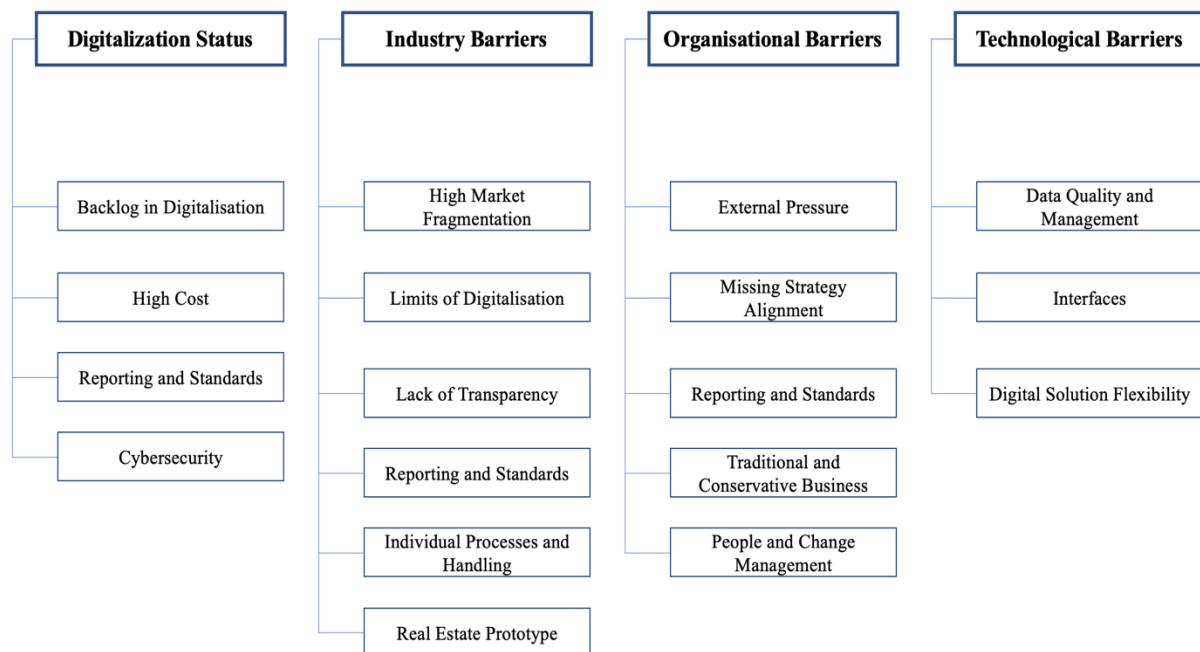
All interviews were audio-recorded, transcribed, and cleared by removing filler words. In the beginning, a comprehensive review of all interview transcripts was conducted, ensuring a complete understanding of the participants' responses. Subsequently, the data was systematically categorised using MAXQDA, a qualitative data analysis software, to manage the large and complex dataset and ensure objectivity and reliability. This enabled the creation of an a posteriori coding guide, adhering to the systematic coding guidelines laid out by Mayring and Fenzl (2019). The analysis process further involved data categorisation, pattern identification and thematic analysis concerning the research questions. With a total of five rounds of coding, axial coding was used to refine the characteristics and dimensions of four identified categories,

and individual cases were examined in detail, allowing for more profound interpretations (Strauss & Corbin, 1998). The coding process followed an inductive theory-building approach (Eisenhardt and Graebner 2007). The summarised results are presented in table two, and the full version of the interviews is disclosed in the appendix.

Even though this approach yielded valuable findings, certain moderating factors should not be neglected, limiting their validity, reliability, and generalisability (Mwita 2022). In particular, the comparatively small sample size limits statistical analysis and hinders the identification of statistically relevant patterns and correlations (Fakis et al. 2014). In addition, the analysis was conducted by a single researcher, which introduces the potential for researcher bias (Mayring and Fenzl 2019).

Table 2

Categorisation of Reported Findings



3. Findings

The following section will present the findings derived from the analytical analysis and coding of the interviews in three main categories related to the digitalisation of capital-intensive real estate companies. Following the research question, these sections will highlight the

complex challenges and risks arising from broader industry barriers and more specific organisational and technological barriers faced by real estate companies in the German market.

3.1 Industry Barriers

The digital transformation of capital-intensive industries faces challenges deeply rooted in the industry's inherent characteristics, as emphasised by the expert interviews. In the real estate industry context, these attributes relate to its assets' highly diverse and geographically dispersed nature, the broader scope of its operations, and the complex regulatory environment. All these factors present unique challenges that differentiate the industry's challenges from others and will therefore be presented below. The following subchapters will first address the initial resistance of the real estate industry to digitalisation, second the regulatory modifications and third, the complexity and heterogeneity of real estate properties.

3.1.1 Resistance to Change

In the past decades, capital-intensive industries have been relatively untouched by the drive for digital transformation, primarily due to the abundance of capital and the absence of any pressing need. As one industry expert stated: *"In recent years, there was no pressure on the real estate industry because there was enough capital and thus no pain point. Consequently, no need for innovation was seen in order to move forward in this area either."* (IO13). IO3 also supported this by highlighting the robust industry profits resulting in low investments for digitalisation: *"Moreover, so much money has been earned in recent years that for many it did not seem necessary to invest in digitalisation to simplify work processes."*

Additionally, the absence of regulatory and other external pressure forcing companies to adapt allowed companies to continue operations without the necessity to embrace digital tools and workflows. This lack of urgency was further amplified by the industry's preference for sticking to established processes. One example is the prominent industry dependence on physical documents: *"Especially in public authorities or municipalities, digital solutions are often not offered and not even demanded. Therefore, the motivation to invest resources into*

digitalisation is lacking in some places." (IO10). Achieving a comprehensive digital overhaul is furthermore challenging, not only due to the stakeholder's traditional mindset but also due to the regulatory frameworks, particularly property rights: *"Property rights and the land register are important legal issues that still exist in physical form and must be dealt with in person at the local notary. Digital contracts exist, but when it comes to selling a property, a personal visit to the notary still has to take place."* (IO5).

These persistent barriers underscore the challenges of achieving complete digital transformation within the German real estate industry. However, in recent years, this resistance has started to fracture since capital raising has become more demanding and new reporting requirements for capital-intensive enterprises have been published. Those necessitate constant and data-based reporting, which can be significantly facilitated through digital operations: *"It is now becoming problematic to get money on the market, and the reporting requirements are increasing, especially for banks and financing. It is for EU taxonomy compliance and consumption data for real estate."* (IO13).

3.1.2 Regulatory Modifications

In addition to the above-mentioned extended reporting obligations, the industry faces further regulatory challenges. Many organisations increasingly turn to digitised operations to navigate this evolving legislative landscape to ensure compliance. Thereby, companies are seeking to collect data on their operations and assets in order to be able to report about their ESG (Environmental, Social, Governance) incentives. Notably, reporting obligations centred around an enhanced investor focus on ESG factors have significantly impacted the industry. As one interviewee noted: *"The sustainability issue and ESG have caught on with investors and are also being pushed by the regulatory side, for example, in the context of Article 8 and Article 9."* (IO8). These articles relate to the sustainable finance disclosure regulation aimed at increasing transparency about sustainability in the financial services sector within the European Union.

Nevertheless, it is crucial to consider the dynamic nature of these regulatory frameworks, which continually evolve to address emerging market needs and changes. This fluidity introduces an additional layer of risk, given the long-term planning characteristic: *"The criticism is mainly directed against the legal regulations in Germany, which often stand in the way of the implementation of digital processes."* (IO14). Accordingly, this potential volatility might increase the risk of suboptimal investment strategy decisions in the area of digitalisation.

3.1.3 Heterogeneity and Complexity of Real Estate Industry

Besides the stakeholder's traditional mindset and the regulatory necessity for physical documents, real estate properties' unique heterogeneity and complexity amplifies the industry's digitalisation challenge. As one interviewee explained: *"Each building is different, and each culture varies when you are globally distributed."* (IO12). Given the unique attributes inherent to each building, many respective processes requiring physical interactions persist integral to property assessments: *"Personal viewings will remain irreplaceable in the future, especially when it comes to long-term decisions such as renting or buying. It is important to get a personal impression of a property or object in order to make sure that it meets your requirements. This cannot be completely replaced by online tools."* (IO6). Another expert exemplified the situation: *"There are simply too many individual aspects. Every plot of land is different. Every federal state in Germany has its own building law."* (IO15). Therefore, market players must develop tailored strategies to encounter these individualities. One interviewee described: *"The problem is that real estate as an object is very heterogeneous by nature and that the market participants in this industry are also very heterogeneous, both in their investment style and in their functions. As a result, there is often no single solution for digitalisation, and companies need several specific solutions to meet their requirements."* (IO15).

These dissimilarities span an intricate web of complexity across properties, processes, regulations, and market players not typically encountered in other industries. As a result, it positions the real estate industry as a *"The real estate industry is a prototype industry since*

every construction project is unique." (IO4), in contrast to more standardised industries: *"There is more scope for standardisation in the automotive industry compared to the real estate one, which is more individualised."* (IO4). Subsequently, digitalisation poses distinct challenges unseen in more homogenous industries.

3.2 Organisational Barriers

Building on the exploration of the broader industry landscape, the focus is now narrowed to the barriers faced by individual organisations, in line with the research question on the risks of digitalisation in capital-intensive industries. Therefore, the following section will examine the interview findings on the prevailing lack of awareness of the potential of digitalisation, the risk of data sharing and the strategic misalignment of digitalisation strategies within organisations.

3.2.1 Unawareness of Digitalisation

Unawareness about digitalised operations is a prevalent issue within the real estate industry, as one interviewee confirmed: *"Turning the world upside down is, in my opinion, the problem in the real estate industry. There is no awareness of what is technically possible today. That is why my main task as a managing director is to show companies what is technically possible in the first place."* (IO15). As one interviewee stated, one of the reasons for this unawareness lies within the personnel of the respective real estate companies: *"Another problem is the mentality in the industry. Project developers tend to have older employees who are less open to new software solutions."* (IO3). IO12 also emphasised: *"In a nutshell, the greatest challenges or problems lie with the personnel."* (IO12). This frequent lack of awareness of digitalisation's potential uses and benefits can lead to significant risks relating to slower transition processes. Therefore, digital strategies can also often be under-prioritised, preventing organisations from realising the full potential of digital tools and solutions.

3.2.2 Resistance to Data Sharing

The identified lack of understanding is compounded in the context of data sharing. The strong reluctance proves to be a significant barrier to industry-wide collaboration, which can impede efficient digital solutions development. IO13 elaborates on this by comparing the German market transparency: *"If you compare Switzerland, Germany and Austria in the German-speaking world, Germany is the most intransparent market in real estate."* This hesitation is, among others, strongly shaped by regulatory constraints such as the General Data Protection Regulation (GDPR), which aims to protect data privacy rights and to reshape how organisations approach data privacy. This hesitance, particularly concerning monetary matters and property details, further exacerbates the issue: *"This is often culturally determined because, in Germany, people do not like to talk about money and values."* (IO11). In addition, IO11 raised a game-theoretic concern that private data, once shared, could become a public good, creating a dilemma for companies considering sharing their data for collective industry improvement. In that way, organisations that pioneer in data sharing through digital solutions might be disadvantaged if their openness is not reciprocated.

3.2.3 Strategic Misalignment

Another risk is that organisations within the real estate industry often do not prioritise digitalisation initiatives since they are often considered *"secondary to the core business"* (IO3). This contrasts with other industries already operating in digital ecosystems, such as IT services and their strategies, which are therefore inherently linked to digital transformation. It is, therefore, crucial to recognise that digitalisation strategies are not universally applicable to the real estate industry, as they require a change in working patterns and behaviours, challenging traditional operational structures. Thus, it seems evident that IO3 explained: *"We only address it when there is an explicit need from the departments of the core business."* Moreover, IO2 highlighted the dependence of the strategies' success on the commitment of the senior management: *"It becomes problematic without the buy-in from the senior management. Only if*

the senior management expects the information to be derived from digital tools, it is enforced from the top and all employees need to comply with it." Nonetheless, IO3 pointed out that: *"Interestingly, however, there is strong pressure from younger employees who, as digital natives, have an intuitive understanding that processes should be leaner."* IO2 summarised that: *"The setup must come from top to bottom so that employees are motivated to use the solution."* Hence, it is decisive for digitalisation strategies to succeed that both the top management and the workforce are aligned and committed. Otherwise, strategic misalignment could lead to poor investment decisions, posing a financial risk and failure to realise the full potential of digitisation.

3.3 Technological Barriers

From broader industry hurdles and specific organisational barriers, the focus will now shift to technological barriers companies face when trying to integrate digital technologies into their traditional real estate operations effectively. The key challenges that will be presented relate to the lack of standardisation in data solutions, resulting in a fragmented application landscape and inaccurate data quality.

3.3.1 Missing Standardisation

The interviewees revealed that in capital-intensive industries, particularly real estate, standardisation of data solutions is a crucial issue since it contributes to enhancing operations and minimising risks. However, it appeared that these standardised solutions, relating to processes, formats, and software applications, are not prevailing in the industry, which often creates inconsistencies and inefficiencies. On a communal level, one contributing reason for this might be the non-existence of a standardised national approach to data gathering. IO13 observed: *"However, there is no uniform data collection in Germany; the cities have to collect everything themselves. Thus, there is no nationwide land register. We do not even know how much space is still vacant."* On a corporate level, the issue of missing standardised data solutions is particularly pronounced for small and medium-sized enterprises (SMEs). As IO15

pointed out: *"The problem for smaller companies is that there are either very comprehensive solutions such as SAP that are only suitable for large companies, nor there are no solutions comprehensive enough to cover most aspects of the business but are still fairly priced."*

Moreover, this may be compounded by the frequent demand from tenants for individualised solutions due to the projects varying characteristics, which presents a substantial challenge for operators and adds another layer of complexity. This distinct nature of real estate is reflected in IO3's comment: *"Tenants want tailored solutions and do not want to live in a standard prefab house. This leads to relatively little standardisation and unique processes that can quickly vary depending on the project and region."* This variability burdens software developers with a myriad of requirements to accommodate. As IO1 pointed out, finding the right balance between efficient standardisation and the need for individualisation is difficult: *"There is a constant struggle between standardisation from above and individualisation from below."* As a result, the absence of standardisation can pose a substantial risk and impediment to the efficient operation in capital-intensive industries. These unintentional losses in efficiency can be referred to as "efficiency brakes" as they hinder digital transformation's principal objective of optimising operational excellence. Another example for this phenomenon might be that digital tools may sometimes even amplify the complexity and workload at first hand. For instance, creating an invoice that used to be done manually and then converting to a digital process that requires more administrative steps, as illustrated by IO3: *"Unfortunately, the introduction of the tool has also meant that staff now has to invest more time in order to submit an invoice."* Lastly, IO14 raised the concern that digital operations may also reach a point of saturation, which should not be neglected: *"There is also a certain point where another digital tool is no longer useful and does not bring any further improvement."*

3.3.2 Fragmented Application Landscape

The absence of standardisation can also be observed in the reliance on multiple software applications: *"Another problem with many software programs is that they are often limited to*

specific subject areas. This means that you need a separate software for each individual subject area in the real estate industry or in the life cycle of a property. This means that you must work with many software programs that all must communicate with each other." (IO14). Further illustrated by IO15: *"The data comes from different sources, in different formats, and each company, in turn, has different software from different providers. It is difficult to bring this data into a standardised form and merge it."* This may develop into a significant constraint on efficiency as *"often information from different sources has to be pulled together and verified, leading to inefficiencies."* (IO1). Such processes consume considerable time and can postpone critical operations: *"In reporting, it often takes two weeks for all the information to be collated and verified."* (IO1). Thus, this time-consuming aspect of such tasks poses a risk to digitalisation. This complexity is compounded by a perceived lack of unified solutions for data storage and sharing, as highlighted by IO5: *"Different platforms are used to share files, leading to further fragmentation of documentation."* IO16 further describes the situation between organizations: *"So far, there is a lack of sufficiently large associations and platforms that can establish uniform standards and data models."* This fragmentation in software applications not only bears the risk of inefficiencies but also of misinformed decisions, as information might be inaccessible or missing. Bridging to the subsequent finding, it becomes evident that this siloed approach contributes significantly to the challenge of maintaining high data quality.

3.3.3 Inaccurate Data Quality

The inability to extract clean data from a unified structure and transform it into accurate and reliable information, for instance reporting purposes, directly risks the data's competitive use and the potential exploitation of digitalisation. This was brought up by several interviewees: *"Everyone does their own thing. Even if you go to the data level, there is often no common format or digitalised platform with all the information in a processed form."* (IO2). IO10 also raised concerns about the risks associated with inaccurate or incomplete data: *"The main problem is the quality of data."* And IO15 echoed: *"We have found that the data is often not*

available in the form and quality necessary for a sensible evaluation.". Confirming this aspect, IO13 related the importance of clean data for generating error-free reports: *"Data foundation has to be clean, and, in most cases, this is not or very piecemeal in silos."*. Hence, the efforts needed to extract and accurately use clean data require high resources, for instance emphasised by IO13: *"We have a project team that is solely dedicated to data."*. A reluctance to undertake such significant investments in digitalisation infrastructures, thus, poses a considerable risk to real estate enterprises and leaves them ill-equipped to face future challenges.

4. Discussion

Following the presentation of the interview findings, the following paragraph will interpret the results, draw connections with existing literature, and shed light on the implications of the research. By complementing the findings with previous knowledge, this study aims to provide a more nuanced perspective on the digitalisation within capital-intensive industries. This aims to answer the research question of which challenges and risks capital-intensive industries face during their digital transformation by applying it to the real estate industry. During the interviews, it became transparent that capital-intensive industries face profound and unparalleled challenges in their digital transition due to their inherent traits, encompassing industry-wide, organisational and technological dynamics. While many capital-intensive industries face these dynamics, the real estate industry is confronted with additional obstacles due to the tangible nature of its assets, the multifaceted nature of its operations, and the customised nature of its services. Thus, the risks and challenges associated with digitalisation emerged as considerable concerns parallel to its potential benefits. Therefore, this study contributes valuable to both theory and practice, not neglecting certain limitations.

4.1 Contribution to Theory

For this purpose, the following will discuss the interview findings divided into three subcategories, namely the challenges for capital-intensive industries, those related to the

digitalisation itself and the resulting risks from this transformation as valuable contributions to the existing literature.

4.1.1 Challenges for Capital-Intensive Industries

The findings of this study extended the body of literature addressing digitalisation's impact on capital-intensive industries by exploring the reasons these industries have historically lagged in digital adoption (Amit and Zott 2012). As the interviews revealed, the market has been sufficiently solvent in the past and there has been little external pressure, such as regulation, to force property companies to adapt to digital transformation. This echoes Tripsas (2009), who highlighted the difficulties of adopting technological change because routine firms misinterpret external stimuli. This lack of pressure to adapt also fuels the traditional mindset identified in the interviews, which is often prevalent in capital-intensive industries, particularly within real estate. Building upon the concept of organisational path dependency, the literature also highlights the central role of historical decisions in guiding or preventing digital transformation (Sydow, Schreyögg, and Koch 2009). Legacy data management and operational systems, shaped by traditional organisational roles, additionally make it challenging to integrate new, flexible digital solutions (Sine, Mitsunashi, and Kirsch 2006; Ashok et al. 2021; Henderson and Ruikar 2010). The resulting significant sunk costs in the industry's digital infrastructure underscore its reluctance to pivot quickly to digital paradigms.

Besides, the interviews identified a digital literacy gap within the industry associated with the prevailing traditional mindset. This is in line with the literature on the link between an organisation's willingness to invest in digital technologies and its awareness of the potential benefits, which poses the highest risk of failure, according to Ullah et al. (2021). Another reason for the restraint of decision-makers might be the absence of "success stories" which has been identified as a barrier for adoption in other industries (Lavikka et al. 2018). In capital-intensive industries and particularly real estate, Dooley (2017) and Gilbert (2005) further highlighted routine stiffness as one of the primary reasons for the non-adoption of technology. This routine

stiffness refers to the insistence on following traditional procedures and the failure to transform organisational processes. Thereby, a lack of skilled workforce to maintain digital technologies might contribute to this, as empirical data by Neumann (2017) advocates that the problem with digitalisation does not lie in the scarcity of tools but in the lack of employees having the necessary skills to operate them.

Another revealed cause for this traditional mindset and transformation reluctance is the risk aversion that can often be observed in capital-intensive industries, also within real estate, which inhibits innovation. The characteristic long-term projects with substantial capital requirements amplify the potential cost of failure and reinforce a culture of risk aversion (Embacher 2021; Dixit and Pindyck 1994; Geltner et al. 2001; Just and Maennig 2012). In industries that are already deeply embedded in digital landscapes, such as IT services, risk aversion is lower because they do not require substantial change. Their established digital foundation allows them intuitively to benefit from compatibility, transparency and standardisation (Bastos Porsani et al. 2021). In stark contrast, real estate presents an intricate digital mosaic, as illuminated by the findings. Hence, it is essential to respect the characteristics of capital-intensive industries in their specific digital strategies to add depth and granularity to the ongoing discourse (Bergmann et al. 2020; Braesemann and Baum 2020; Nambisan, Wright, and Feldman 2019). Finally, real estate companies must overcome their traditional mindset, leave their comfort zone and pioneer as they otherwise will become obsolete, as underscored by Christensen (2013) and Liang and Qi (2017).

4.1.2 Challenges with Digitalisation

Contrary to the predominant discourse that frequently celebrates the positive aspects of digitalisation (Bharadwaj et al. 2013; Yoo et al. 2012), this research revealed the additional layers of complexity and potential vulnerabilities it introduces, referred to as the "dark side" of digitalisation (Buck et al. 2023; Malik and Froese 2022; Trittin-Ulbrich et al. 2021). In accordance with the elaborated findings, which emphasised the fragmented data landscape and

missing standardisation within the real estate industry, this study further discovered the importance of accurate data management and sharing, which is not yet widespread. Pinpointing them as the epicentre of complexities in the digital transformation, this research underscored the industry's unique nature. As the findings show, heterogeneity impedes the application of a universal one-size-fits-all digital strategy, thus, causing data fragmentation and potential intransparency. This complies with Aina (2017), who showed that a lack of industry-wide standards and policies is a significant barrier to adopting digital technologies. In becoming a truly data-driven industry, such opacity may evolve into an operational risk, limiting digitalisation's potential benefits and obstructing the effective utilisation of the generated data (LaValle et al. 2010; Saiz 2020).

Another result of the industry's heterogeneity is the use of different systems to accommodate the diverse processes. In the past, real estate companies integrated a range of software applications for different utilisation stages, characteristics, or client requirements of the property lifecycle (Saull, Baum, and Braesemann 2020; Ullah, Sepasgozar, and Wang 2018). However, this use of various applications complicates the interoperability between systems, which in turn limits seamless communication and collaboration. Without standardised ecosystems, industries face the risk of duplicating efforts and compounding workflows, a sentiment echoed by both Sleiti, Kapat, and Vesely (2022) and Bharadwaj et al. (2013), who emphasise that such gaps can significantly hinder collaboration and dilute the advantages that digitalisation promises. These operational inefficiencies can also arise when digitalisation fails to fully address specific processes or unique property characteristics on each of the three domains, namely, the company, the tenants, and the property. Referred to as 'efficiency brakes' in this research, they pose a significant threat to the competitiveness and strategic positioning of companies, underlining the necessity for strategic and thoughtful management of the digitalisation process. This resonates with the findings of (Bergmann et al. 2020), underlining the broader ramifications beyond mere operational constraints. Despite, it should be recognised

that not all systems fit all company sizes. Mesa et al. (2022) raised awareness that 'one-fits-all solutions' (Aina 2017) may be appealing to large companies with large investment budgets but discouraging for SMEs with less financial power.

Besides inefficiencies, the fragmented and non-standardised application landscape makes data quality hard to reach and maintain. While data can be a powerful tool, the emergence of data silos restricts collaborative opportunities within and across organisations, introducing the central role of data as a double-edged sword (Radecke 2023). These findings follow previous studies by Sadayuki, Harano, and Yamazaki (2019), Nadler (2018), and Newell (2016) emphasising the importance of resolving data intransparency and inaccuracy issues. Alongside the quality of data, sharing data is essential to create an industry-wide ecosystem, as uncovered by the interviews.

Nevertheless, the digitalisation of the real estate industry is so underdeveloped that data sharing is still seen as a risk rather than an opportunity. This mentality of withholding information persisted in the past and continues to this day. Companies do not yet see the big picture of sharing data to achieve a transparent market. This kind of behaviour makes information scarce and a valuable asset in the industry (Schulte, Rottke, and Pitschke 2005; Newell 2016). This recognition acknowledges the need to consider the potential risks and complexities inherent in the digitalisation journey of capital-intensive industries.

4.1.3 Resulting Risk Management

While the prevailing discourse often highlights the potential of well managed digitalisation for growth and efficiency (Bharadwaj et al. 2013; Haffke, Kalgovas, and Benlian 2017), the risks involved often go under-addressed (Wimelius et al. 2021; Gao et al. 2019). However, in the economic landscape in which the real estate industry plays a crucial role but is still hesitant to embrace digital changes, as outlined in the introduction, it is crucial to examine the underlying unique set of risks. Therefore, this study offers a nuanced view on the elaborated challenges which will develop into risks if unmanaged, emphasising the need for a balanced,

risk-aware approach to digital transformation (Yoo, Henfridsson, and Lyytinen 2010; Leonardi 2017). Within this discourse, the multifaceted risks can be differentiated into technological, legal, operational and financial factors.

Existing literature often treats digitalisation strategies and risk management as separate entities by applying traditional risk management approaches, thus overlooking their intertwined nature (Bromiley et al. 2015; D. Teece, Peteraf, and Leih 2016). Additionally, industry-specific risks are often not sufficiently recognised, as highlighted by the interviews and literature findings (Sitek 2019; Proff, Sommer, and Knobbe 2020; Xiang et al. 2022). Therefore, primary and secondary research revealed the need for a more integrated risk management approach. A potential implementation risk should also be recognised due to the fragmented data landscape that has been identified as prevalent in the real estate industry.

In addition, prevailing risk management approaches are often not dynamic enough to take account of changes, such as regulatory changes (Sharma 2022; Ullah et al. 2021). As discussed in the use case for ESG regulation, technology can evolve faster than the respective legal frameworks. This creates the risk that investments may become obsolete or non-compliant over the long investment horizon, as raised by the interviewees. Such a misallocation of resources can create ripple effects across the industry, echoing the contagion effect of crises, as illustrated by Yu, Sengul, and Lester (2008). This is consistent with Anthony Jr (2019) findings, which emphasised the need for legal frameworks and related proposals from government institutions to achieve information retrieval aiming for sustainability. Mergel (2019) also mentioned that government relevance for digital transformation is mostly not captured in academic studies despite being critical to create holistic adoption blueprints (Bannister and Connolly 2015).

Besides the nature of the firm's risk management approach, the commitment of the senior management has been brought up by the interviewees as a decisive factor for the success of digitalisation strategies. As underlined by Eggers and Kaplan (2009), the decision-making dynamics of high-ranking executives play a pivotal role in influencing an organisation's

adaptability to such technological shifts. Similarly, Tripsas (2009) and Haneem et al. (2019) underscored top management support as one of the principal factors affecting digital adoption and innovation. Moreover, when digitalisation endeavours are inadequately conceptualised or misaligned with overarching strategies, the financial exposure for capital-intensive organisations heightens due to misleading investments (Sine, Mitsuhashi, and Kirsch 2006; Henderson and Ruikar 2010). Ullah et al. (2021) additionally highlighted the lack of management trust in new technology adoption as a critical success barrier, echoed by Ho, Ocasio-Velázquez, and Booth (2017) claiming that the trust of stakeholders dictates its adoption. Therefore, it is crucial for businesses to assess the characteristics specific to their industry carefully and the obstacles they may encounter in their journey towards digitalisation, to integrate these insights, and to ensure commitment across all organisational tiers.

4.2 Contribution to Practice

After contributing to the existing literature, the following section will draw recommendations for companies to enhance the management of the identified challenges and emerging risks. As evidenced by the findings, this research already highlighted that the key to effective digital transformation in capital-intensive industries is not merely technology adoption but a nuanced view that recognises the benefits while also considering the inherent risks. As a result, this research advocates a paradigm shift advising companies to move towards more integrated, dynamic, and risk-aware digitalisation strategies, being aware of both opportunities and risks of developing technologies but is also agile enough to pivot when necessary. Thereby, organisations need to incorporate the interwoven industry-specific, organisational, and technological risks they face, necessitating a holistic rather than fragmented view. This proactive approach will ensure that digital solutions are better integrated, aligning seamlessly with the organisation's willingness and capacity for change. Such an agile and informed approach will also secure businesses to remain resilient and competitive. In addition, a

pioneering digitalisation that the firms should strive for will enable them to gain a competitive edge in the rise of ESG reporting and implementations on company, tenant, and property level.

Beyond mere risk management and transformation strategies, real estate companies should foster a culture of innovation, adaptability, and collaboration to fully leverage the benefits of their transformation journey, especially in this more conservative industry. It is, therefore, crucial to identify and address stages with pronounced organisational inertia early in the digital strategy formulation. Nationwide standardisation and interoperability, coupled with a culture of data sharing, will significantly mitigate data fragmentation. In addition, real estate companies should aim for a culture that understands the vital role of accurate data management, actively lives data transparency, and harnesses the power of data sharing. It will also be essential to create the understanding and capabilities required for the transformation within the organisation, which can be achieved through targeted skill development, for example, regarding data handling. Subsequently, the migration towards a unified digital ecosystem will facilitate seamless collaboration, optimise decision-making, and streamline operations activities for a multitude of stakeholders. Thereby, companies can benchmark with other pioneering platforms that start to emerge in the market. One example can be seen in the platform Bulwiengesa, where over 20 real estate companies share their anonymised data around recent transactions, including the type of use, property size, purchase price, yields and multiples (Embacher 2021). For such a holistic adoption, organisations must recognise the decisive role of a convinced and motivating. On a broader level, governments could support the efforts through targeted funding and incentives to establish nationwide standards.

4.3 Limitations and Future Research

Before concluding, certain limitations of this research and further research recommendations should be acknowledged. Besides secondary research, the findings mentioned above relied heavily on primary research in the form of qualitative interviews. This method creates limitations from both the data collection and analysis. Firstly, the sample of

interviews was primarily aimed at high-level strategic perspectives, which may have left out insights from the ground level, also due to the relatively short duration of the interviews of 37 minutes on average. The digital format of the interviews might additionally miss subtle non-verbal cues crucial to qualitative research. The primary research relied on the answers of 19 participants, a relatively small number of interviews, limiting the generalisability of the findings. The collected data may furthermore include multiple biases. Geographical and contextual biases may be included since only participants based in Germany have been interviewed, introducing potential disparities in experiences based on regional specificities, such as market maturity or regulatory climates. Self-reporting biases may also exist, especially among senior executives who may present a more favourable view of their firm's digital transformation journey. Furthermore, the use of MAXQDA to analyse the data may have introduced subjectivity as the results were based on the interpretation of a single researcher. Lastly, the findings solely focus on the commercial real estate industry, while the broader landscape of capital-intensive industries was not explored in depth.

Therefore, future research should investigate the distinct challenges and risks tied to digitalisation within specific asset classes and varying company types. Future research should employ a blend of qualitative and quantitative methods to enrich the understanding of digital transformation in capital-intensive organisations. Thereby, qualitative detailed case studies could provide rich, contextual insights into the process dynamics, while quantitative approaches could reveal industry-wide patterns and trends. Based on the dual-aspect model, these studies could also help develop effective strategies to address the specific challenges and risks. Moreover, examining other industries, such as healthcare and manufacturing, is necessary to draw cross-industry conclusions for capital-intensive industries. Finally, research should take into account the dynamic nature of digital transformation, which requires continuous monitoring and adaptation of findings and recommendations.

5. Conclusion

As presented within this thesis, the digital transformation process is undeniably fraught with complex challenges which can develop into potential risks for capital-intensive industries. Following the research question, the analysis delved deep into the real estate industry and illuminated the multifaceted dynamics at play during this transformation journey. One of the most profound revelations of this research is the depth of resistance that capital-intensive industries, particularly real estate, have shown to the digital wave. The heterogeneity within the industry, an inherent risk aversion, and a marked lack of digital literacy have all contributed to an ecosystem where change, while inevitable, is approached with caution. In addition, the industry's fragmented data landscape and inaccurate data management adds layers of complexity to this scenario, underscoring the need for standardisation, transparency, and collaboration. To counteract this caution, the analysis uncovered the importance of strategic alignment, top-level commitment, and a proactive approach to digital risk management as critical success factors. Industry stakeholders should, therefore, appreciate the strategic blend of emerging risks and craft comprehensive strategies that tackle the hurdles holistically rather than in isolation. Businesses aiming to remain relevant and competitive must navigate this journey with foresight, agility, and a deep-rooted understanding of both their internal dynamics and external market forces. Thus, the journey towards harnessing the true potential of digitalization in the real estate industry is as much about recognizing and unraveling the intricate tapestry of interwoven risks as it is about embracing technological advancements. Despite yielding valuable contributions to both theory and practice, this study also recognised certain limitations to its findings. Focusing on the real estate industry provided in-depth perspectives but may not capture the full range of challenges all capital-intensive industries face. Moreover, while the challenges and risks have become apparent, the solutions, especially in a rapidly evolving digital age, require continuous investigation, adaptation, and learning.

References

- Ahmadova, Gozal, Blanca L Delgado-Márquez, Luis E Pedauga, and Dante I Leyva-de la Hiz. 2022. "Too good to be true: The inverted U-shaped relationship between home-country digitalization and environmental performance." *Ecological Economics* 196: 107393.
- Aina, Yusuf A. 2017. "Achieving smart sustainable cities with GeoICT support: The Saudi evolving smart cities." *Cities* 71: 49-58.
- Amit, Raphael, and Christoph Zott. 2012. "Creating value through business model innovation." *MIT Sloan management review*.
- Anthony Jr, Bokolo. 2019. "Green information system integration for environmental performance in organizations: An extension of belief–action–outcome framework and natural resource-based view theory." *Benchmarking: An International Journal* 26 (3): 1033-1062.
- Arbeit, Bundesagentur für. 2023. "Branchen im Fokus." <https://statistik.arbeitsagentur.de/DE/Navigation/Statistiken/Interaktive-Statistiken/Branchen-im-Fokus/Branchen-im-Fokus-Nav.html>.
- Ashok, Mona, Mouza Saeed Mohammed Al Badi Al Dhaheri, Rohit Madan, and Michael D Dzandu. 2021. "How to counter organisational inertia to enable knowledge management practices adoption in public sector organisations." *Journal of Knowledge Management* 25 (9): 2245-2273.
- Autio, Erkko, Martin Kenney, Philippe Mustar, Don Siegel, and Mike Wright. 2014. "Entrepreneurial innovation: The importance of context." *Research policy* 43 (7): 1097-1108.
- Azhar, Salman. 2011. "Building information modeling (BIM): Trends, benefits, risks, and challenges for the AEC industry." *Leadership and management in engineering* 11 (3): 241-252.

- Bank, European Investment. 2023. Digitalisation in Europe 2022–2023. Accessed 14. August 2023.
- Bannister, Frank, and Regina Connolly. 2015. "The great theory hunt: Does e-government really have a problem?" *Government Information Quarterly* 32 (1): 1-11.
- Bastos Porsani, Gabriela, Kattalin Del Valle de Lersundi, Ana Sánchez-Ostiz Gutiérrez, and Carlos Fernández Bandera. 2021. "Interoperability between building information modelling (BIM) and building energy model (BEM)." *Applied sciences* 11 (5): 2167.
- Bergmann, Patrick, Endre Kamarás, Werner Gleißner, and Edeltraud Guenther. 2020. "Enhanced cash flow valuation in real estate management by integrating innovative materials and risk assessment." *Sustainability* 12 (6): 2201.
- Bharadwaj, Anandhi, Omar A El Sawy, Paul A Pavlou, and N v Venkatraman. 2013. "Digital business strategy: toward a next generation of insights." *MIS quarterly*: 471-482.
- Björkdahl, Joakim. 2020. "Strategies for digitalization in manufacturing firms." *California Management Review* 62 (4): 17-36.
- Braesemann, Fabian, and Andrew Baum. 2020. "PropTech: Turning real estate into a data-driven market?" *Available at SSRN* 3607238.
- Bromiley, Philip, Michael McShane, Anil Nair, and Elzotbek Rustambekov. 2015. "Enterprise risk management: Review, critique, and research directions." *Long range planning* 48 (4): 265-276.
- Buck, Christoph, John Clarke, Rui Torres de Oliveira, Kevin C Desouza, and Parisa Maroufkhani. 2023. "Digital transformation in asset-intensive organisations: The light and the dark side." *Journal of Innovation & Knowledge* 8 (2): 100335.
- CBRE. 2022. "2021 Global Investment Volume Hits Record Level." Accessed 07 July 2023. <https://www.cbre.com/insights/briefs/2021-global-investment-volume-hits-record-level>.

- Chesbrough, Henry William. 2003. *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.
- Christensen, Clayton M. 2013. *The innovator's dilemma: when new technologies cause great firms to fail*. Harvard Business Review Press.
- Creswell, John W, and Cheryl N Poth. 2016. *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- Denzin, Norman K, and Yvonna S Lincoln. 2011. *The Sage handbook of qualitative research*. sage.
- Deppner, Juergen, Benedict von Ahlefeldt-Dehn, Eli Beracha, and Wolfgang Schaefers. 2023. "Boosting the Accuracy of Commercial Real Estate Appraisals: An Interpretable Machine Learning Approach." *The Journal of Real Estate Finance and Economics*: 1-38.
- DeStatis. 2023. ["https://www.destatis.de/DE/Themen/Wirtschaft/Konjunkturindikatoren/Volkswirtschaftliche-Gesamtrechnungen/vgr210.html#241964."](https://www.destatis.de/DE/Themen/Wirtschaft/Konjunkturindikatoren/Volkswirtschaftliche-Gesamtrechnungen/vgr210.html#241964) Accessed 07 July 2023. <https://www.destatis.de/DE/Themen/Wirtschaft/Konjunkturindikatoren/Volkswirtschaftliche-Gesamtrechnungen/vgr210.html#241964>.
- Dixit, Avinash K, and Robert S Pindyck. 1994. *Investment under uncertainty*. Princeton university press.
- Dooley, Kenneth. 2017. "Routines, rigidity and real estate: Organisational innovations in the workplace." *Sustainability* 9 (6): 998.
- Eggers, Jamie P, and Sarah Kaplan. 2009. "Cognition and renewal: Comparing CEO and organizational effects on incumbent adaptation to technical change." *Organization Science* 20 (2): 461-477.
- Eisenhardt, Kathleen M, and Melissa E Graebner. 2007. "Theory building from cases: Opportunities and challenges." *Academy of management journal* 50 (1): 25-32.

- Embacher, Felix. 2021. Transparenz auf einem gewollt intransparenten Markt. Accessed 16. June 2023.
- Faber, Oliver. 2019. "Digitalisierung—ein Megatrend: Treiber & Technologische Grundlagen." *Management 4.0—Unternehmensführung im digitalen Zeitalter*: 3-42.
- Fakis, Apostolos, Rachel Hilliam, Helen Stoneley, and Michael Townend. 2014. "Quantitative analysis of qualitative information from interviews: A systematic literature review." *Journal of Mixed Methods Research* 8 (2): 139-161.
- Favoretto, Camila, Glauco Henrique de Sousa Mendes, Moacir Godinho Filho, Maicon Gouvea de Oliveira, and Gilberto Miller Devós Ganga. 2022. "Digital transformation of business model in manufacturing companies: challenges and research agenda." *Journal of Business & Industrial Marketing* 37 (4): 748-767.
- Fielke, Simon, Bruce Taylor, and Emma Jakku. 2020. "Digitalisation of agricultural knowledge and advice networks: A state-of-the-art review." *Agricultural Systems* 180: 102763.
- Foss, Nicolai J, and Torben Pedersen. 2016. "Microfoundations in strategy research." *Strategic Management Journal* 37 (13): E22-E34.
- Foss, Nicolai J, and Tina Saebi. 2017. "Fifteen years of research on business model innovation: How far have we come, and where should we go?" *Journal of management* 43 (1): 200-227.
- Gao, Shan, and Esko Hakanen. 2021. "Technical capabilities are not enough: deploying internet of things in the metals and mining industry." *International Journal of Services Technology and Management* 27 (4-6): 307-323.
- Gao, Shan, Esko Hakanen, Pekka Töytäri, and Risto Rajala. 2019. "Digital transformation in asset-intensive businesses: Lessons learned from the metals and mining industry."
- Geltner, David, Norman G Miller, Dr Jim Clayton, and Piet Eichholtz. 2001. *Commercial real estate analysis and investments*. Vol. 1. South-western Cincinnati, OH.

- Gilbert, Clark G. 2005. "Unbundling the structure of inertia: Resource versus routine rigidity." *Academy of management journal* 48 (5): 741-763.
- Graebner, Melissa E, Jeffrey A Martin, and Philip T Roundy. 2012. "Qualitative data: Cooking without a recipe." *Strategic Organization* 10 (3): 276-284.
- Grover, Varun, Rajiv Kohli, and Pradipkumar Ramanlal. 2018. "Being mindful in digital initiatives." *MIS Quarterly Executive* 17 (3): 223-236.
- Günther, Wendy Arianne, Mohammad H Rezazade Mehrizi, Marleen Huysman, and Frans Feldberg. 2017. "Debating big data: A literature review on realizing value from big data." *The Journal of Strategic Information Systems* 26 (3): 191-209.
- Haffke, Ingmar, Bradley Kalgovas, and Alexander Benlian. 2017. "Options for Transforming the IT Function Using Bimodal IT." *MIS quarterly Executive* 16 (2).
- Haila, Anne. 2000. "Real estate in global cities: Singapore and Hong Kong as property states." *Urban studies* 37 (12): 2241-2256.
- Haneem, Faizura, Nazri Kama, Nazim Taskin, David Pauleen, and Nur Azaliah Abu Bakar. 2019. "Determinants of master data management adoption by local government organizations: An empirical study." *International Journal of Information Management* 45: 25-43.
- Henderson, James R, and Kirti Ruikar. 2010. "Technology implementation strategies for construction organisations." *Engineering, Construction and Architectural Management* 17 (3): 309-327.
- Ho, Shuyuan Mary, Mónica Ocasio-Velázquez, and Cheryl Booth. 2017. "Trust or consequences? Causal effects of perceived risk and subjective norms on cloud technology adoption." *Computers & Security* 70: 581-595.
- Humphreys, David. 2020. "Mining productivity and the fourth industrial revolution." *Mineral Economics* 33 (1-2): 115-125.

- Just, Tobias, and Wolfgang Maennig. 2012. *Understanding German real estate markets*. Springer.
- Just, Tobias, and Frank J Matzen. 2018. "Digitale Geschäftsmodelle in der Immobilienwirtschaft."
- KPMG. 2023. Global Costruction Survey. Accessed 9th August.
- Kraus, Sascha, Francesco Schiavone, Anna Pluzhnikova, and Anna Chiara Invernizzi. 2021. "Digital transformation in healthcare: Analyzing the current state-of-research." *Journal of Business Research* 123: 557-567.
- Kretschmer, Tobias, Aija Leiponen, Melissa Schilling, and Gurneeta Vasudeva. 2022. "Platform ecosystems as meta-organizations: Implications for platform strategies." *Strategic Management Journal* 43 (3): 405-424.
- LaValle, Steve, Eric Lesser, Rebecca Shockley, Michael S Hopkins, and Nina Kruschwitz. 2010. "Big data, analytics and the path from insights to value." *MIT sloan management review*.
- Lavikka, Rita, Johanna Kallio, Thomas Casey, and Miimu Airaksinen. 2018. "Digital disruption of the AEC industry: Technology-oriented scenarios for possible future development paths." *Construction management and economics* 36 (11): 635-650.
- Leonardi, Paul M. 2017. "The social media revolution: Sharing and learning in the age of leaky knowledge." *Information and Organization* 27 (1): 47-59.
- Liang, Yikai, and Guijie Qi. 2017. "The determinants of e-government cloud adoption: multi-case analysis of China." *International Journal of Networking and Virtual Organisations* 17 (2-3): 184-201.
- Loonam, John, Sally Eaves, Vikas Kumar, and Glenn Parry. 2018. "Towards digital transformation: Lessons learned from traditional organizations." *Strategic Change* 27 (2): 101-109.

- Malik, Ashish, and Fabian Jintae Froese. 2022. "Corruption as a perverse Innovation: The dark side of digitalization and corruption in international business." *Journal of Business Research* 145: 682-693.
- Manyika, James, Michael Chui, Jacques Bughin, Richard Dobbs, Peter Bisson, and Alex Marrs. 2013. *Disruptive technologies: Advances that will transform life, business, and the global economy*. Vol. 180. McKinsey Global Institute San Francisco, CA.
- Marr, Bernard. 2015. *Big Data: Using SMART big data, analytics and metrics to make better decisions and improve performance*. John Wiley & Sons.
- Mayring, Philipp, and Thomas Fenzl. 2019. *Qualitative inhaltsanalyse*. Springer.
- Mckinsey. 2016. "Imagining Construction's Digital Future." Last Modified 09 August 2023. <https://www.mckinsey.com/capabilities/operations/our-insights/imagining-constructions-digital-future#>.
- . 2020. "Reimagining the Real Estate Industry for the Next Normal." Accessed 07 July 2023. <https://www.mckinsey.com/about-us/new-at-mckinsey-blog/how-will-real-estate-be-different-in-the-next-normal>.
- Mergel, Ines. 2019. "Digital service teams in government." *Government Information Quarterly* 36 (4): 101389.
- Merriam, Sharan B, and Elizabeth J Tisdell. 2015. *Qualitative research: A guide to design and implementation*. John Wiley & Sons.
- Mesa, David, Gianni Renda, Robert Gorkin III, Blair Kuys, and Simon M Cook. 2022. "Implementing a Design Thinking Approach to De-Risk the Digitalisation of Manufacturing SMEs." *Sustainability* 14 (21): 14358.
- Mwita, Kelvin. 2022. "Strengths and weaknesses of qualitative research in social science studies." *International Journal of Research in Business and Social Science* (2147-4478) 11 (6): 618-625.

- Nadler, Michael. 2018. "Performance vs prospectus= transparency in German closed-ended real estate funds?" *Journal of Property Investment & Finance*.
- Nambisan, Satish, Mike Wright, and Maryann Feldman. 2019. "The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes." *Research policy* 48 (8): 103773.
- Neumann, Clas. 2017. "China as the Frontrunner in Digitalization." *The Drivers of Digital Transformation: Why There's No Way Around the Cloud*: 91-104.
- Newell, Graeme. 2016. "The changing real estate market transparency in the European real estate markets." *Journal of Property Investment & Finance*.
- Patton, Michael Quinn. 2002. "Two decades of developments in qualitative inquiry: A personal, experiential perspective." *Qualitative social work* 1 (3): 261-283.
- Pfnür, Andreas, and Benjamin Wagner. 2020. "Transformation of the real estate and construction industry: empirical findings from Germany." *Journal of Business Economics* 90 (7): 975-1019.
- Porter, Michael E, and James E Heppelmann. 2014. "How smart, connected products are transforming competition." *Harvard business review* 92 (11): 64-88.
- Preuß, Norbert, and Lars Bernhard Schöne. 2022. "Consulting, Digitalisierung und Reorganisation." In *Real Estate und Facility Management: Aus Sicht der Consultingpraxis*, 95-157. Springer.
- Proff, Heike, Stefan Sommer, and Florian Knobbe. 2020. "Capabilites to Exploit the Opportunities of Digitalization in Capital-Intensive Industries." *International Journal of Strategic Management* 20 (1): 79-100.
- Radecke, Hans-Dieter. 2023. "Den Datenschatz Heben und Nutzen." *immobilienwirtschaft*, 54-57.
- Rubin, Allen, and Earl R Babbie. 2016. *Empowerment series: Research methods for social work*. Cengage Learning.

- Rubin, Herbert J, and Irene S Rubin. 2011. *Qualitative interviewing: The art of hearing data*. sage.
- Sadayuki, Taisuke, Kei Harano, and Fukuju Yamazaki. 2019. "Market transparency and international real estate investment." *Journal of Property Investment & Finance*.
- Saiz, Albert. 2020. "Bricks, mortar, and proptech: The economics of IT in brokerage, space utilization and commercial real estate finance." *Journal of Property Investment & Finance*.
- Saull, Andrew, Andrew Baum, and Fabian Braesemann. 2020. "Can digital technologies speed up real estate transactions?" *Journal of property investment & finance* 38 (4): 349-361.
- Schulte, Karl-Werner, Nico Rottke, and Christoph Pitschke. 2005. "Transparency in the German real estate market." *Journal of property investment & finance* 23 (1): 90-108.
- Sharma, Rashmi. 2022. "The new digital era: emerging risks and opportunities." In *The New Digital Era: Digitalisation, Emerging Risks and Opportunities*, 151-167. Emerald Publishing Limited.
- Sine, Wesley D, Hitoshi Mitsunashi, and David A Kirsch. 2006. "Revisiting Burns and Stalker: Formal structure and new venture performance in emerging economic sectors." *Academy of management journal* 49 (1): 121-132.
- Singh, Anna, Patricia Klarner, and Thomas Hess. 2020. "How do chief digital officers pursue digital transformation activities? The role of organization design parameters." *Long Range Planning* 53 (3): 101890.
- Sitek, Marcin. 2019. "Barriers of Innovation Activity as Risk Factors on the Real Estate Market." *IBIMA Business Review* 2019: 1-12.
- Sleiti, Ahmad K, Jayanta S Kapat, and Ladislav Vesely. 2022. "Digital twin in energy industry: Proposed robust digital twin for power plant and other complex capital-intensive large engineering systems." *Energy Reports* 8: 3704-3726.

- Solarino, Angelo M, and Herman Aguinis. 2021. "Challenges and best-practice recommendations for designing and conducting interviews with elite informants." *Journal of Management Studies* 58 (3): 649-672.
- Starr, Christopher W, Jesse Saginor, and Elaine Worzala. 2021. "The rise of PropTech: Emerging industrial technologies and their impact on real estate." *Journal of Property Investment & Finance* 39 (2): 157-169.
- Sydow, Jörg, Georg Schreyögg, and Jochen Koch. 2009. "Organizational path dependence: Opening the black box." *Academy of management review* 34 (4): 689-709.
- Tavoletti, Ernesto, Niloofar Kazemargi, Corrado Cerruti, Cecilia Grieco, and Andrea Appolloni. 2022. "Business model innovation and digital transformation in global management consulting firms." *European Journal of Innovation Management* 25 (6): 612-636.
- Teece, David J. 2010. "Business models, business strategy and innovation." *Long range planning* 43 (2-3): 172-194.
- Teece, David, Margaret Peteraf, and Sohvi Leih. 2016. "Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy." *California management review* 58 (4): 13-35.
- Trindade, Manuela, and Nuno Almeida. 2018. "The impact of digitalisation in asset-intensive organisations." *Netw. Ind. Q* 20 (4).
- Tripsas, Mary. 2009. "Technology, identity, and inertia through the lens of “The Digital Photography Company”." *Organization science* 20 (2): 441-460.
- Trittin-Ulbrich, Hannah, Andreas Georg Scherer, Iain Munro, and Glen Whelan. 2021. "Exploring the dark and unexpected sides of digitalization: Toward a critical agenda." *Organization* 28 (1): 8-25. <https://doi.org/10.1177/1350508420968184>.
<https://journals.sagepub.com/doi/abs/10.1177/1350508420968184>.
- Ullah, Fahim, Samad ME Sepasgozar, Muhammad Jamaluddin Thaheem, and Fadi Al-Turjman. 2021. "Barriers to the digitalisation and innovation of Australian Smart Real Estate: A

- managerial perspective on the technology non-adoption." *Environmental Technology & Innovation* 22: 101527.
- Ullah, Fahim, Samad ME Sepasgozar, and Changxin Wang. 2018. "A systematic review of smart real estate technology: Drivers of, and barriers to, the use of digital disruptive technologies and online platforms." *Sustainability* 10 (9): 3142.
- Verhoef, Peter C, Thijs Broekhuizen, Yakov Bart, Abhi Bhattacharya, John Qi Dong, Nicolai Fabian, and Michael Haenlein. 2021. "Digital transformation: A multidisciplinary reflection and research agenda." *Journal of business research* 122: 889-901.
- Vigren, Olli, Anna Kadefors, and Kent Eriksson. 2022. "Digitalization, innovation capabilities and absorptive capacity in the Swedish real estate ecosystem." *Facilities*.
- Vishnevskiy, Konstantin, Oleg Karasev, Dirk Meissner, Anastasia Razheva, and Marina Klubova. 2017. "Technology foresight in asset intensive industries: The case of Russian shipbuilding." *Technological Forecasting and Social Change* 119: 194-204.
- von Ahlefeldt-Dehn, Benedict, Marcelo Cajias, and Wolfgang Schäfers. 2022. "Forecasting office rents with ensemble models—the case for European real estate markets." *Journal of Property Investment & Finance* (ahead-of-print).
- Vornholz, Günter. 2021. *Digitalisierung der Immobilienwirtschaft*. Walter de Gruyter GmbH & Co KG.
- Wang, Yingli, Leighton Evans, Gilbert Owusu, and Alistair McCormick. 2013. "Data integrity issue in asset-intensive industry." *Journal of Advanced Management Science*: 338.
- Warner, Karl SR, and Maximilian Wäger. 2019. "Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal." *Long range planning* 52 (3): 326-349.
- Welch, Catherine, Rebecca Marschan-Piekkari, Heli Penttinen, and Marja Tahvanainen. 2002. "Corporate elites as informants in qualitative international business research." *International business review* 11 (5): 611-628.

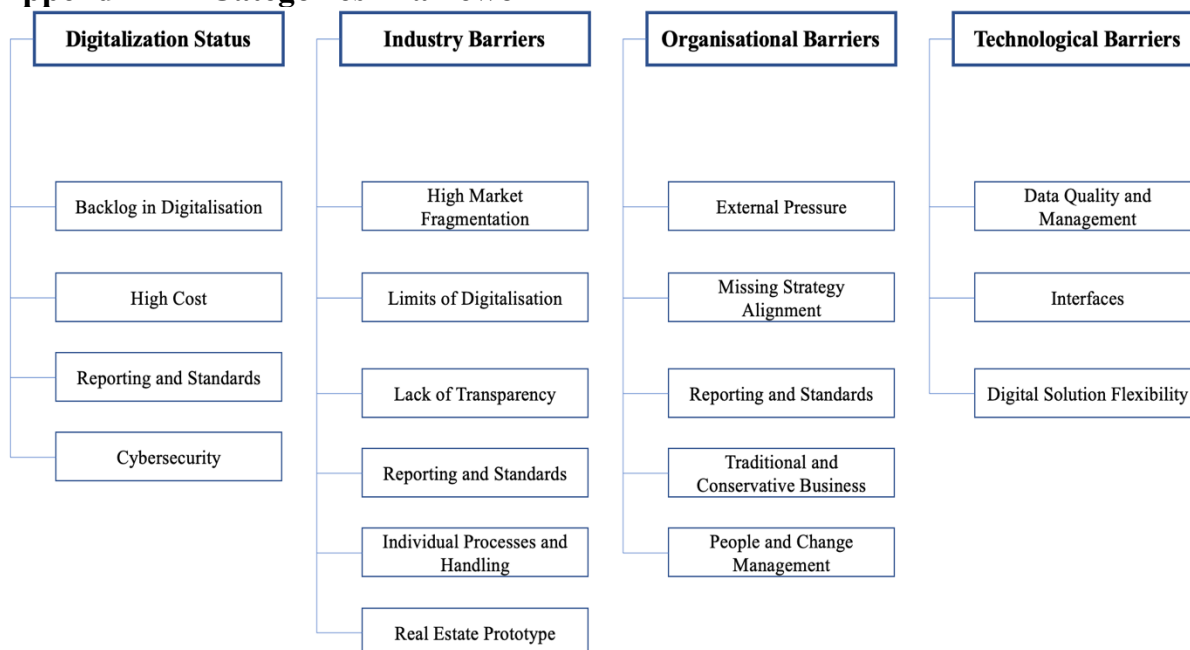
- Wimelius, Henrik, Lars Mathiassen, Jonny Holmström, and Mark Keil. 2021. "A paradoxical perspective on technology renewal in digital transformation." *Information systems journal* 31 (1): 198-225.
- Xiang, Ying, Qiaoyun Jiang, Yicheng Zhang, and Wangyue Zhou. 2022. "Identifying Barriers to the Digitalization of China's Real Estate Enterprises in Operations Management with an Integrated FTA–DEMATEL–ISM Approach." *Buildings* 13 (1): 100.
- Yoo, Youngjin, Richard J Boland Jr, Kalle Lyytinen, and Ann Majchrzak. 2012. "Organizing for innovation in the digitized world." *Organization science* 23 (5): 1398-1408.
- Yoo, Youngjin, Ola Henfridsson, and Kalle Lyytinen. 2010. "Research commentary—the new organizing logic of digital innovation: an agenda for information systems research." *Information systems research* 21 (4): 724-735.
- Yu, Tieying, Metin Sengul, and Richard H Lester. 2008. "Misery loves company: The spread of negative impacts resulting from an organizational crisis." *Academy of Management Review* 33 (2): 452-472.
- Zahra, Shaker A, Mike Wright, and Sondas G Abdelgawad. 2014. "Contextualization and the advancement of entrepreneurship research." *International small business journal* 32 (5): 479-500.

Appendices

Appendix A – Interviewees Background

No.	Position	Type	AUM (in bn.)	Duration (in min.)
IO1	Key Account Manager	PropTech	n.a.	35
IO2	Associate Investment Director	Investment	39	31
IO3	Senior Manager Corporate Development	Development	6*	42
IO4	Digitalisation Development	Development	n.a.	32
IO5	Senior Real Estate Manager	Development	6.5	37
IO6	Head of Leasing	Consultancy	n.a.	27
IO7	Senior Projectmanager	Development	6.6	34
IO8	Head of Real Estate Research Europe	Investment	31.4	34
IO9	Projectmanger	Development	*	52
IO10	Fund Manger	Investment	26	44
IO11	Investmentmanager	Investment	46.8	32
IO12	Head of Real Estate Management Europe	Investment	73.6	35
IO13	Digital Real Estate Manager	Development	51	60
IO14	Senior Associate Director	PropTech	n.a.	33
IO15	Chief Executive Officer	PropTech	n.a.	40
IO16	Chief Information Officer	Investment	120	35
IO17	Managing Director	Property Management	23	37
IO18	Consultant	Consultancy	n.a.	30
IO19	Senior Transaction Manager	Investment	79.1	29
* same mother company			Σ 509	699
			Ø	36.8

Appendix B – Categories Framework



Appendix C - Interviews

Interview IO1

Moderator:

What digital tools or processes have you introduced?

Interviewee IO1:

A concrete example is the Fehmarnbelt project, where an hour is being built between Fehmarn on the German side and Denmark on the Danish side. Currently there is only ferry service, but a tunnel is being built to allow car traffic. This is a project that I am in charge of. The issue of digital document management was introduced during the construction phase in 2019, and the construction will last until 2029. The first step was the introduction of digital document management in the first two years, and now we have expanded it further. Then we introduced BIM, which is software for model validation, clash detection, quantity takeoff and other classic use cases, which we introduced as a first step. Last year, we also introduced digital contract management. The Fehmarnbelt project has many contractors they work with. Therefore, there are many communications that can be managed in the software. The main issues are currently the handover to the facility management area when the construction is finished and the parent company Unterwelt as the future operator, which needs essential information from the construction phase, especially about the technical facilities, to be able to use it for operations.

Moderator:

Were there any problems or limitations with the implementation?

Interviewee IO1:

One can look at the implementation chain to see how receptive a company is to new tools. Normally, almost two years pass between the introduction of new functionalities. We started with a minor change, saying that documents are no longer sent by email in a jumble, but are uploaded to a platform and keyworded so that they are findable. So that was the first change.

Next came the topic of BIM, then the topic of contract management and finally the topic of handover. Change management is one of the core topics that we see as major challenges of digitalisation in theory. The management can say: "Yes, I want to have everything", but how can you bring the users along and not overwhelm them?

Moderator:

How do the staff deal with the culture change?

Interviewee IO1:

It's about the way of working. Fehmarn was founded as a project company and people had worked in other projects before and had their own way of working. Usually they have local folders where they store documents and communicate by email or teams. There might be a SharePoint where they can store other documents, but everyone does their own thing. With the introduction of the so-called Common Data Environment, users are forced to adapt the way they work because they now have to store documents on the platform. They have to think more about how they tag their documents so that others can find them. Another issue that always resonates is transparency. When you work and communicate on the platform, everyone can see the communication, depending on permissions. This can make some users feel very watched. Some therefore use surreptitious ways of communication instead of the given official ways.

Moderator:

What do you mean by isolated solutions?

Interviewee IO1:

Isolated solutions are the classic point where we usually start. Many processes in a company already have digital solutions, especially e-mail and classic MS Office products. The problem, however, is that the connection between the products is missing in order to get an overall picture on a project, especially in construction. Often information from different sources has to be pulled together and verified, leading to inefficiencies. In reporting, it often takes two weeks for all the information to be collated and verified. There are also 34 review loops until the report is finally

found to be correct. We try to solve these inefficiencies with an integrated solution and often say "reporting with one click". Our goal is to create efficiency.

Moderator:

Are there any complications?

Interviewee IO1:

The quality of the reporting depends on the quality of the data entered. The platform we use offers selection fields for keywording uploaded information. You have to choose from a drop-down list and are not allowed to use your own terms. This leads to a kind of quality assurance, but it can also lead to some users not knowing what to select. This is where the issue of training comes in. We do role-specific training to make sure that every user knows how to use the software to do their job effectively. In the work environment, interpersonal relationships play an important role. In a company or project there are relationships between employees, some get along well, some not so well. There are also many political issues, like who is allowed to know what or who makes decisions? Sometimes you also want to keep things secret from the public. These issues, which also exist in private life, are also relevant in the company. For those who do not like to follow official processes, an online platform can be difficult because it offers a lot of transparency. Every activity, such as uploading documents or viewing information, is documented and can be tracked. Tracking and tracing is an important aspect that some users may perceive as an invasion of their privacy.

Moderator:

Does this also prevent the industry from going digital?

Interviewee IO1:

The obstacle to digitising the construction industry is more about bringing the contractors along. The industry is very fragmented, there are big construction companies, but also many small local service providers that take on subcontractor jobs. The biggest challenge is that many of these smaller companies are not yet ready to go digital. Some still use fax machines and are not

ready to switch to modern technologies. There is also a big gap between companies that already use 4D-5D BIM and those that still rely on 2D drawings. This is a big challenge in the industry.

Moderator:

What are the chances for smaller companies to prepare for digitalisation?

Interviewee IO1:

I would imagine that contractors who don't play ball will eventually stop getting contracts. However, it is also the case that builders rely on contractors who can do the work. It's a cascading process if you look at it more closely. On the subject of BIM, there have been legal requirements from the federal government for the last year or two that construction planning must be carried out according to BIM working methods. I am not sure whether these requirements depend on the size or volume of the project. Certainly you can still work without BIM in some cases, but if it is required by law, the builder must work compliantly. If his contractors cannot deliver, he has a problem. There is a cascade effect that occurs. That is also the goal of politics, to make such specifications so that the change in the industry is driven faster. Especially when it comes to BIM, you can realise enormous efficiency gains. For example, you can check whether the structural engineer and the technical building planner are compatible with each other. The topic of defect prevention is also an important factor. If you can check in the digital model whether everything fits together, you can avoid defects before they occur in the real world. This is an enormous gain in efficiency, which politicians also want to promote.

Moderator:

How should policy makers act in the absence of pressure for change?

Interviewee IO1:

The next step will be for building owners to determine for themselves what cost and time savings are possible through digitalisation. Management must recognise these advantages. I understand why the construction industry is behind in terms of digitalisation. It is a traditional

industry and although there are some start-ups trying to push digitalisation, it is difficult. I often hear the sentence: "In the end, I have to build something, I don't need a school degree for that. In the end, I have to put one stone on top of the other." It's a fundamental issue. There could definitely be more inspiration from other industries to drive the real estate and construction industry.

Moderator:

Can you describe situations where there were problems of efficiency with digitalisation?

Interviewee IO1:

What you have to take into account, however, is that in large infrastructure projects such as tunnel construction, for example, many ecological studies have to be done for the ground and the underwater. In such cases, the best software does not help when unforeseen problems like natural biotopes arise that have to be dealt with. The management can support to make quick decisions, but there are also unpredictable environmental conditions like the relocation of bats that cannot be accelerated. However, there are also ways to use IT to speed up certain processes. For example, a customer who installs cable ducts for electrical lines in walls also has to do ecological research. However, with a mobile solution, he can document what he has found more quickly and efficiently and speed up the workflow to make decisions faster.

Moderator:

Have you ever experienced problems with costs related to digitisation?

Interviewee IO1:

The interesting thing is that with the clients I work with, like big infrastructure companies in the energy sector or projects like the Fehmarn Belt, IT is the lowest cost item. One example is an energy company I'm involved with. They are laying a cable for a billion euros and then when I come in with my software and say it costs €30,000 a month, money is never really the problem.

Moderator:

What is it like for the smaller companies?

Interviewee IO1:

Yes, this is an important point. Small companies and contractors often find it difficult to include IT costs in their planning and costing, as they need to focus more on their core competencies and have fewer resources available. In addition, there can also be a certain reluctance or rejection of technology among smaller companies, which adds to the resistance to IT costs. However, it is important that small businesses also recognise the importance of digitalisation and seek external support where necessary to remain competitive.

Moderator:

Is there also a certain over-dependence on technology and a loss of the human touch?

Interviewee IO1:

That is an interesting point. In large companies, there are often many different stakeholders involved in a project, including people from different disciplines. This can lead to a balance between the different interests. However, it is important to also consider the perspective of the professional disciplines and not only that of the IT department, which often tends to want to digitise everything completely. In IT implementation projects, it is therefore particularly important to involve all stakeholders and to take the needs of the specialist disciplines into account. Often the human factor is neglected when implementing IT solutions, which can lead to poor usability and acceptance. It is important to involve all stakeholders and users in the development process at an early stage and to take their needs and requirements into account in order to create a meaningful and user-friendly product. It can be helpful for software service providers to point out potential problems and offer alternative solutions. It's about finding a balance between the needs of the data managers and the users and creating a solution that works for both sides. Automation and data enrichment can also play a role in this, in order to require the minimum of data entry from the users and to complete the rest automatically. A good user experience is crucial to ensure acceptance and usability of the software.

Moderator:

What about the strategy? Do the individual companies have a clear digitalisation strategy?

Interview IO1:

In large companies, there is often a Business Information Officer or Chief Digitalisation Officer with a corresponding department such as Digital Process Excellence at one of my clients. However, it is difficult to see clients locking their whole company into one strategy, because in the end the business does what it needs anyway. There is a constant struggle between standardisation from above and individualisation from below.

Moderator:

How does the pressure for change come from reporting?

Interviewee IO1:

The topic of sustainability and digitalisation is becoming more and more important, especially in the Nordic countries. In Germany, however, implementation is slower. Reports on the consumption of building materials or the ecological footprint are not yet widespread. The topic of sustainability is often referred to as "greenwashing", as it is rarely demanded from the software component. Traditional methods often still prevail in the construction industry, which makes it difficult to integrate sustainability and digitalisation into the work process. At the end of the day, it is still about building something and not about the digital innovation behind it. Companies try to build a digitalisation strategy and data centre working, but often this only remains on paper. Although I found in my research that many companies present such concepts on their websites, it is often not really lived. In the infrastructure and energy sector I deal with, this is particularly pronounced.

Moderator:

Please describe what you mean by isolated solutions?

Interviewee IO1:

Mobile data management is very popular on construction sites because you can capture data on site with your smartphone and process it later in the office. But where does the captured data

end up? Often it is stored on SharePoint, but it is difficult to present it in a usable format and collaborate with others. There are many software products on the market, also from small start-ups, that specialise in digital defect management. These are often popular with smaller companies because they want to spend less money. However, I don't think these solutions are really unsustainable.

Moderator:

The ^[1]_{SEP} last question will be about data protection. Have you already had negative experiences? With the topic of digitalisation, of course.

Interviewee IO1:

Data protection is an important topic for us. Clients actively ask how we ensure that we handle their data cleanly. We need to be transparent and make it clear that we only manage the platforms and that the data is always owned by the client. An interesting topic related to data protection is permission management, especially when working with external and internal users on digital platforms. It is important to manage permissions and ensure that only those people who really need to have access to certain information have it. In contractual communication, the permissions system can lead to difficulties as some clients are concerned about who can see what information. That they then say something that someone else happens to see who is not supposed to see it. On our platform, comments can be written on contract-related issues, which worries some clients as they fear that anyone could have access to this information. During the review phase, for example, client representatives can leave comments on an addendum and decisions are made that are tracked in the system. However, the configuration of the platform can be designed so that only those people who really need it have access to certain information. However, there is still a discomfort among some clients. However, we argue that it is just as difficult to ensure the confidentiality of information on other platforms, such as in email systems or when using Slack. Here, too, there is always the risk of information being forwarded or screenshots being taken. As is clearly evident, the human factor is still the greatest risk. It is

therefore important to clarify the roles and rights concept to ensure that each user can only access the information they need and that sensitive data does not fall into the wrong hands.

Moderator:

Would you like to explain another risk factor of digitalisation in relation to the construction industry?

Interviewee IO1:

Another important topic is IT infrastructure management, where customers have to decide whether they want to set up a server themselves or use a provider that offers software as a service. It is important to weigh up how much control you want to have. However, if you as a customer want to have everything in your own hands, you also have to provide the responsibility and resources for IT management, such as backup and recovery services.

Moderator:

Thank you very much for the interview.

Interview IO2

Moderator:

What is the latest digital solution in your company that you know of?

Interviewee IO2:

I would say that Salesforce is the biggest topic in terms of digitalisation.

Moderator:

Let's get to the main topic, the negative aspects of digitalisation.

Interviewee IO2:

First of all, I'm speaking purely from a sales perspective. I don't have enough insight into what's going on in the background in terms of data technology, I'm not involved in that.

Moderator:

What negative experiences have you had with digitalisation in your company?

Interviewee IO2:

None. From my perspective, the real estate industry is so far behind in terms of digitalisation that digitalisation at this stage actually only has positive effects, in my opinion. Seen from the sales perspective. If I now maintain my customer data in an Excel list, which is quite common in the industry. If 15 others in my team do the same, ^[1]_{SEP} then the data is not on one platform. But if everyone simply enters their data on a digital platform, such as Salesforce, then you simply have the advantage that all the information is in Salesforce and senior management can start to make evaluations with it.

Interviewee IO2:

That is why we are moving at this level and the information is simply not yet in Salesforce. As long as this is the case, there are only advantages for us at the moment from the capital market perspective of digitalisation.

Moderator:

Can you elaborate on the aspect that everyone maintains their own Excel lists?

Interviewee IO2:

Everyone does their own thing. Even if you go to the data level, there is often no common format or digitalised platform with all the information in a processed form. In a company with 50 billion assets under management, it is hard to have such a platform, and the reality is often different. If you know someone who has such a platform, I would like to hear about it.

Moderator:

Can you explain to yourself why this is so?

Interviewee IO2:

Moreover, so much money has been earned in recent years that for many it did not seem necessary to invest in digitalisation to simplify work processes. People have hired analysts to maintain Excel spreadsheets, which is basically a job that anyone could do. It is not really acceptable for someone at our skill level to waste time manually transferring data from A to B.

This should be automated. This should be automated. Ultimately, the goal is to have the data processed and analysable.

Moderator:

Have you reached a point where a digital solution makes the process worse rather than better?

Interviewee IO2:

I don't work at the cash flow level with Argus, but some systems have their limitations. For example, some shareholders go back to Excel because they can create more flexible models there. At the end of the day, you have to say that Argus needs to become a bit more flexible. Once it goes to portfolio level, you can merge information and do evaluations, but in Excel this is a separate Excel file. Digital solutions are perhaps not yet as developed as they could be, but there is a possibility that programmes like Argus will be used in the future. It is important that the tools are customisable to make the work more effective.

Moderator:

Let's go back to the point of customisability. Is it important that each product can be customised to different objects? Are there other examples where this is important and where there were problems?

Interviewee IO2:

It's always a problem that everyone creates their own individual Excel spreadsheets, like Salesforce. My job in the former company was to optimise Salesforce to make team output as simple as possible and to reduce clicks. We looked at every click and saw where we could reduce them. For the fundraisers, it was important that the application was as simple as possible and had no dead ends or illogical processes. An application that is too complicated with too many clicks is not favourable for digital solutions. Therefore, digital solutions need to be designed in such a way that they are easy to use.

Moderator:

Does this mean that some digital solutions were too complicated and therefore not used?

Interviewee IO2:

Yes, that's true. It is not a problem of digitalisation, but mainly depends on the user-friendliness, which can be improved. At our company we invested a lot of work and after about three years people started to use the solution. It becomes problematic without the buy-in from the senior management. Only if the senior management expects the information to be derived from digital tools, it is enforced from the top and all employees need to comply with it. At Salesforce, that was also the case. For example, if the co-CEO says that the quality of the meeting notes is underground, then they quickly take notice and put things into the co-CEO's tool.

Moderator:

Did you have different tools then or how can you understand that?

Interviewee IO2:

Yes, there were separate Excel files where everyone did their own work. However, it is difficult for the staff to invest an additional 10 hours a week on their own to enter the data. The setup must come from top to bottom so that employees are motivated to use the solution.

Moderator:

Did you have to customise Salesforce specifically, or was it specific enough from the start?

Interviewee IO2:

Yes, that's true. But you have to invest time, work and money to make it adaptable.

Moderator:

In terms of cost, there is another issue we should address. Was there a point where it was said that it is too expensive and you can't implement it?

Interviewee IO2:

This was not the case with Salesforce, as senior management had already recognised that Salesforce was the tool in which all investor information would be collected in the future.

Moderator:

This means that the management's decision was also integrated into Patrizia's strategy and was considered viable for the future?

Interviewee IO2:

Yes, exactly. They focused on the Salesforce programme and implemented this decision consistently.

Moderator:

Have there been problems in communication where digital tools have not brought improvement?

Interviewee IO2:

No, I don't see any negative experiences. We used platforms like Conference for Meeting Notes, which was very helpful at the time, but then it was replaced by Teams. I have not yet reached the point where I would say that digitalisation should be completely removed. It's simply about efficiency. In the real estate industry, every shareholder has their own cash flow model, which leads to a lack of standardisation. With Argus, you can accurately say it's calculated correctly. Although there are always people who say that a certain tool is not good, you can customise and configure most tools.

Moderator:

Then we are already coming to the end. Thank you very much for the interview and all the best for the future.

Interview IO3

Moderator:

What new digital solutions or processes have been introduced in your company?

Interviewee IO3:

Lately we have been using solutions again, although we do it every year. The tools have always been very different. Some of them were used in cost controlling, for example, to better monitor

construction costs. A smaller thing was a PowerPoint add-in to create better investor presentations and pitches, or the digital signature tool DocuSign, which was considered very fine and useful. Some tools took only a few weeks to implement, while others took years and are still in use. So it was very different. Very currently, it is about tool selection to improve reporting and HR.

Moderator:

Can you also describe where digitalisation reaches its limits and risks arise?

Interviewee IO3:

In general, the topic on everyone's mind at the moment is AI and chatbots. In particular, the new product from Microsoft, which is integrated into Microsoft's everyday work, is an extremely powerful tool. But it's also a major issue needs to be controlled and you shouldn't just switch off your brain and take on unchecked information. There is a lot of wrongly thought out and incorrect information that looks good at first glance and is well worded, but the content is grammatically incorrect. So there is a big challenge here to teach people how to check facts and how to create a culture where you still research things. A global problem, especially in the real estate industry, is the maximum hurdle created by the high fragmentation of the market. There are many small providers and little standardisation and professionalisation in the industry, which makes it lag behind other industries, such as e-commerce, by 10 to 15 years, or even 20 years if you consider how old-fashioned and uninteresting the specific real estate software is.

Moderator:

Please explain fragmentation and standardisation?

Interviewee IO3:

It is wrong to say that the market in the real estate sector is less fragmented than in the automotive sector, which makes it more difficult to develop and sell software for the real estate sector. In the automotive sector, there is a manageable number of players to sell software to and you can quickly achieve high market penetration. In the real estate industry, on the other hand,

even after selling to 100 companies, you don't even have 20% market penetration. So a lot of companies have to build a big sales arm to even get a foothold and generate sales. You have to have more than one company as a customer to develop a tailor-made product that fits a larger number of customers. But then it only fits one company and it doesn't fit the next company. The more customers you have, the better you can improve the software and adapt it to the needs of the customers. This is a laborious process for everyone involved in the real estate industry.

Moderator:

By the aspect of standardisation, what do you mean exactly?

Interviewee IO3:

For example, it could help to introduce standardised data formats and ordering processes to pass on information and orders in a standardised way in the real estate industry. It is frustrating that every window manufacturer has different ordering processes and data formats and there is no support. Every time you want to order a window, you have to pick up the phone and measure the window with a folding rule. There is no standardisation and you can't simply transfer the data and experience of one company to another because there is no common data basis yet. Yet, in case of doubt, we all want the same standardised window measurement.

Moderator:

How do you track in your company?

Interviewee IO3:

We already have a construction cost tool that is deeply integrated with the real estate industry and tracks data. But if you look beyond the real estate industry, the data basis is not that good. In comparison, e-commerce, for example, knows each of its customers much better than we know our customers, even though we have fewer customers. This is because we do not yet provide enough data bases and often still have to rely on staff picking up the phone and having verbal exchanges with clients. So there is still a lot to do to make the real estate industry more digital.

Moderator:

Please give an example of you as a project developer.

Interviewee IO3:

In part, there are tools that are not optimally tailored to us due to the market fragmentation in the real estate industry. It is not easy to find the right software solution. Another problem is the mentality in the industry. Another problem is the mentality in the industry. Project developers tend to have older employees who are less open to new software solutions. In addition, we have earned so much money in recent years that for many it doesn't seem necessary to invest in digitalisation to simplify work processes.

Moderator:

What do you mean by necessity?

Interviewee IO3:

The pressure was missing.

Moderator:

What do you mean by the software tools are not optimally tailored?

Interviewee IO3:

For example, in a company selling office equipment, there might be perfect templates for customer acquisition that can be adopted by another company selling catering equipment, as the process is very similar. But with real estate, the process is more lengthy and complex with many parties involved, so it is more difficult to map this process. You can't just get the leasing process as a ready-made workflow and implement it, there are high customisation costs for your own needs. In addition, the construction process and the planning process also have to be mapped. This is due to the complexity and fragmentation of the real estate market.

Moderator:

How do you describe the individuality of real estate in terms of digitalisation?

Interviewee IO3:

Individuality is still very high due to building regulations and the fact that leases are often signed for 10 years. Tenants want tailored solutions and do not want to live in a standard prefab house. This leads to relatively little standardisation and unique processes that can quickly vary depending on the project and region. Even internationally there are differences. So the market is very fragmented and the customer demands an individual product, which of course should also be serviced individually. This leads to processes that cannot be standardised and software developers have to adapt a lot and offer many options. We are too cosy to get involved in standardisation, because then less is possible.

Moderator:

Are you already trying to establish standards for yourselves and the market?

Interviewee IO3:

I think that we have not yet reached the level of maturity to answer this question, because at the moment we are still finding enough solutions to help us. It will probably only make sense to ask this question in a few years, when we have worked through the low hanging fruits and realise that we still haven't found good solutions to important problems. For now, we need to focus on what is already working well, as we cannot change everything at once without overwhelming the organisation.

Moderator:

What do you mean by the degree of maturity?

Interviewee IO3:

company last year was a sign of the level of maturity in terms of digitalisation. Before, all documents were signed on paper, which cost a lot of time and effort. The introduction of Docusign has now saved many man-hours. It is important to introduce such simple solutions before venturing into complex and time-consuming projects. Once all the simple solutions have been implemented, one can then take time to work on more complex projects and further increase the level of maturity in terms of digitalisation.

Moderator:

What is the reason that you are not yet ready?

Interviewee IO3:

I think there might be one more person, but you have to keep in mind that everything that is changed affects the daily work of 300 people. These people belong to different age groups and have to get used to the changes. If you have to change a percentage of their work, you cannot change 100% of their work overnight. Some time has to be given to get used to the changes and understand the new system. You can't just hire a large number of IT specialists to implement changes quickly. This would only confuse and overwhelm people, as they have to do their actual jobs in addition to learning the new system. Therefore, it is important to introduce new technologies gradually and take the staff along the way. If you introduce too many changes too quickly, it becomes an obstacle to digitalisation. In addition to digitalisation, employees also need to learn how to integrate new tools and systems into their daily work. Depending on the complexity of the tool, learning can take from a few days to several months. At the same time, employees also need to be trained in other areas, e.g. new optimisation options or new technologies. As a company, you have to weigh up how much you can expect employees to learn at the same time without them having to focus only on learning and neglecting their actual tasks. It is important that employees are able to do their work in parallel with learning. Ideally, learning should not take up more than 1% of their working time so that they can continue to do 99% of their work. At the moment, however, the balance is shifting as many new issues are added that staff need to understand and integrate into their work. You could hire 1010 people, but that wouldn't make digitisation happen faster or more effectively. Ultimately, people determine how fast digitisation can happen because they have to keep up with the speed of innovation. There is a curve of innovation speed that shows how fast humans can absorb and implement new technologies. There is a point at which humans are overwhelmed and can no

longer keep up. It is important to understand this curve in order to successfully implement digitalisation.

Moderator:

Were there any conspicuities regarding employee performance with digital processes that attracted negative attention?

Interviewee IO3:

As an example of digitalisation, we introduced a travel expense tool that allows people to record their travel expenses via a mobile phone app. The process before was absurdly paper-based and required scanning, copying and signing receipts, filling in Excel spreadsheets and scanning and sending them to the accounting department again. With the new tool, one can simply photograph the receipt and the amount, date and restaurant are automatically read. The manager can then approve the costs in the app. However, one now has to do the account assignment oneself and check if the VAT rate is correct. One also has to enter who one was with at the restaurant and similar details, as this is needed for future data analysis. Unfortunately, the introduction of the tool has also meant that staff now have to invest more time to submit an invoice. This is administrative work time that was not previously incurred, as they only roughly recorded the amount and date. This example shows that digitalisation does not always bring only advantages and that one should keep an eye on the effects on the daily work of the employees.

In theory, the new tool should save time by eliminating the need to scan and fill out Excel spreadsheets. Unfortunately, the introduction of the tool has also meant that staff now has to invest more time in order to submit an invoice. Accounting requires such information, but from the employee's point of view, it seems like they are being unnecessarily burdened and required to spend more time to submit a receipt. Overall, this example shows that digitalisation does not always have only positive effects and that the impact on the employees' daily work must be taken into account.

Moderator:

Have the costs for digitisation ever been exceeded?

Interviewee IO3:

As an example, we had the idea of introducing an app to book workplaces digitally. The costs would have been between 3 and 7 € per employee per month. Although the cost saving would have been great, as it would have saved jobs, in the end we opted for an Excel spreadsheet, which costs us nothing and works just as well. This is an example of how we misjudged the value of the product and made ourselves too expensive an offer.

We have found that access to certain real estate, newspaper or market data programmes is often overpriced and that they are charged per employee. One example is Thomas Daily, where the cost can be several thousand euros a year. It is difficult to assess whether the benefits of these programmes match the costs. It is often easier to ask for this information through brokers or other sources.

Moderator:

How is digitisation implemented in your company with the strategy?

Interviewee IO3:

Digitalisation did not play a role in the founding phase of our company and is often seen as secondary to the core business. We only address it when there is an explicit need from the departments of the core business. Interestingly, however, there is strong pressure from younger employees who, as digital natives, have an intuitive understanding that processes should be leaner. If they find that the IT infrastructure or equipment is outdated, there is a possibility that they will leave the company. Therefore, their opinions and needs have a great influence on changes in the company and can lead to digitalisation projects being implemented more quickly.

Moderator:

What is the digital affinity at senior level?

Interviewee IO3:

Not all senior employees have an intuitive understanding that processes should be simpler because they don't know it any other way. However, some of them have a strong interest in digitalisation and combine this interest with experience, which helps them to assist in the implementation of projects. Others do not think that certain processes could be made simpler because they have been working the same way for years. However, some people have a gut feeling that it should be easier to do certain tasks with a mobile phone app or another digital solution instead of tediously filling out tables in Excel, printing them out and scanning them.

Moderator:

Do you have any other negative aspects or risks in relation to digitalisation?

Interviewee IO3:

Process mapping and process automation are important aspects of digitalisation. My dream would be that we as a company could support our employees' workflows with appropriate tools. For example, when an employee is in a certain project phase, the required templates should be suggested to him automatically and he should be able to obtain approvals from other people automatically. Standardised processes, such as a rental, can be mapped well. But it still takes humans to complete complex tasks like writing a job reference. Anything that requires more than three steps cannot yet be fully automated.

Moderator:

Thank you very much for the interview.

Interview IO4

Moderator:

What digital tools or processes have recently been introduced in your current company?

Interviewee IO4:

In the field of project development there is also the field of planning. We buy planning from many offices, such as rectangular, structural, building services and landscape architects, and there is the process of digitalisation towards digital twins. This process is done in the field of Building Information Modelling, which means that planners now have to deliver digital twins. The model and this process is not an internal process, but at the level of the purchasing process, the management of the organisation has to be organised towards the contractor. We have set our standards there and we use inspection software that we train according to these inspection rules. These inspection rules are also reflected in the orders vis-à-vis the planners and lead to a data-based statement about quality in the area of content, deadlines and costs.

Moderator:

Have you also had negative experiences with digitalisation?

Interviewee IO4:

There are two things that make up borders. One is the change process that everyone goes through when they change. But there has never been a time when there were no change processes. Currently, the change from cars to carriages to e-cars is the most enduring change process. However, in the real estate industry, this has only just arrived and is the last to be implemented. It is always like a strong wind in the sails of a sailing yacht and is most fun with a lot of wind, but this wind also makes noise. So the change process is a natural process. When there is no wind, the ship stands still. On the other hand, there is the issue of IT and IT developments springing up quickly, but not always being equipped with the necessary know-how and overall view. Our basics of services, have to be covered in terms of liability. Liability is also a big aspect and needs to be considered. Not all start-ups that offer themselves to us can afford that. Therefore, we have to steer a lot, correct and prioritise where special services are needed and where the planning has not been thought through to the end.

Moderator:

Can you please explain what you mean by liabilities?

Interviewee IO4:

The real estate industry has lagged behind in digitalisation because every construction project is a prototype. If BMW, Audi or Mercedes, for example, had to make an individual car for each customer, like a station wagon convertible or with a sunroof, it wouldn't work. The automotive industry has been able to automate the process because they have no standards and always build a prototype. This is first visually modelled and then prototypes drive around with different foils to test the car. There is more scope for standardisation in the automotive industry compared to the real estate one, which is more individualised. It is often difficult to combine isolated solutions into a complete whole when dealing with new topics if you have no experience or come from the IT or AI sector. You only look at one idea or one part, but not the big picture. On the other hand, customised solutions can often be better. Every project developer has his own solution and claims it for himself. It is difficult for the proptech startup to enter the real estate industry. First of all, they are not set up everywhere. But if they are set up everywhere, again it is not customisable enough. If they make it customisable, it is still not sufficiently focused on the needs of the project developers.

Moderator:

What do you mean by the prototype in buildings?

Interviewee IO4:

Cars can go from garage to garage from Munich to Hamburg and everywhere else, while real estate is built in one place and has to be coordinated with the neighbourhood and the authorities. With the automotive industry, there are more standardisation possibilities compared to the real estate industry, which is more individual. To be informed about all phases of project development, you need an overarching and fully integrative approach from a project developer. Some companies are moving towards modular construction to increase the degree of customisation. This allows you to use certain modules for different construction projects. This is a good approach to make construction progress faster and to meet the needs of mayors and

authorities. The real estate industry is a prototype industry since every construction project is unique

Moderator:

Have you been unable to carry out a digitisation measure because of enormous costs?

Interviewee IO4:

First of all, the basis for digitisation is the sorting of processes. Sorting the processes is something that actually always has to be done. Like tidying up the cupboard or having order has nothing to do with cooking. That is, I sort everything first and that is something that has to be done anyway. That's 80% of the work for us, at least. When I have sorted the processes, I already have a workaround that I can make scalable and controllable with small means. But of course I can also put a development on top of it, which is then also simple, because there are clear construction tasks in IT that have a clear planning. You can implement it clearly at a price. It's either very prefabricated, then you can customise it moderately, or you make customising the main business. You say I want to work with it, I want to have a say in it, but it has to be in principle in the blueprint that you have to implement. We have to get to the point where it doesn't drive up costs if we have a clear structure and the buyer knows what he wants. If he has worked out what he wants in his own team beforehand, he can also order digitisation relatively cheaply.

Moderator:

How do you deal with the resources required for data management?

Interviewee IO4:

In a company, it is important to regularly check whether the processes are optimal. The said position enables a running process that would also work without digitalisation. However, before going into software development, one can already roll out the process without digitalisation. For example, one can simplify the processes by implementing and clearly defining a ticket book

system. An example of this would be the construction planning and installation of a new workplace. The team does not need a prototype, but a clear plan

Moderator:

Can you describe problems in the process of standardisation?

Interviewee IO4:

The question is whether to go bottom-up or top-down. We opt for a bottom-up approach. However, the company's experience and know-how should also be used to develop best practices. It is not possible to simply say: 'This is our new standard'. Instead, the task is to gather experience within the company and develop standards from it. This requires footwork, of course, but is necessary to create acceptance for the topic. There is a reporting system if certain processes are not followed. However, it is not necessary to illuminate every single metre. It's more about milestones, work packages and how quickly you want to measure delays. We have agreed on a weekly rhythm.

Moderator:

How do you digitise soft factors, such as genius loci, political mood, sensory feelings?

Interviewee IO4:

If we have the ideal process for each project and find that it is not moving forward due to external factors, it is not the process itself, but the situation. Then we have to change certain speeds in order to move forward. We can target that because we know exactly which political situation or neighbourhood is the risk. Then we can specifically address risk management there

Moderator:

How would you describe the digitisation strategy in your company?

Interviewee IO4:

Digitalisation in business development has existed for a long time, but it has expanded and grown due to external demands. Many planners have made enormous progress in the last 5-7 years and now offer their services to us. We need to respond to this and communicate our

requirements at this level in order to be able to use this service at all. We use data-based measurability in costs, deadlines and qualities. Due to these developments, the strategy has specialised in project development and is a fixed component alongside corporate development, which is directly docked to the management.

Moderator:

This brings us to the last aspect, cybersecurity. Have you encountered any problems with this issue during the digitalisation process?

Interviewee IO4:

The topic belongs to corporate development and is run by our colleague Dorn, as it is an IT-specific topic that we do not have as project developers. We have been well set up by our colleague, be it through Unity or other tools. I am glad that I am relieved of this issue and we have the corporate development part that takes care of security.

Moderator:

Thank you very much for the interview.

Interview IO5

Moderator:

Which processes or digital tools have been introduced in your company?

Interviewee IO5:

The topic of contract management is still in a grey area when it comes to which contracts may be signed digitally and which may not, especially with regard to the requirement of written form. If the contract amount is low, commissioning or construction contracts are signed digitally, but rental contracts are still printed, bound and sent in the original, signed and then kept. There is a scan copy that is placed on a drive. The whole process of digital signature is driving the company. The company also wants to improve the structuring of the collected

contracts and documents. Currently, the contracts and documents are stored on a drive that is on a server and cannot be accessed on the road. In the future, the company will store everything in Trums to allow access from anywhere. In addition, each contract and document will be stored in a structured way by object so that they can easily click buttons to make them available to potential buyers.

Moderator:

Have you ever had negative experiences with digitalisation?

Interviewee IO5:

Document filing is a big mess in the company because every company handles this differently. If there is a policy on how documents should be named and in which folder they should be filed, that is good. The next step is to make sure that every project manager or staff member follows this policy and that everyone who looks in the folder structure finds the document in the expected place. There are often subtleties, such as where the extract from the real estate cadastre should be filed, that can quickly cause chaos. Document management is often a reflection of the operational workings of the business, and there is often a lack of time for bureaucratic tasks such as filing. Different platforms are used to share files, leading to further fragmentation of documentation. A patch from a Danish company was presented that improves the management of digital signatures and is also used in Scandinavia. In Germany, however, this is not yet as advanced, neither legally nor in terms of data protection.

In Germany, there is still a long way to go to fully implement digital contract signing and approval. One option that the interviewer is particularly interested in is a software from Denmark that allows you to upload contracts digitally and then track the signature process. However, it is still a big challenge in day-to-day doing, as contracts are often not fully negotiated when they are supposed to be signed and it can be difficult to keep track of them. Another challenge is how data is shared, especially if it is too big for emails or if different platforms are used. The issue of data security is also of great importance, especially when

sensitive data is transferred. Every data protection officer and IT specialist is therefore concerned about data security with Moni phones.

Moderator:

Can you describe if there was any degradation in performance

Interviewee IO5:

In everyday working life, the word "email ping pong" is often used to describe the exchange of many emails, often concerning minor changes to a contract or agreement. This can take up a lot of time and it would often be quicker to have a face-to-face conversation or at least a phone call to move the discussion forward. This is especially important when negotiations are involved and there is not yet agreement between the parties.

Moderator:

Is this a coordination problem?

Interviewee IO5:

Contract negotiations often result in e-mail ping-pong, which takes up unnecessary time on minor points. In such cases, it is better to seek a face-to-face conversation or at least have a telephone call. Even if contract negotiations take place digitally, a video call is recommended to avoid misunderstandings. In the case of tenancy agreements with a long term or large space requirements, it can be difficult to clarify everything without the spoken word. Team meetings can remedy this and save resources. But only a purely digital exchange is often not sufficient in contract negotiations.

Moderator:

Are these short or long term problems for you?

Interviewee IO5:

Clearly long term.

Moderator:

Is that because of the industry for you?

Interviewee IO5:

Of course, I only know this industry and no other, but I would say that it is always like that. Even if it's necessary, like in supermarkets for example, where the prices are fixed, you don't need to negotiate much. But whenever there is room for manoeuvre, personal negotiation is preferred. I mainly do commercial tenancy law or commercial buildings, so I think the door is a bit wider open for a completely digital process in residential tenancy law. That's because there are legal requirements that are incredibly strict and well regulated for the tenant in residential tenancy law. Therefore, there is less room for discussion and more regulation leads to less room for negotiation, which in turn facilitates a 100% digital process.

Moderator:

Is increased regulation contributing to the real estate industry being so far behind in digitalisation?

Interviewee IO5:

I will always want to make sure that I do not violate any applicable rights, especially when it comes to real estate. Property rights and the land register are important legal issues that still exist in physical form and must be dealt with in person at the local notary. Digital contracts exist, but when it comes to selling a property, a personal visit to the notary still has to take place. Legal regulations hinder the digital process and need to be taken into account.

Moderator:

Can you explain why the industry is poorly digitised, even though there is a lot of money in the market?

Interviewee IO5:

There was no need. Why should I change my process if it is running? According to the motto "Never change a winning team". Especially in the real estate industry, many managers are male, over 50 and not particularly digitally affine. This is especially true of medium-sized companies operating in smaller towns. There, every invoice is stamped, ticked off and forwarded to the

accounting department. The boss then signs the paper remittance slip. If this process works and there is no need to convert 1000 invoices to digital, for example, it is not converted. However, through digitalisation, one can gain a competitive advantage and implement it financially. For example, in invoice management. If you do everything digitally, you can also work independently of location. You don't have to wait weeks for the invoice to be paid and it's easier to work with entrepreneurs. Especially in times of home offices, this is an important point. Before the Corona pandemic, digitalisation was not yet present in the industry to the same extent. But now there is a need for some processes to be digitised in order to keep staff working together.

Moderator:

How is digitalisation implemented in your strategy?

Interviewee IO5:

Momeni is a traditional house that was founded over 20 years ago and has grown organically. Therefore, many things were not immediately completely digital. However, there are managers in the company who are very much behind digitalisation. There is even a separate business division called Momeni Ventures, which invests in start-ups in the real estate industry. These are often companies from the digital world. The management level imposes the digital strategy from the top down and is rather cost-driven. It wants to streamline processes and avoid sending paper invoices around and spending €0.70 per invoice every week. However, the employees are also very interested in working digitally, as they would like to do 2 days of home office per week, for example.

But I think it's also due to the structure of the staff, I'd say, because the people are mainly young, so to speak.

Moderator:

How is digitisation handled, in-house or outsourcing?

Interviewee IO5:

Digitalisation tends to be home-grown, buying services such as software for data rooms but not setting up their own cloud structure. Because that requires resources and core competencies that are not available in the real estate sector. However, there is a core competence team that puts such services through their paces and then controls and monitors them in the ongoing process.

Moderator:

Thank you very much for the interview.

Interview IO6

Moderator:

Can you report which latest technologies related to digitalisation have been introduced in your company?

Interviewee IO6:

I can't say whether it's the newest ones we work with. But of course we work mainly digitally and use this both for recording and for presenting properties. I think we are pioneers in the real estate industry when it comes to creating our own homepage for clients in order to create a high recognition value. Every employee can create this homepage within a few minutes, as it contains prefabricated pages and combines all the necessary tools in one package. I think it's great that we can offer our clients such a homepage with their own logo and combine all tools in one place without having to switch between different applications. In research, investment and leasing, we work almost exclusively digitally. You can still download exposes, as they say, but at the end of the day it's often helpful to print them out for the boss, who may not be that savvy in the online space. So I think it's good not to rely entirely on online tools. When it comes to recording content, sometimes it can also be useful to have a printed version, as online content can easily be changed. It can happen that a price was different recently and is suddenly

displayed differently online. It is quick to make changes online, but this can lead to confusion for customers. Of course, mistakes can happen here too. In the end, a human being still operates the tool, and mistakes can happen, even from a typo. But I think the issue of the homepage is an important one, as we work in an increasingly digital world. 360-degree tours are a great tool to get a first impression of properties and move through them. However, it is important to note that the 5 senses, especially the sense of smell and touch, cannot be replaced. Personal viewings will remain irreplaceable in the future, especially when it comes to long-term decisions such as renting or buying. It is important to get a personal impression of a property or object in order to make sure that it meets your requirements. This cannot be completely replaced by online tools. This cannot be completely replaced by online tools. I hope this gives you a first impression of the tools we use. We have many more, but I think this is the most important, especially because you asked about our newest tool. It allows us to discuss everything online with our clients and share it on screen, so we can discuss everything digitally

Moderator:

Have you had any negative experiences with digitalisation in your company?

Interviewee IO6:

The issue with online brochures or exposes. They used to be sent by post and later sent as a PDF. Back then, the client had a proof in his hand and it wasn't so easy to make changes. Now the client gets a link to an offer that can be changed at any time. There are advantages and disadvantages to this approach. For example, it can happen that wrong information or a wrong price ends up in the offer. But on the marketing side, changes can be made and adjusted quickly. However, it can be confusing for the customer if he looked at the offer a few days ago and now a different price is shown. He almost has to take a screenshot or download the offer as a PDF in order to have proof. I think there will always be both options, online and as a PDF download. It is important that the customer has the option to save or print out the offer in order to be able to prove later what was offered. Whether this will change in the future, I don't know. But I think

both options will continue to be useful. There are still some people, especially older generations, who prefer written documents and want to print them out, especially in transactional directions such as sales or notarial matters. There will probably always be a mix of online-based and printed documents. As you said, mistakes can always happen because at the end of the day a human being is creating and sending the documents. It is also important to remember that in today's fast-paced online world, documents can quickly and easily fall into the wrong hands. It is therefore particularly important to treat sensitive data with caution in the online world, especially in the transactional area. It is important that we are aware of how quickly anything can happen in the online world. In the past, people exchanged documents in person and only the person sitting at the table had access to them

Moderator:

Can you please explain what you mean by the personal impression and the senses?

Interviewee IO6:

That's a good point. When you walk into a property, you perceive things that you might not perceive with a drone or a 360-degree tour, because the perspective is different. Our senses, especially sight, hearing and touch, play an important role in how we perceive real estate. A camera or video can capture things differently depending on who created it and what angle of view he or she has. For example, a camera may only record nice things and not pay attention to things that are important to the potential buyer, such as sounds from motorways or sewage treatment plants nearby. An online viewing can never offer the same experience as a personal viewing on site. Our senses play an important role in how we perceive real estate and there is no substitute for that. Perhaps in the future there will be more advanced technologies that will allow us to view properties online in more detail, but it still won't be the same experience as a personal viewing. At the end of the day, real estate is a very human business and it's about valuing the spoken word and the personal experience on site. That is something that cannot be replaced digitally. There are many soft factors that are difficult to quantify and cannot be

transferred on a digital level. In the end, we are all individuals with different preferences and sensibilities. What may be attractive to me may be unattractive to someone else. The topic of noise is also very subjective. Everyone feels it differently and therefore it is important that clients have the opportunity to visit a property on site and experience their own sensations. A personal conversation with the previous tenant or landlord can also be very helpful in order to get a better understanding of the property. It is about dialogue and the personal experience, which cannot be fully reproduced on a digital level. The real estate business is still a so-called people business. Personal contacts and the exchange of information are still very important. You can learn a lot from a personal conversation with the caretaker, the previous tenant or the landlord that you wouldn't necessarily find out online. Even seemingly small things can prove to be very relevant when it comes to renting or selling a property. Therefore, it is important to get an idea in person on site and to seek an exchange with the people involved. Leasing is often about long-term contracts, while commercial is about long-term partnerships. It is in order of basic data, such as the frequency of the street, the shop window frontage and accessibility, which are important in retail. For example, if there is an escalator, sales go down because people often only visit the ground floor. Expansion managers can do a lot of research from the office desk before looking at a space. In the office, however, it is a people issue, what the neighbourhood and surroundings look like. I don't know what asset managers say about this. For them, security is probably not a big factor and they would like to minimise contact with tenants. That's why they would like to digitise everything and have tenants report problems by mail. The problems are then forwarded to technicians. That's understandable, because nobody wants to hear about problems all the time.

Moderator:

Can you go into the aspect of data security again and the negative aspects associated with it?

Interviewee IO6:

With digitalisation, the speed and simplicity of data transmission has also increased enormously. While this has many advantages, it also poses risks when it comes to data security. A single click can inadvertently send data to the wrong recipient, which can have serious consequences. In the past, when people communicated by fax, the process was much slower and people usually took more time and paid more attention to their work. So it is important to be aware of the risks and take appropriate security measures.

Moderator:

Have you experienced that the introduction of digital processes or tools has made a process worse?

Interviewee IO6:

In that sense, it is perhaps the case that digitalisation has made things faster, but in the end, in the service industry, every starting point always includes a consultation. This means that you might be able to send out 20 offers in an hour because everything is so fast, but you also get a response from 20 people. Before, you might have sent out only 5 offers in the same time, and now you have even more work on the table and people have all the expectations of a consultation.

This means that you now have even more topics on the table and people are constantly in contact. There is also an immense flood of requests coming at you through different channels like social media platforms, WhatsApp and email. I think that's a huge risk for the quality of service in the end, because you're sometimes overwhelmed and have different deadlines. You would also like to do justice to that and be on time, but everything is very clocked now. I think that with digital clocking, unlike in the past, which you felt especially through COVID-19. One is clocked online directly to the next appointment. You know that after hanging up the phone you can take the next call directly. In the past, you had much more fixed appointments where you also had time to travel from A to B and clear your head, process what was said or already

prepare paths and rework topics. Now you have many more topics to deal with after your daily business.

Moderator:

Do you feel a certain dependence on technology?

Interviewee IO6:

Basically, of course, we're screwed if we can't switch on the PC.

There is no longer any filing system in printed form. This means that if the internet doesn't work, we are practically screwed.

Moderator:

Perfect, that was it. Thank you very much for the interview and your time.

Interview IO7

Moderator:

What is the latest technology in the area of digitalisation that has been introduced in your company in recent years?

Interviewee IO7:

There was actually not so much that was new. There was continuous development, I would say. Topics like planning tools, calculations, projects or products are continuously developed. Since I've been at BEOS, there haven't been many new technologies, but rather a restructuring.

Moderator:

Have you had any negative experiences with the introduced technologies that you currently use in your work?

Interviewee IO7:

It is sometimes a hindrance to work and stops me in my tracks. One is naturally dependent on technology and digitalisation. If something doesn't work, it can be difficult to continue working. If the server breaks down or there's a power cut, you almost can't work. These are fundamental problems that have nothing to do with the individual products, but with the infrastructure that makes it difficult.

Moderator:

You raised two interesting points: Dependency and inability to work. Let's now look at the dependency aspect. Do you think that you or your company are too dependent on this technology?

Interviewee IO7:

Yes, I would say that dependency is a big issue. As you saw even in our paperless office, there are hardly any physical folders left. If the system fails, I can basically go home, to put it casually. Without paper copies, I then no longer have access to the rental contract or other important documents, unless I happen to have them in paper form in front of me. This is a dependency that can cripple everything in the event of a major failure. It is important to create redundancies, but these are often not affordable by small businesses.

Moderator:

Regarding the prevention of work, can you describe exactly what you mean?

Interviewee IO7:

Yes, that's true. There are many workflows that you have to follow and that can sometimes be time-consuming. For example, when a tenancy agreement comes in, there are many steps you have to take. You don't just file it in a folder like it used to be, you rename it and file it in different places. That can be a bit of a hindrance to work because you're supposed to be out with the tenant or at the property. That's a pity.^[11] Moderator:^[12] Can you elaborate more on the point where you find that digital is no longer as efficient?

Interviewee IO7:

Good question. There are many little places where things go wrong. For example, when approving invoices. You have to click through different programmes in order to find out the account balance. You enter the invoice in one tool and release it there. But you only get the account balance from tool 2 and that slows down the workflow. There is simply a lack of well thought-out integration that allows you to work efficiently by retrieving information quickly and easily.

Moderator:

Do you have an excessive number of digital tools?

Interviewee IO7:

I wouldn't say too much. To be honest, we are currently in the process of changing over. However, you notice that there are already many programmes in which you do different tasks. For example, Architrave as a database, or invoice approval in two different programmes. It's certainly not too much, but you don't really go into depth. For example, I know the master list and where to find the tenancy agreements, but beyond that there is a lot of other information that I am not aware of. I wouldn't speak of an over-supply, but it is already a well-stocked toolbox.

Moderator:

Can you describe how digital tools and processes help or hinder your work?

Interviewee IO7:

Yes, digital tools don't really support us in communication per se. We had an example today with an architecture and urban planning firm. We talked about the classic architectural model and the architect told us that you can't replace it, not even with a 3D model. The model made out of polystyrene eggs is simply too good in order to stomp it and only work digitally. So in the real estate industry, the old tried-and-tested ways of working are also worth preserving and cannot be done away with. I couldn't imagine looking at the development study we commissioned only in a 3D model on a PC. I think it's important to physically change the

structure of the model and check whether it still fits or whether it needs a different cubature. Digitalisation doesn't limit us in this, but you notice that the analogue also has a *raison d'être*.

Moderator:

would you say that there are some things that simply cannot be made better by digitalisation?

Interviewee IO7:

Yes, exactly. So that one should preserve a bit of this analogue, simply because it has its justification.

Moderator:

How else would you describe communication with public authorities? Have you experienced any problems?

Interviewee IO7:

Yes, this can cause tensions. There have always been differences in the size of digital mailboxes that can cause problems. A current problem is that we can no longer read USB sticks and CDs because we can no longer connect CD drives or CD burners to our computers. This can cause problems, for example, when we receive revision documents on CD. Security is an issue here with digitisation, as everything has to be made more secure. Unfortunately, this sometimes hinders efficient work. For example, in a presentation by a project controller, he could not connect to our screen because he could not connect his laptop with a USB stick. That is not very efficient.

Moderator:

Can you explain why you think this is particularly the case in the real estate industry?

Interviewee IO7:

I think all industries are struggling with this challenge. However, the real estate industry is very diverse, even in asset management you can digitally model entire buildings. It is becoming increasingly difficult to keep track of what incremental benefits the various digitalisation measures bring.

Moderator:

Has the change only happened in the last few years?

Interviewee IO7:

I think so. When I started in real estate, there were already PCs, printers and scanners, but at that time no one had really thought about a paperless office. Archives were still necessary because otherwise you had space problems. It was like a first wave of digitisation, and now you have to get even better and continue to digitise.

Moderator:

Have you reached a point or experienced a threshold where you say it's not getting any better?

Interviewee IO7:

Yes, the dependency also depends on the degree of digitalisation and can vary from company to company. However, it must remain somewhere within the framework. I also like to print out my rental contract again and mark it with a light pen or have a plan in front of my eyes when I stand in the rental space and draw in a wall with a pencil. Such tasks can quickly go wrong with a digital programme and often take much longer.^[1]_[SEP]

Moderator:

Did you incur costs in your company due to digitalisation that could no longer be borne?

Interviewee IO7:

No, we don't get that from our side. That's more the other level, I'll say the central function. We are actually only told what to do.

Moderator:

Have you noticed any obstacles in the area of social interaction that have arisen due to digital tools?

Interviewee IO7:

I think that when it comes to handing over space, it would be difficult to do it completely digitally. Running through the space as a project manager and taking pictures or videos with a

laptop that are then accepted by the tenant in Munich seems very unlikely to me and also not yet legally mature. Have you ever had the case that people exchange information via digital tools like teams without sitting face to face?

Moderator:

That brings us to the end. Thank you very much for your interview.

Interview IO8

Moderator:

Can you also describe the last technologies that were introduced in your company?

Interviewee IO8:

"Technologies" sounds so antiquated, I think of steam engines and telephones. I can't really think of any big technological waves. What keeps coming up is the increasing digitalisation during the pandemic, such as increased use of video conferencing. That is a topic that I think is important in the area of research, especially in the area of resilience. Data blur can be improved by collecting data, e.g. on the residential market. There have long been key figures for office markets, but now new and more specific segments and sub-segments are coming into focus. However, this is less an issue of digitalisation. I think the first digitisation issue is really what we are doing right now - video conferencing. These existed 23 years ago, but they were not as widespread. Tools like Sharepoint certainly existed, but collaborative editing of documents got a strong push from digitalisation. It is now possible to work on documents across locations and at the same time and to exchange more, which makes the specific geographical location less important.

Moderator:

Have you also had some negative experiences with digitalisation?

Interviewee IO8:

It is indirect, but if you look more closely, it becomes clear. The pandemic has an impact on all areas, including digitalisation. Centrifugal forces in the industry are increasing because you are no longer in direct contact with colleagues, which limits intra-team interaction. As an example, at DWS we are very international and have 20 research teams worldwide, 700 in Europe and 2 of them in Frankfurt. We have regular exchanges with Europe on a daily basis. However, I think that these conversations that take place beyond that will fall away. The conversations you have with colleagues when you happen to meet them at the coffee machine will fall away. This is not necessarily a digitalisation issue, but it will be amplified by the increasing ease of daily processes. There will be less need to come into the office, which means that unplanned conversations and exchanges will go away to some extent. This is, of course, industry specific. Accountants may not need this as much as someone who has to work with different areas. However, I think that due to the technical possibilities offered by digitalisation and the reduced need to come to the office, the exchange and sharing of ideas may become less, which could be a negative aspect.

Moderator:

Have you also had the experience that this has had an effect on efficiency and performance?

Interviewee IO8:

I personally have not had this experience, but I can imagine that it is an issue. It certainly depends on the nature of the work and the team dynamics. You are talking about the surface, namely the colleagues, but it can also affect the heart members of the team who may not know what their direct subordinates or teammates are doing. I personally have not observed this, but I think it can be true in some cases. In our company, many employees are intrinsically motivated and have some motivation in order to finish their work. However, the motivation may be different when it comes to subcontractors and when you are not directly responsible for the results. I have not personally observed it yet, but I can imagine that it can happen. However, there are ways in which this can be prevented.

Moderator:

How do you see the current state of digitalisation in the industry?

Interviewee IO8:

On a scale of 1 to 10, we might have been at a 4 before the crisis and now we might be at a 5. There is still a lot of potential to work more efficiently and easily, especially in areas like collaboration between different industries. There are regulatory requirements and technical issues like the availability and speed of the internet. But there are also other opportunities and tools that we may not yet be using or even know about. I think we will see similar developments to the radiologist sending his results to India. We will also cooperate much more in other areas. As data permeability and information sharing improves, we will also become closer. However, this can also be a clear danger. For the industry worldwide, digitalisation is not so much a threat, but for individual employees it can mean that they can be replaced if they do not have to be physically present in the office. For example, if I were to say that I don't have to work in Frankfurt but can work from home in my rocking chair or hammock, my employer might legitimately ask why they shouldn't then hire me somewhere in Eastern Europe or India where labour costs are much lower. This can be a danger for individual employees. As with the computer and the fax back then, there will be changes in individual occupational groups in the future. It is a certain change that we can already observe.

Moderator:

Do you also see this danger yourself in your company with people that they are^[11]_{SEP} afraid of being replaced?

Interviewee IO8:

I think this is still very abstract and far away. It's a concrete issue of digitalisation, whether you can do your job somewhere else entirely. I think it is still far away and I hope and think that it will go in a different direction, namely that new job profiles and tasks will be found and reorganised. However, if you think purely in black and white and assume that you don't have to

come into the office anymore and can do everything digitally, then theoretically it is a danger. However, I think that very few people think about it practically.

Moderator:

What is your explanation that the real estate industry, being capital-intensive, is so far behind in terms of digitalisation?

Interviewee IO8:

Perhaps the pressure to adapt was not so great in the construction industry. In this industry, workers really have to tackle and create something with their hands. It is comparatively capital-intensive to buy a 3D printer that can build a house, for example. Although there are first attempts where you no longer need a brick builder and just someone who prints out the material with a joystick, I think this is still relatively new. Maybe it's because there was no need to adapt, or maybe it's because of convenience. However, I don't know if we are that far behind compared to other industries. There are certainly individual use cases and uses. I just mentioned the radiologist as an example, but there are probably many other professions that are already digitised. I think that the need in this industry was not so great, because exchange and cooperation is important to many workers.

Moderator:

What do you mean by convenience?

Interviewee IO8:

It used to be the habit to go to the office and meet in order to discuss issues and things. During the Corona crisis, however, the technical possibilities improved, in order to replace Skype with various other tools, for example. In the banking industry, however, there are relatively strong hurdles in order to introduce such tools, especially due to regulations and data protection rules. For this reason, conversations need to be recorded in order to ensure traceability and the protection of client data and company secrets. The possibilities that exist now were not there before, but they have received a huge push. It is now taken for granted that meetings with

investors can be done remotely and regulation has also moved in this direction. There are now colleagues who have to record their conversations in order to comply with regulatory requirements. Previously, such hurdles were there, but necessity has removed them. Licensing was an obstacle for a long time, as individual chat protocols were not allowed to be used. It was only half a year ago that teams were officially introduced; before that, only an exemption was possible. There were many hurdles that were not thought of that far back then, but now it is taken for granted that it is no longer mandatory to work in the office. Yes, I see it the same way. The Corona crisis showed that many industries and companies were forced to quickly adapt to the changed conditions and find new ways to continue their work in order. Not only technical solutions were found, but also new ways of working and mindsets were developed. I think that this will also have a long-term impact on many industries and that we will see more efficiency and flexibility in the future.

Moderator:

Were there limits to digitalisation where problems could not be digitally optimised or solved?

Interviewee IO8:

In the short term, many things can be solved, but in the medium term I also see solutions for legal and tax issues, such as digital signatures for land registry offices or notaries. Some time ago, you still had to request land register extracts by hand, but now there are also digital solutions, such as coding in the blockchain, which some countries are already implementing. Germany, however, is still far away from such developments. However, in recent months and years there has been a change in thinking and there is also a certain push in this area. Still, I would not be able to guarantee that an e-file will work as well as a physical stamp on documentation when you go to the office. Such things are still an issue, especially in large institutions like our company.

Moderator:

Let's move on to the aspect of strategy. How is digitalisation announced and handled in your company?

Interviewee IO8:

As a real estate company, we have to deal with various issues that can affect our corporate strategy. For example, we have a large share of the investment volume in the office market or office properties. In this context, we have to deal with polarisation, as some properties may become obsolete due to decreasing demand. The increasing trend towards home offices can also lead to other locations and property qualities being in demand. This thus has an impact on our daily work, although our corporate strategy will not necessarily change, for example by no longer acquiring office properties, but by increasingly investing in data centres.

Moderator:

Are your digitisation measures outsourced or managed in-house?

Interviewee IO8:

As a real estate company, we also have to deal with digitalisation issues, as we certainly need some resources for implementation. Here, internal colleagues and external consultants can support us in order to give specifications and ideas. Digitalisation may also be necessary in relation to specific properties, especially with regard to ESG and sustainability issues. Improved efficiency can only be achieved here through the evaluation and use of data, for example through smart metering. It is important to find clever reading mechanisms and tools to transmit data in real time. A colleague of ours is working on the topic of the "digital twin", which mirrors the property, so to speak, and possibly replaces on-site visits with virtual reality glasses or other digital tools. So it's important to use external help as well, because we can't cover everything in this area internally.

Moderator:

Can you describe whether the pressure to digitise has increased from outside?

Interviewee IO8:

The sustainability issue and ESG have caught on with investors and are also being pushed by the regulatory side, for example, in the context of Article 8 and Article 9. For this reason, there is a high investor focus on clustering, measuring, valuing and scoring properties more strongly, both in existing and new buildings. This has implications for digitalisation, as huge amounts of data and data points are generated, which should ideally be available digitally in order to be evaluated faster and more efficiently. The susceptibility to errors is much higher if this is done manually and, for example, recorded in writing in a notebook that is then delivered by letter. This process therefore needs to be done much faster and more efficiently digitally, which is already happening. The impact on investors depends heavily on which properties and locations they invest in. For example, if an investor has invested in back-office locations in remote forest and meadow areas, this can be a clear disadvantage as such properties with lower rent levels are much harder to let. This is difficult for investors who have a short-term view. However, long-term investors such as core investors, pension funds or insurance companies see the advantage that sustainability measures become more competitive in financial terms and can be used later on. There are companies that are not able to improve their ecological footprint by not constructing or producing buildings. In this case, we as real estate companies have to deal with our buildings. This has an impact on investors, which can sometimes be positive and sometimes negative. For example, if we invest in the stock and address sustainability issues early on, we can invest massively in such measures and acquire properties that have already been improved in this respect. This also allows us to benefit from concrete advantages, such as a green premium when we own an efficient building that increases tenant demand. In addition, we can benefit from reputational effects, as efficient buildings are better regarded by tenants and investors. If we as an investor do not have such properties, this can lead to a disadvantage, especially if we have an old building that loses value and raises various issues. On the regulatory side, for example, in the UK and Holland there is a requirement to have certain energy certificates before you can rent. Without these certificates, you theoretically cannot rent out, which leads to a clear

disadvantage. It is therefore important to weigh up what the advantages are of investing in sustainable measures at an early stage and what the disadvantages are if we do not do so.

Moderator:

Please go into the aspect of "stranded assets" again. What exactly do you mean by that?

Interviewee IO8:

If I own old properties with a rent of €7.50 somewhere in the outskirts of Frankfurt and the market develops in such a way that tenants increasingly demand energy efficiency or, for example, apply the new "Bremen Use" building standard, I have a problem if I do not improve these properties. In this case, I can hardly sell and do not participate in this trend. This can be a disadvantage for digitalisation, especially if everything becomes measured and measurable and I don't implement these measures. It is difficult to replace a boiler and install smart meters if my rent level is already low and this affects my cash flows. Therefore, this can lead to a disadvantage.

Moderator:

Is this aimed at a cost aspect?

Interviewee IO8:

In addition to the cost aspects, other factors such as the loss of value of the properties and the reputation effect can also play a role. For example, if I hold existing buildings and rent them out to smaller players that are listed on the stock exchange, Greenpeace or other organisations may walk through Frankfurt city centre pointing at various companies. There are also reports referring to this and expressing concern that certain investors might attract negative attention. Although this is not a big issue at the moment, it could lead to a reputational effect in the future if fewer and fewer investors take sustainability measures.

Moderator:

Thank you very much for the interview and all the best for the future.

Interview IO9

Moderator:

What are the negative aspects of digitalisation in the capital-intensive real estate industry?

Interviewee IO9:

The use of cloud-based solutions in companies has some challenges and negative aspects. One main problem is the lack of standardisation, as different companies work with different solutions and you always have to adapt to something new, especially in terms of project structures.

Another negative aspect is the dependence on technology, which often falls on our feet at the moment. The technology is often overwhelmed when new programmes are added, which leads to problems with access to drives and the server. This can lead to not being able to access certain programmes for days and not being able to release invoices, for example. Extended communication channels are another disadvantage, as not all staff members are tech-savvy or need more time to get up to speed. Errors of the programmes and users are also a problem. Another risk is the loss of data, either because it is not saved or because it is saved incorrectly. In the past, you had a folder where everyone knew documents were filed there. Today, documents are often shredded and filed somewhere so that no one knows where they are. Every staff member has a different way of dealing with the programmes available, which can lead to loss of data and information. Some maintain their data and communication in Outlook, others use OneNote or a notebook.

Moderator:

What exactly do you mean by dependence?

Interviewee IO9:

Our IT infrastructures have not grown fast enough to keep up with the multitude of programmes we use. We do not have sufficient contacts in order to find solutions quickly when problems arise, and they are often overloaded. There are issues we can't help ourselves with, such as access problems to servers or data when there is construction work or disruption. We have heard that colleagues at other companies have similar issues where adjustments and upgrades are constantly being made, making it difficult to keep systems up to date. We recently had difficulties with our accounting system where the adjustment took longer than expected. It seems that IT capacity is not yet sufficient to cope with these demands. This may also have an impact on our invoicing.

Moderator:

Have you also noticed any deterioration in terms of performance?

Interviewee IO9:

The constant need to document everything in order to ensure that nothing is lost leads to a significant loss of time. The limited availability of information and data during working hours can also be very limiting.

Moderator:

What do you mean by limited?

Interviewee IO9:

For example, if I have to deliver a rental contract, but due to problems accessing different drives or files that cannot be opened or are too big to open in order, I cannot meet my deadlines. This can also happen with architects who work with programmes that generate large files. In such cases, the plans are often output in a reduced size, which can lead to a significant reduction in quality. This is a major problem for us in terms of performance constraints. However, there are also advantages that can compensate for this. Sometimes there comes a point where introducing a new programme or tool for documentation causes more problems than it solves. There are many options for documentation, but you have to weigh up whether another programme is

really necessary or whether you have already found a solution. It can be difficult to decide which option is best, especially when you hear about different methods of documentation and reporting from colleagues. With the abundance of tools and programmes, it can be difficult to keep track and decide which ones make the most sense.

Moderator:

Why is there no standardisation?

Interviewee IO9:

We don't have set processes or standards for how we document things, especially in relation to project issues and how they are stored. There are clear guidelines for reporting, like Excel or Word, but when it comes to how to store important information or what happens if you are not available when you are sick, there are no clear standards. There are no standardised programmes or processes in order to ensure that important information is stored and managed correctly.

Moderator:

How is strategy lived in your corporate strategy with regard to digitalisation?

Interviewee IO9:

Digitalisation in our company is very different. We were known for being pioneers in the use of Teams and Architrave, which allowed us to collect data online and access it from anywhere. However, our company was acquired by Swiss Life, who have different standards and priorities, which meant that we had to withdraw as a digital pioneer.

Moderator:

Is the digitalisation strategy implemented by top management?

Interviewee IO9:

They are currently working on harmonising the programmes and processes so that everything is more uniform. In 2019 and 2020, the issue with Corona was huge, so there was a lot of discussion about what was more important and in the foreground. Now there will probably be a strategy, but before you can find that, you have to look at what the others have and how you

can harmonise it. For example, they changed the PDF programme from Adobe to Kofax, which did not work so well. But let's leave that for now. They are currently thinking about how to unify everything, because there are many different programmes at the group. They also work a lot with project controllers for cost tracking, but they have never looked at whether they need such a programme. Life has something like that, so they are looking into it. They are also in the process of installing a new software for business plans that can be used for the whole group of companies, as previously there was only a local application. You can see that everything is just starting up and you wonder how the others are doing it and what options there are in order to find the most beneficial for everyone.

Moderator:

How is digitalisation handled at your company, in-house or outsourcing?

Interviewee IO9:

We work with Cancom for some IT issues, for example setting up and sending the equipment. Some programmes run through our system, but mostly they are in order. I don't know exactly why this is and whether it is for strategic reasons. Our IT department is quite small and mainly takes care of the equipment in order. The paperless office theme was in the foreground, in order to get away from paper, and we have more or less achieved that. Now it's about gradually discontinuing other topics, but I don't know exactly which ones yet.

Moderator:

Why is the real estate industry, as a capital-intensive sector, so far behind?

Interviewee IO9:

I think it was actually just very, very expensive because the programme was not available internally and you had to buy it externally. In big companies, there are always people who are tech-savvy, but also those who are not. It takes an enormous amount of time and money to build up the infrastructure and know-how in order for people to be able to use it. I think that at the

moment, when it wasn't really of absolute necessity, everybody tried to work around it. It worked like that for a relatively long time.

Moderator:

Then can you also explain why there was no need?

Interviewee IO9:

I think there was always a need, but people just wouldn't see it and wouldn't do it in order to save money and time. We used to do a lot with Excel and Word, even for contracts. But with the increasing need to measure performance, you realised you needed it. Programmes like Power BI make it possible to measure buildings, costs and rental income on a monthly basis and to better document successes. Employees are now also measured in their performance and that needs to be made measurable. I think that in the past, companies have focused on making money rather than thinking about the future and preparing for digitalisation. They focused on making money instead of investing in things that didn't seem so important at that moment.

The requirements have changed over time and other key figures are now also needed in order to measure the success of a building. This also includes the CO2 balance and consumption. These data are now also very important in a sale or purchase, as they provide a meaningful database. In the past, this was perhaps not so important and accordingly the programmes that are used today were not used.

Moderator:

How has the pressure to digitise grown?

Interviewee IO9:

We now have funds that are copied according to Articles 8 and 9 and have a good carbon footprint. In order to attract tenants, it is important to provide certain data such as consumption data. In sales, it is also important that properties are at least a little bit green and show where they can go. For example, costs can be saved by converting to LED, and there is a lot of data

available to show how consumption will change in the future. A good database makes it easier to rent and sell and also makes it more measurable.

Moderator:

Many thanks for the interview

Interview IO10

Moderator:

What new digital solutions have been introduced in your company recently?

Interviewee IO10:

The biggest project is in order of data warehousing. We have a lot of properties in our portfolio where all the data changes monthly or quarterly, such as new tenants, expired contracts and indexations. In the past, everything was handled through Excel, with Rent-roll being stored locally by the property or asset managers and used for reporting to investors. We have now introduced a data warehouse tool where property managers can do their uploads directly. We can then automatically read this data for each fund and mandate.

Moderator:

Okay, so a lot of it is about automation in the portfolio with property management?

Interviewee IO10:

That's exactly what's important, because our company manages assets of around 24 billion US dollars and has a correspondingly large number of international assets. This makes the process much more convenient, scalable and automatable. If the property managers upload the data directly into the data warehouse, senior management can also retrieve all changes immediately. For example, in a logistics property with only two tenants, it's easy to keep track, as opposed to a retail park with 35 tenants. The system automatically detects where changes have been made,

whether it is in order of rent, number of spaces or remaining lease term. If something has changed, the managers can check and match it. If everything matches, it is accepted and uploaded. I can then download a daily overview, including income, weighted average remaining lease term (WALT), sector allocation or geographic location.

Moderator:

Can you give me an example where you noticed negative aspects?

Interviewee IO10:

The main problem is the quality of data. Different property managers work in different countries and the on-boarding process for uploading the data can be very cumbersome, especially for smaller local companies. It often takes up to half a year to get used to the new tool and the data quality is not always correct. Problems can also arise when different property management tools and data warehouse software are not aligned with each other, making the process longer and more error-prone.

Moderator:

Does this mean that the programmes are not intuitive and the training courses take too long?

Interviewee IO10:

Exactly, it can either lead to lengthy processes or there is simply a lack of understanding on both sides. I think that the big companies are much further ahead here. Especially the local property managers have not yet had the need to use such programmes to their full extent. Especially when it comes to individual information regarding the property, such as the holding structure and other complex issues, many reach their limits. The first big hill is to make sure that everything is entered correctly at the beginning, especially for multi-tenant properties with many tenants.

Moderator:

Regarding interfaces, how many programmes do you have and how are they connected?

Interviewee IO10:

As a large company with various locations, we agreed on a data warehouse programmes in order to achieve holistic reporting between each unit and to avoid each unit doing its own thing. Therefore, our warehousing only works through one platform. By "interfaces" I meant more the exchange of data between external partners and companies. For example, CBRE uses JAVI as its property management programmes. In a perfect world, you should be able to transmit the information on a certain key date to our platform at the push of a button. That is also in the works. In the beginning, this interface did not exist and accordingly one had to work with Excel downloads, adapt them to our formats and upload them to our programmes. As far as I know, this now works reasonably well, because we sat down together and tried to find a way to create a technical interface. Of course, this also illustrates one of the problems regarding technical interfaces with the tool of an external service provider.

Moderator:

How well does the data transfer work with API, is data lost here?

Interviewee IO10:

Exactly, the main problem is the lack of flexibility and the difficulty in making changes. For example, if new data needs to be added or there is a change in the data structure, this can take a lot of time and lead to delays in reporting. Also, handling special cases, such as the purchase of a property during a quarter, often requires manual work and increases the workload. In addition, data quality must be ensured, which also requires resources.

Moderator:

And how could these problems be solved?

Interviewee IO10:

One possibility would be to use more flexible and adaptable tools that allow changes to be made more quickly and efficiently. Improved training and support for staff using the system could also help to improve data quality. In addition, it would be helpful to better standardise data sources and formats in order to reduce the effort required for data preparation.

Moderator:

Are there also many compliance hurdles?

Interviewee IO10:

Yes, so the compliance department doesn't check every single upload file, but they do internal checks and risk assessments. However, depending on how many changes have been made in the system, they can ask questions about the data in the database once a month or every two months. Depending on how much authorisation one has in the system, managers can retrieve the data themselves. For example, if the value of a property needs to be reassessed, one can upload and confirm that in the system oneself. However, if one wants to create or delete a new property, this must be approved by our Data Manager in order to avoid misuse or errors. When buying or selling, the information must be entered into a form, which is then signed by the fund manager. This is now done via DocuSign, which I think is a good solution as the constant printing, signing and scanning of documents is cumbersome and unnecessary. Everything that does not need to be in writing can be handled well via DocuSign.

Moderator:

Why is the real estate industry lagging behind in digitalisation?

Interviewee IO10:

The real estate industry is very document heavy, even for simple purchases there is a flood of documents such as building applications, building specifications, building permits, leases and purchase agreements. Many of these documents are not yet digitised, which is due to a lack of energy and motivation to digitise older documents in this way. In many cases, they are still in physical form in safes or archives. Business in the real estate industry is also a very mechanical and on-site process that cannot be fully digitised. Although many processes can be digitised, the actual business still has to take place as it used to. This could explain why digitalisation in the real estate industry has not progressed as much as in other industries. However, it would be

desirable for this to change, as even approval procedures still have to be submitted physically to the building authorities.

Moderator:

Do you think this is due to a lack of pressure?

Interviewee IO10:

Partially. Especially in public authorities or municipalities, digital solutions are often not offered and not even demanded. Therefore, the motivation to invest resources into digitalisation is lacking in some places.

Moderator:

Are high costs an obstacle to digitalisation in your company?

Interviewee IO10:

It is unclear to me how much money is invested in digitalisation at Us, but there are projects like a data warehouse to automate reporting processes. Companies need to hire consultants in order to check which tools are suitable and which hardware is needed to push projects forward. It is important to have a strategy with small goals in order to invest in better and more efficient ways of working. However, it can happen that the wrong choice leads to huge costs. An example is a company that tested ARGUS for cash flow calculation, but returned to Excel after 2 years because ARGUS could not present all the necessary data in an optimal way. There were particular problems with the individual modelling at portfolio level. Withholding tax, holding structures, etc. could not be optimally represented. ARGUS is a good tool for cash flow modelling, but it can be expensive as it requires training and time to use it in order. It is intuitive and avoids human error, but it has its limitations when modelling different cash flows at the fund level.

Moderator:

Perfect. Thank you for the interview and all the best for the future.

Interview IO11

Moderator:

What digital processes or tools have you recently introduced in your company?

Interviewee IO11:

There are several products. On the one hand, there are newly introduced costing tools that serve as complete systems and are meant to unify all data in order to manage transactions and inventory. On the other hand, there are data room tools and CRM tools that can be used for contact capture, documentation of communication with stakeholders and sometimes a combination of both.

Moderator:

Have you had any negative experiences with digitalisation?

Interviewee IO11:

I now work for a large corporation and there is often friction when implementing tools because the structures are very complex. It is extremely time-consuming to introduce a tool because many stakeholders have to work with it. During the process, you then realise what the advantages and disadvantages of the tool are. It can be tedious at times, as some functions may be missing if it is a one-fit-all programme to be used in different areas. It happens that the tool is then difficult to use because it is designed for very diverse areas. If you take a calculation tool, for example, you immediately see that there are special requirements for hotel, logistics and office properties. For the office investment manager, it is important to have very many different users and a complex user structure. For the logistics manager this is usually irrelevant, as they usually only have 1 or 2 users in a property. The requirements for letting hotel and retail properties are also very different. The tool should always work for everyone so that data can be aggregated and analysed. This can be difficult as everyone wants their function in it and the tool becomes cluttered as a result. I have noticed from my past that it is very difficult to use such programmes. The CRM tool is used to maintain all contacts and track all communication.

The calculation for the purchase and the business plan processing in the inventory for all the different asset classes also takes place in it. The goal behind this is natural and logical: if it works, you can really evaluate aggregated data from the entire company. But that sometimes makes it a huge monster to fill for the user who provides the inputs

Moderator:

Can you describe the complication with the programmes in more detail, was it too much or too difficult?

Interviewee IO11:

No, in that case it was like that you could also leave everything blank, which is not relevant for me. I didn't have to do an extreme amount of input. However, there were many options for data input, but I didn't need them at all. It then quickly became confusing and no longer intuitive if there were too many input options that were not needed.

Interviewee IO11:

Yes, it was individual, but it was for everyone. This could make it confusing.

Moderator:

How would you describe the user experience and its efficiency? Did you get to know new limits of digitalisation

Interviewee IO11:

As a rule, one then finds some kind of solutions in order to solve such problems. You then build ways to deal with it in order, although it is actually not ideal. If, for example, I cannot represent a scenario that is relevant for my asset class but not for another, and there is no input option for this, one sometimes builds a solution. You don't represent it ideally, but in such a way that the same result comes out. It is unattractive, but sometimes necessary.

Moderator:

Do you have an example of where this happened?

Interviewee IO11:

Problems often arise in projects where the tool is used to show relatively stable portfolio development for the portfolio owner. Although there are clear capex investments, there can be difficulties when additional rental space is added and the stock is further developed. Over the course of the stabilised 10-year cash flow, problems can arise when the property doubles in size. Sometimes you then have to make do by entering the same data several times in different programmes, which leads to redundant work. This is often the reason why there are these big tools that can do everything. Another problem is that there is often no good solution in order to import data between different programmes, which leads to having to enter it manually again and again. Companies are then often forced to build a tool that has everything in one, but this often leads to an unwieldy monster. There is no simple solution to this problem.

Moderator:

How was the communication between the programmes?

Interviewee IO11:

Often it's because of the software, for example Teams has now become the standard communication tool and there is a lot of attempt to do data editing or document editing in Teams. But that just doesn't work well with external partners. You can force them to do it, but it's not really suitable. I don't think teams are the best solution in order to work on documents with external people. It's stupid to send documents back and forth by email, but you have to consider that an external partner who is invited to my team doesn't automatically have access to the team in their company. It's super confusing. At our current employer, we used teams for internal document processing, but we quickly turned to other solutions for working with external people.

Moderator:

Did the collaboration encounter problems with digital solutions?

Interviewee IO11:

The usability of Teams is not confusing, but it is so bad that it is not used. If you use Teams, it works very well, but for externals it is usually unusable because of the poor usability. Internally,

we use it a lot and it works well if you don't keep building variants. But the usability for externals is so bad that they usually ignore it or email it. In transactional processes, I have tried to work only in teams, but I still get work results by email because the usability is not good enough. People would use it more if the usability was better.

Moderator:

Can you explain why the real estate industry is poorly digitised even though it is very capital-intensive?

Interviewee IO11:

So there are several reasons why the industry is not so open to digitalisation. On the one hand, it could be due to the demographic composition of the industry, which often consists of older, less digitally-savvy people. For another, the data in the industry is often non-transparent and heterogeneous, which makes it difficult to collect and standardise. Many important inputs still have to be asked for "old school" by phone and the data situation is often not well available. All of this makes digitisation in the industry more difficult.

Interviewee IO11:

Yes, that's true. I also think that in other industries that are more homogeneous and have more standardised processes, it is easier to digitise and use the data. But in the real estate industry, there are just many different types of assets and transactions that all require different data. That makes it difficult to create a uniform database and use the data. But I think that the industry is slowly moving in this direction and that there will be more opportunities to digitise and use the data in the future.

Moderator:

Please explain this further

Interviewee IO11:

In Germany, it is nobody's business if someone asks how much they earn. However, when an American asks, a figure is proudly mentioned, for example "I earn 160,000 euros". The

interlocutor then often congratulates and says "Congratulations". This is often culturally determined because, in Germany, people do not like to talk about money and values. Although there are more people talking about it openly lately, this mostly takes place in backroom conversations and not at public events like an Expo. There, such factors are only mentioned in personal conversations. Companies sometimes join forces, such as the Corporate Real Estate Initiative, in order to collect data together and produce a market report based on this, which does not come from brokers. Brokers may be involved, but developers and portfolio holders are the main players. This collaboration has the advantage of creating a solid database that can convince investors. This is in order of game theory, where a private good becomes a public good when data is shared. The advantage of not giving out the data is that it gives you a competitive advantage. However, if everyone shares their data, all companies can do better business and benefit. This has to be overcome by merging and binding data sharing.

Moderator:

Then can you explain to me why this has not arrived in German in the real estate industry?

Interviewee IO11:

The openness about prices in Germany is culturally conditioned. If you look at the real estate markets in the UK, there is much more open talk about prices and the markets are more transparent. I suspect that this is not the case in Germany, as companies think they can gain a comparative advantage and therefore do not want to share. However, if everyone participated in such data, everyone could benefit. This is the core of game theory or Nash equilibrium. The individual advantage of sharing data alone is zero or even negative, because you have a disadvantage if you are the only one sharing the data. It only works if everyone participates. Therefore, mergers or associations are needed that commit to each other to share their data. If everyone does this, everyone has a total advantage. There is a lack of initiative and external pressure in order to invest time and improve the availability of data. There are already initiatives like the corporate real estate initiative, but it is only suitable for light industrial properties and

not for large logistics properties. One possible solution would be to make the data more available. The problem, however, is that it is difficult to anonymise the data. For example, if property "XY" was sold at a certain purchase price and generates a certain rental income, one immediately knows who the tenant is, who the seller is, who the buyer is and what prices were paid. Since the location of a property has a decisive impact, anonymisation is difficult. This is an important point because the data is not anonymous.

Moderator:

Thank you for the interview and all the best for your future.

Interview IO12

Moderator:

Can you name any digital tools or breakthrough digitalisation that have recently been introduced in your company?

Interviewee IO12:

This is in order of the latest topics and projects we are currently using. One of them is the change of our factory model in Asia from traditional to activity-based working, in order to be able to make better decisions based on numbers in the future. A Visitor Management System has also been introduced there. However, I personally have not yet analysed and evaluated this system. These are the two latest developments at the moment. We are in the process of moving our resource booking tool to the cloud so that we can use more functions. In parallel, we are working on a digital agenda until the second quarter, which will include more topics we want to implement. In particular, we want to move from a selective implementation to a comprehensive implementation. For this reason, we are now working in a concentrated manner on a digital agenda for our area. I have forgotten one topic, but it is rather small. In Frankfurt, we have also implemented the topic of AI-based video surveillance, which is also quite exciting. This allows us to connect a few smaller locations, which we can then manage via the security

centre. We have also solved licence plate recognition via this topic, i.e. automated entry into the garage and some other topics.

Moderator:

Have you had negative experiences with digitalisation in your projects?

Interviewee IO12:

Difficult. I have been working in the digitalisation sector since 2013, before that I was a project manager and had experience in ICT infrastructure. So I am very familiar with the topic of digital facility management.

From the company or among ourselves, we spoke, I say, two different languages and the topics have now married more and more. You notice that companies are trying to get more and more into FM, but FM is more of a manual and administrative profession and not experts. That is then more the exciting challenge, to provide the right expertise and not to make the topics too complex.

Moderator:

Have you experienced problems with the implementation of digital solutions?

Interviewee IO12:

The question is always: where are the challenges? Possibly this falls into the category of "exhausting". I think there are two factors that play a role.

The biggest factor is the cultural change in people. It is important that they accept that IT or software are just as important as a vice, in order to speak figuratively. I think that is a big challenge that we are working on right now. The second challenge is that I am a bit worried that after this change we will no longer have the possibility to choose between different solutions. As an example of the problem in real estate is that we completely digitised a flagship office in Paris, for example, in order to be able to offer such a platform to their clients. They needed 16 solutions in order to cover the entire portfolio. But when you have 16 IT solutions, you also need appropriate staff to manage them in order. So that's another challenge to deal with. In

addition, buildings are expensive in themselves, which is another factor. In the past, sustainability and digitalisation have been used to streamline and simplify issues. However, now when you make such a big leap and also include animals that may not be as cost-effective, such as caretakers, it presents a strong challenge. These are the three parameters that need to be considered: One's own staff must be able to accept and use these changes. It may be necessary to train them for this. However, there is also the danger of creating too many solutions. The question is whether there is a single solution or whether one has to deal with the complexity. The third issue then is what the operational costs will be in the long run.

Moderator:

You have now mentioned three exciting aspects that I would like to discuss further. What is your experience with staff training?

Interviewee IO12:

This is partly what happens and is too stressful for some. Some feel that they underestimate their operating religion because they come from the facility management sector, which is similar to the service sector, such as the restaurant industry. As a result, there is sometimes a risk or danger that issues are automated, but then there are not enough people to maintain the social interface that they live on and to deliver services well in the home. As a result, the issues suffer because the direct contact with the client is lost. So you need the right intersection here. For some others, however, it is really the burden of change in facility management that they find too onerous. They prefer to be out and about in the house instead of being tied to the PC. In the process, they may also lose their own joy or nature that they have acquired over the years. You can also see here that the profile for the future is changing.

Moderator:

Is it because the training and programme are too complicated?

Interviewee IO12:

I wouldn't say it's too complicated. The routine of the work is a factor that makes it difficult when someone arrives in person. However, when someone arrives in person, I can respond quickly by coming over and serving quickly. However, if I had a workflow management system, the ticket would come in centrally, I would answer it and inform the customer about the ticket without contacting the customer in person. In this case, yesterday's employee would possibly be satisfied.

He could give up something quickly without tying up his personal time. But the facilitator who had previously enjoyed seeing his clients in person may fall behind a bit more. Then new problems can also arise because you are no longer as involved in the day-to-day business and you also don't get to see much in the organisation. There are advantages and disadvantages in both situations, and it is a typical change that has to grow over time

Moderator:

Please explain how the 16 solutions in the Paris office location came about?

Interviewee IO12:

I haven't looked at all 16 in detail now, but they really implemented all the components you can implement - from digital guest management to navigating through the office. They would integrate everything. For example, they implemented a wealth management system, which is more of a health management system for the building. It shows air quality and occupancy and they really implemented almost everything that is feasible in order to provide a portfolio for their clients. Merging and reporting the components requires complexity and individual systems must be able to be operated operationally. Of course, this also requires manpower.

Moderator:

Is there then the possibility to consolidate 16 products into one application to work somehow.

Interviewee IO12:

There are already standardised APIs that many people use in order to integrate everything. You can possibly use an app, but it is still necessary to have someone who understands the system

in the background. Vision is expanding, designing and developing the system, adapting the processes and interfaces and working especially on current issues. For example, we are implementing weather-dependent building management and a sustainability barometer in Frankfurt - there is always something to do. Depending on the season or changes, you have to address issues individually. Each building is different, and each culture varies when you are globally distributed. This requires expertise and skills in order to create the right user experience. When it finally gets to the location manager or a staff member as a single interface, it requires a lot of effort to ensure an appropriate user experience in order. You can't just apply the same 16 solutions from Paris to another building. It takes a special person to manage the building individually, as each building is unique and cannot be managed in a general way. The user behaviour, the building, the technology and the desired use cases are all different.

Moderator:

Have you already reached the point in your company where the costs of digitisation were too high and therefore not feasible?

Interviewee IO12:

I have not asked them in detail about the costs, but I know from other projects and properties that it is done in new buildings because maintenance and a digital building are needed in order to meet future requirements, especially with regard to the Net Zero strategy and other new developments. From my experience in facilities management of our existing buildings, it can often be too expensive in order to add or upgrade systems. However, the market is working to use existing systems in the building in order to upgrade them. An example would be using LED lighting to save in the long term. Creative ideas like Bosch's to update smoke detectors when they are replaced are also helpful. The market is looking at adding technology so that it can be used for building navigation or lighting in the future, in order to save costs and not have to re-route wiring and systems in existing buildings. Costs are reviewed regularly because sustainability is an important issue for us and in order to work sustainably you need data. In the

past we have focused on digitising where it is possible, but it is more the system components that are already in place that are being digitised. There are two areas: one that digitises the building itself and the other that further digitises the processes. Examples are access to the building, payment in the canteen and other activities. Currently, we are working on both fronts in parallel with the group and other issues, and you can see that the building issue is much more cost-intensive.

Moderator:

Is digitalisation then also implemented in the corporate strategy for the future?

Interviewee IO12:

So one of the core building blocks is simplicity and digitalisation, although it has to be said that the building issue is always slower than your own other operational processes that are already digitalised. As you mentioned earlier, new buildings are inherently digitised. The technical problem sometimes arises when there are multiple tenants in a building. The systems cannot cope with this in part if there are too many different wishes. Most of it consists of existing buildings and the question is how to design them. For example, our campus in Schwabing consists of 11 different buildings that need to be unified in order to see what technology is used and how it is supplied. While in one building core cooling works, in others walls are cooled and cooling is delivered throughout the day. If you don't have sensors, you may be running all 11 buildings instead of just running the core buildings and adding others as needed. Such issues can only be solved by numbers, data and facts.

Moderator:

What happens when two different buildings or subcontractors are merged and data has to be exchanged? Do complications arise in the process?

Interviewee IO12:

Today, a lot is in order with infrastructure, especially with companies like Allianz Global Investors or Pimco that have their own IT and network infrastructure. When you have to bring

them together, there are a lot of complex challenges with our IT systems and theirs. It requires deep expertise in order to connect them. In the next 3 to 5 years, it will probably get easier as many companies give their data centres to cloud services and more communication sharing and EPI integrations occur. But currently, many companies still have their own infrastructure, which leads to challenges when it comes to different tenant and system requirements. It is an increasing challenge when companies have different systems and data requirements due to sustainability obligations. Currently, this is still handled manually.

Moderator:

Have you noticed any problems with communication with external parties in relation to digitalisation?

Interviewee IO12:

No, not at all. It's more the case that our systems are very closed, even from the past. If we need data from external parties, we have our own file exchange where topics have to be uploaded. Otherwise, contracts are concluded and that's what the contracts are for. It is now very easy to have them signed via systems. We mostly use Office 365 or our colleagues in the decentralised American region, I think it's called. They have largely good digital interfaces. Covid has probably also made communication much simpler and easier to understand. We are now also connected via teams. In the past, it was often conference calls where you didn't see each other and then topics were much more difficult to communicate. For most companies, this is not a problem because Germany is also very much a singles' country, and as a result they are often practised, whether they are consulting companies or project companies, which are then also partly hired on a project basis. And most companies already have very distinctive external management where people can be onboarded well or very well. What I've also seen in our group is that it's very easy to create guest accounts via teams or other platforms, so that people can really use the same platform and the profiles are automatically deleted after 6 months at the latest, if not earlier for project-related reasons. The only problem is that you often have to switch

between different Teams accounts, but I also believe that this problem will be almost negligible in the next 2-3 years. In a nutshell, the greatest challenges or problems lie with the personnel. There are many solutions, individual solutions of real estate, which is of course also associated with high costs. In addition, there is the infrastructure, without existing standardisation. The question is what is the right solution for you? Many would like to see more consolidated solutions on the market.

Moderator:

Thank you very much for your interview. All the best for the future.

Interview IO13

Moderator:

What digital innovations have they experienced or accompanied?

Interviewee IO13:

I am happy to look at the stereo vision group, especially the projects they have accompanied. They have accompanied the accounts payable workflow as well as the complete digitalisation of invoice receipt, including the approval process. This has led to the introduction of the invoice run, which is now well accepted in the real estate industry. There are certain invoices that you simply have to approve by mobile phone. Another project concerned the digitalisation of customer service, especially in the rental department. CRM systems based on Salesforce were introduced here, which are leaders in this field. Digitalisation projects were also carried out in the rental workflow, marketing and unemployment. Everything was based on a centralised platform. Many applications were also developed in the area of portfolio management, property management and Regner application management. In the digitalisation process, it was important to consider not only the technological component, but also the human component, as they have to operate and maintain the systems. Another project I did during my time as an analyst at Metro was to create a location analysis model based on S-reacts, the leading comma

system provider. We reduced a job that normally takes two weeks to four hours. I also ran a tender for an international analysis system for Metro Cash and Carry locations based on Alteryx. This system gathered all the store data and packed it into large databases, which were then transformed to create potential analyses for new locations as an expansion tool. These were some of the big projects I was involved in. When I start new projects, I always try to check the available data first. But often you start from scratch again.

Moderator:

What negative aspects or risks have you experienced in the process?

Interviewee IO13:

I can say that none of the companies I have worked for have prepared their data properly. We have dealt with many start-ups that offer great technologies and platforms, but without clean and controlled data and a structured filing system, digitalisation will not work. With standard systems, I tell the system what to do, be it chat GPT or something. The system only does what I tell it to do and not what I don't tell it to do. When it comes to digitalisation, the understanding is rarely there. The work that needs to take place before a process or transformation - consolidating data, cleaning it, creating concepts and recording processes - is often not done before you tackle something technologically. It is astonishing that the know-how is mostly available in the company, but external consultants are hired who often have as much or even less idea than the employees in the company.

Moderator:

Do you have an external consultant for the know-how?

Interviewee IO13:

The hurdle, I think, is that you can introduce as many tools and come up with as many digital processes as you want. But if you don't know what the foundation of the real estate industry is, no house will stand cleanly in the current real estate industry. Nobody is able to present or share data in a fully structured way, which is the next big problem in digitalisation. If you compare

Switzerland, Germany and Austria in the German-speaking world, Germany is the most intransparent market in real estate. Without data sharing, there is no digitalisation. There are only a few providers who are good at this, such as Bulwiengesa, who set up the Peace Platform. But most other providers don't understand how mobility policy works because it's not a market of its own. There are no dedicated mobility providers who can do it well. Digitisation often fails because the information is not linked.

Moderator:

Can you elaborate a bit more on the data quality?

Interviewee IO13:

Data foundation has to be clean, and, in most cases, this is not or very piecemeal in silos. The understanding of digitalisation is not always there, regardless of age. Our generation often says that older people are not so digitally affine or lack understanding, but that is not always the case. There are also many young people who have no understanding of digitalisation. We have to find ways to create understanding and create a culture that is oriented towards digitalisation without focusing on the technological aspect. It's about bringing people along and creating a culture that is focused on digitalisation, because people ultimately feed the systems with information. If the understanding is not there that data has to be entered correctly, in the right place and at the right frequency, then there are many problems in digitisation. The basic concept of digitisation is the same for all companies: you have to get your data in order and create a data foundation in order to then update.

Moderator:

Is training also offered for this?

Interviewee IO13:

This problem is multidimensional. Of course there are training courses, but I would like to give a simple example: In every larger company I have worked in, the Office package was mostly used extensively in the business sector. I alone would wish that my company would come close

to exhausting the Office package. The possibilities that Microsoft offers are manifold, for example in terms of collaboration. We're not just talking about MS Teams, which has only been around for a few years, but also other programmes like Outlook or OneNote, which has experienced a kind of renaissance, even though it was almost shut down. How can you use Excel without being a professional? So it's about understanding the basics of the programmes. After that, it's all about training. Do you need PowerPoint training? I would say no, but many say yes. It is useful to use the tour of the programme to create understanding, in order to share and collaborate. For us it's standard, but for older colleagues it can be difficult and in that case information should just be shared in a timely manner without having to call someone or chase data. There are a variety of issues when it comes to training people to use software, some of which is also very bad. One dimension is that we all know software from our personal lives, like apps or platforms like Amazon that have a very good store. However, in the real estate industry it is rare to find intuitive and clear software that works like a 3-click system on Amazon for purchasing. It is often said that the subject is more complex. You may see it that way, but in my opinion, many software companies, especially in the German-speaking world, do not have the approach of keeping design and usability high on their agenda. One point is that staff are often the ones who have to enter data and it should be easy for them to enter it. But are they motivated to enter the data? There is no compulsion to do so, so if I don't enter the data, I can still work. As a result, the data is slower and sometimes not available in a system at all. There are two levels: The flexibility of the system and the motivation of the staff to enter the data. Sometimes the system can be manipulative, but on the other hand, not everyone can be expected to have a deep affinity for it. So the maintenance of the data has to get up somewhere in the goals. What is completely missing is that digitalisation also goes hand in hand with keeping my data clean and forcing everyone to use digital tools. Self-government in Germany has done it to some extent and we can see that it works. This is exactly how it works for all other areas, if I don't make it compulsory, but introduce digital work as a standard. Once I have established

the digital workflow, I can devote myself to other things and present the added value of digitisation to everyone. For me, digitalisation has always been an opportunity in order to simplify processes and make them more efficient. Intuitive and clear software in the real estate industry is rare. It is important that digitalisation simplifies the maintenance of data and that all employees use digital tools. It is not self-evident that all employees are motivated to enter data. The process of digitisation initially requires more time than the original process to process something in order. However, if it takes us a week to learn in order to use a new tool, we save a week of processing time in a month for a certain process and thus have a time saving of 50 weeks in a year. Digitalisation allows us to have more free time for other things, both professional and private.

Moderator:

Can you describe situations where efficiency has deteriorated?

Interviewee IO13:

I remember the accounts payable workflow that we created together with the accounting and finance team in one of the older films. In the beginning it took a long time to set up this process. We had to adapt old work processes that the system didn't understand. It also quickly became clear that everyone was doing the process a little differently. We decided to implement the process in an area of the accounting team where there were many older ladies. At the beginning they struggled and things did not go optimally. A lot of time was needed for processing and forwarding into the workflow. Technically, there were also some difficulties, as some freedoms could not be mapped in a project before. I don't know if things have improved in the meantime. What is often missing is a recording of the situation of processes before and after digitalisation in order to be able to draw comparisons. Digitisation often requires more effort than increased efficiency. You have to rethink the processes, conduct training and actively live the processes. The latter is often the most difficult. Once the processes are in place, things tend to move faster. For example, in an older company, contracts used to be signed on paper and sent back and forth

between 6 locations throughout Germany. It took up to 6 months for the contract to go through all the locations. That is absurd. We then introduced Docusign, a tool that now allows you to do it in 6 minutes - from start to finish. This is a good example of how digital solutions can speed up processes.

Moderator:

Can you explain why there has been little pressure over the years to digitise the real estate industry, even though there is so much capital in the market?

Interviewee IO13:

It is amazing how much money is involved and how digitalisation has increased the pressure to optimise processes for cost reasons. In the industry, there used to be less pressure to digitise because Excel and other tools were sufficient. It is now becoming problematic to get money on the market, and the reporting requirements are increasing, especially for banks and financing. It is for EU taxonomy compliance and consumption data for real estate. A pure data problem. We are at the beginning and must continue to focus on creating a solid data basis in order to improve reporting and obtain ratings. We have a project team that is solely dedicated to data. I believe that the bottom-up approach to digitalisation is the more effective approach. We need to create a solid data basis at the bottom and then increase the granularity in order to push the data upwards. What is done with it at the top then doesn't matter. If the foundation is not clean, the reporting tool can't do anything. It is important that the data is clean in order to produce error-free reports. This is a challenge, but it is possible to deal with tools like Power BI and Excel.

Moderator:

Were the costs always feasible for Digital Optimisation?

Interviewee IO13:

It always depends on the company and the expectations. Many companies would like to have a 'beast', but that is often not realistic and costs a lot of money. No software company can solve

all problems, there are always compromises. I have already experienced narrow solutions that were well thought out and cost little money. But I have also experienced systems that cost over millions and were not nearly able to do what they were supposed to do at the beginning. That is why it is important that companies first think about the data concepts, people and processes and put these points in writing. Before contacting a service provider, one should be clear about this oneself. Any company can do this, regardless of size or industry. Blackrock, for example, has done it well by being completely systemic. But until 5 or 8 years ago, they did everything in Excel models, which is very impressive for the largest asset manager in the world. It certainly works with systemic support from SAP and other tools, but it is amazing that it worked with Excel models.

Moderator:

Are there differences to digitalisation among smaller real estate companies?

Interviewee IO13:

The opposite is true. If you think through the processes well in a small company, you can do it just like a big company. Of course, you might not be able to afford SAP, but there are so many tools on the market. Small companies just have to invest a lot more time and know-how in order to get the process right, but it is doable. Big companies just have more resources, but then pay consultants to explain to them something they could actually know themselves. Otherwise, I could say we'll take all your processes in a week and see which ones can be digitised. There are many simple things that can be implemented, such as electronic signatures. You can also use other certified signatures that cost less than Adobe.^{[11][12]}

^{[11][12]} Moderator: Are there problems with so many solutions on the market?

Interviewee IO13:

Among all the providers on the market, there are of course black sheep. If I haven't done the three steps I mentioned before, I don't know which tool to choose. If I don't know what my requirements are, I can't choose a suitable tool. It is no use to blindly screen through the internet

in order to find out who can offer what. The search for a suitable tool starts with knowing exactly what you actually need. For example, if you want to digitise the invoicing process, you need to be clear about how the process currently works and whether you would like to simplify it. You also have to consider whether the entire process needs to be thought of digitally and whether everyone involved can handle it. Not every process is worth digitising. For example, if a process only costs 1000€ but currently only consumes 10000€, one should ask oneself whether digitalisation is really necessary. It is important to prioritise and digitise those processes that cost you the most time and money in your company. Even smaller, but annoying processes can be digitalised in order to save time and effort.

Moderator:

Were there any digitisation processes that could not be digitised for cost reasons?

Interviewee IO13:

It doesn't fail because of money, at least not for a certain time. But when is the right time for digitalisation? Either when you want to look innovatively into the future or when the pain is very high, such as when you can no longer control costs or the complexity becomes so high that you can only manage it digitally. The real estate industry has to deal with issues that it has been rather negligent in dealing with so far, especially when it comes to sustainability. Investments and financing have to be processed, and depending on how many properties or projects have to be financed, everything has to be kept under control because the bank does not sleep. For example, if you don't pay your instalments, the bank takes the project and the money away. This applies to small and large companies. In recent years, there was no pressure on the real estate industry because there was enough capital and thus no pain point. Consequently, no need for innovation was seen in order to move forward in this area either. An example of a disruptive model is marketeers. When looking for a flat or a house, one no longer needs an agent, as one can freely look around the market and see the available properties and their costs. One could argue that the agent merely posts the data on Immobilienscout or similar platforms, but is it

really necessary to pay the agent three and a half net cold rents for this? I don't think so, and this will also have an impact on other models. There are many service providers in the universe of the real estate industry that can be digitised and will thus be eliminated.

Moderator:^[11]_{SEP}

How is the digitalisation strategy managed in your company?

Interviewee IO13:

It seems that digitalisation has been thought of in the real estate industry for a long time, but it is not the same as digital work. Digitalisation rather means mapping manual processes automatically or partially automated. It is important to choose the right time in order to start this process. Companies that digitise their processes first now will be more successful in the future. The pressure is getting higher in order to work more efficiently and deal with rising costs. Digitalisation is coming more and more into focus, as it is a big construction site in order to get all the processes together. Investors now see the financial advantage of digitalisation and the possibility of reporting and evaluations. Strategy development is an important point, as it is necessary to think about how to implement the net-zero plan for new buildings by 2030 for the next 10 years. Time is short and many processes have to be changed in order to achieve this goal. A normal software implementation takes at least one year and it takes several years to convert all processes. There is no software that meets all the requirements, so different tools have to be used.

Moderator:

Is there a clear digitisation strategy?

Interviewee IO13:

It is important that companies do not just talk superficially about digitalisation, but have concrete strategies and implementation plans. There are countries like the Baltic States that are more advanced in terms of digitalisation than Germany. It is also worth noting that Finland has

already digitised civil marriage ceremonies and notarisation. Companies need to understand that digitalisation is not just a trendy topic, but a necessity in order to remain competitive.

Moderator:

How do you see cybersecurity and data protection on these aspects? Were there any negative experiences?

Interviewee IO13:

What is the biggest weak point in the company? The human being. The easiest way to get into a company network is through an email. Even though our security measures are high and we conduct regular training and simulations, there is still a possibility that someone can get through. This is because while a firewall and other infrastructure measures can defend against experienced attackers, they cannot help against human negligence or deliberate attacks, such as someone plugging in a USB stick or clicking on a link in an email. It is only possible to prevent these types of attacks through training and awareness-raising, but it remains a big issue.

Moderator:

Is this an issue that hinders digitisation?

Interviewee IO13:

That depends on the particular economic or administrative sector in which it is readily used as an argument. Any large organisation that would operate economically has to make sure that its data is secure. In recent years there have been many cases where large companies like Samsung have given their code to Chat GPT and then been surprised that it was suddenly publicly available, like Facebook. It is important to understand that everything on the internet belongs to whoever is making it available. That is why people are the issue of security. If people don't learn privately to handle the internet safely, it won't work professionally either. That's why there needs to be a lot more awareness raising and people need to be aware of the consequences the first time encryption happens on their own computer or they are asked to pay in Bitcoin or pay

a bill from a collection agency. It is important to think about what is going wrong on your own computer. The stupidest thing you can do in these situations is actually pay.

Moderator:

Back to the topic of transparency, how do you see the current situation in the real estate industry?

Interviewee IO13:

In order to improve our work processes, we can first digitise our own and improve internal reporting and external automation. However, the question arises whether a certain market transparency would not be fundamentally advantageous. In Germany, however, this is seen differently than in Austria, where information on house sales and rents, for example, is publicly available. In Germany, however, many companies do not like to share their data, even if it is not in order of personal information. The GDPR plays an important role here, as it states very specifically that no person-specific data may be shared. However, the question arises why, for example, rental prices or office locations cannot be shared without person-specific information. A certain degree of market transparency could be beneficial for all parties involved, especially for companies that work with real estate. There are clear assessment procedures and standards in Germany and internationally. You have to think carefully about which model you would use. There are many variants, but in the end each only does something special that is actually simple. The financial mathematics can be mapped in the system and I expect the usability to be good. Transparency would mean that data can be linked together in order to identify potential. For example, vacant and brownfield sites can be identified in order to develop them and stop sealing more land. In Germany, however, there is no uniform collection of data; the cities have to collect everything themselves. So there is no nationwide register of brownfields. We don't even know how much land is actually still vacant. However, the Dwv is currently taking care of this and is worth recommending. So it is still this dominating knowledge that prevails. In the US, there are many examples from the geodata sector and also in the mobile sector, where the division of

data actually creates more added value, because there are many more companies that then process this data and create new products from it or at least provide more background. In other words, intransparency would lead to everyone developing their own isolated solutions and there would be no uniform approach to digitalisation at all. Firstly, that, and secondly, there are usually quite a few problems that many companies have and that would only have to be solved once. So why is everyone working on the same thing? For example, in Germany there are a thousand different ways in which every real estate company tries to present cash flow.

Moderator:

Why not standardise this and develop software that makes it uniform?

Interviewee IO13:

There are clear assessment procedures and standards set in Germany and internationally. But there are an incredible number of variants where everyone somehow thinks they are doing something special, but it is often very simple. Financial mathematics can be mapped in the system and the usability should be good. In order to improve the brownfield land register in Germany, for example, it would be important to share data. Every owner who has a speculative property somewhere in the city centre should be asked after a year why nothing has happened yet. But that is exactly what does not take place because the owners are not interested. The same applies to the property tax, where all the necessary information was available to the authorities but was not connected. It is completely absurd, but this is how it works in Germany because no one at the administrative level brings things together.

Moderator:

Thank you very much for the interview.

Interview IO14

Moderator:

How long have you been working in real estate and what is your current position?

Interviewee IO14:

My job is called Senior Associate Director. I am in charge of Sales and Partner Management here, which means that I am responsible for building up new clients and developing digital real estate projects on the commercial side. I've been here for three and a half years now and in that time I've gained experience in real estate and the digitalisation of real estate.

Moderator:

Please describe technologies or digitalisation measures that have been introduced in your company in recent years.

Interviewee IO14:

When you meant digitalisation measures, do you mean the internal ones we take out or the ones we sell externally to the outside world?

Moderator:

Now, internally, it's not about the product, but rather in your company, how you deal with digitalisation.

Interviewee IO14:

Internally, we have of course introduced the digitalisation of files and all kinds of documents, which has to do mainly with our tenants. We use systems like Doctor, Who or also Domus for our property management, accounting and bookkeeping. At the same time, we have our USP, the software we developed ourselves, which digitises the entire real estate process. We use it to cover leasing, marketing and the entire rental cycle, and use our own software to digitise processes rather than relying on third-party software.

When you look at the big result, you naturally look at things less critically. We are a 100-person team and therefore also have to pay attention to the costs. We can't afford licences for several thousand euros a month if processes can be mapped manually almost as quickly as with software.

Moderator:

What are your negative experiences in relation to digitalisation?

Interviewee IO14:

A big factor that slowed us down in digitisation was foreign software like Docuware and similar programmes. The scope of functionality of this software does not correspond to what is needed today. The task package for which the software was designed fit in some form 15 years ago. This means that at that time one only had one document as a rental agreement and no further additions were necessary. Such issues are poorly represented in the old software programmes and pose a problem in the software developed in-house. Another problem with many software programs is that they are often limited to specific subject areas. This means that you need a separate software for each individual subject area in the real estate industry or in the life cycle of a property. This means that you must work with many software programs that all must communicate with each other. During the construction phase you need software for letting and marketing, and during operation you also need your own software. This means that you have to work with a large number of software programmes that all have to communicate with each other. If the software programmes are not compatible with each other, you have problems operating them and there is a high potential for errors when you have to transfer data manually. Another important factor why we decided to develop our software ourselves is the high price of accounting and other software programmes in the real estate industry. These programmes are very expensive and are broken down to the number of users, which makes them very costly to use. From a commercial point of view, this is a big disadvantage.

Moderator:

Is the cost factor a decisive point for you as a PropTech?

Interviewee IO14:

Of course, this also depends on the size of the company. If you are a large company, you often look at things less critically. As a 100-person team, however, we have to pay attention to costs

and cannot afford to buy licences for several thousand euros a month. Especially not when processes can be mapped manually almost as quickly as with software.

Moderator:

Have you had any experience of efficiency breaks caused by digitalisation?

Interviewee IO14:

I have also noticed in my own work that there is a problem. For one thing, the user interface of the software programmes is very unattractive because they are often so old. They are not as intuitive as we are used to nowadays as the Instagram and Co. generation, which means that you often have to search for a long time and the software loads slowly. Another big problem is the lack of interfaces between different systems. If you want to switch from one system to another, you either have to export data or open the other system and transfer data manually. This is of course very inefficient.

Moderator:

How would you describe the problem here?

Interviewee IO14:

Lack of, connectivity and intuitive use of the software interface.

Moderator:

Can this problem be solved with training and tutorials?

Interviewee IO14:

Another negative factor is that you have to create extra positions in the company to act as coaches for the introduction of new systems. Of course, these positions also cause costs. The coaches are internally responsible for training, which has to be carried out again and again, because even a simple system update often changes the entire user interface. Especially with an old-fashioned platform, this can mean that people have to be trained again and again in the processes and cannot simply start the computer in the morning and start working straight away.

Moderator:

Can you describe the limits of digitalisation, where digital was a problem?

Interviewee IO14:

Yes, one example is the issue of flat handovers. Here, you have to be on site and take an accurate picture of the flat in order to ensure that the flat is taken over in perfect condition and that the deposit is returned. However, we have found that apps or other digital ways of taking photos of the flat can be manipulated. This means that the effectiveness and benefits of such a digital solution are too high risk. Manual work on site during the walk-through is superior to digital solutions in terms of accuracy and implementation.^[1]_[SEP]

Moderator:

Is it possible to digitise and optimise the process in the future?

Interviewee IO14:

I see this as a process that should be possible in theory if you want to pull off digitalisation throughout the real estate cycle. However, this goes hand in hand with developments in the area of data protection in Germany. For example, you would have to take a closer look at the legal aspects of a live transmission during a flat inspection that you carry out yourself. There is probably still a long way to go in order to implement this. At the same time, online identification procedures also need to be developed in order to ensure that the person carrying out the inspection can be clearly identified. This probably also involves a high cost factor.

Moderator:

How important is the cost factor for you young company?

Interviewee IO14:

We see things mainly from a commercial perspective and that's why I often hear the answer: "It's too expensive". In summary, it can be said that digitalisation is primarily about efficiency and making work easier. There is also a certain point where another digital tool is no longer useful and does not bring any further improvement. It is important that ideas on the market are mature enough in order to significantly increase efficiency.

Moderator:

Is there a point where digitalisation has not helped, but made things worse?

Interviewee IO14:

I can't give you an exact number, but we definitely use too many internal software and tools. This leads to interface problems and we sometimes have trouble figuring out which department is working in which tool and what information is available where. There are too many databases and options, which can be very frustrating at work because you don't know where to start and how to work. There is a communication problem internally, but on the other hand, the problem also lies in the fact that the individual software solutions on the market do not cover all the functions that are needed for certain processes. This often makes it necessary to introduce a second or third software that complements the process in a meaningful way.

Moderator:

Can you describe problems in the social sector that have arisen due to digitalisation?

Interviewee IO14:

We have found internally that the pure separation of work increases effectiveness. Everyone can work in the home office when and how they want, and through Microsoft Teams, appointments and processes can be carried out more quickly. A quick phone call and the work topic is done in two minutes. In the office, we might have talked about the Bundesliga or something like that over the weekend, but we have also found that team building is more difficult. We are 100 employees here and have no personal ties to the company. As a result, we lack the daily exchange and bonds with our work colleagues. This has a negative impact on the team dynamic. Rumours or insecurities arise more quickly, which cannot always be avoided, and which can quickly develop into larger issues that could be quickly clarified at the coffee machine.

Moderator:

Can you describe situations where problems with external communication have occurred in relation to digitalisation?

Interviewee IO14:

One obstacle could be that many of our clients use Teams and thus there is an expectation to receive feedback quickly via the Messenger service. If the client writes a huge project in the morning in order, it is difficult to respond adequately within 3-4 hours, which can lead to difficult prioritisation. In addition, some things are lost via communication via messenger service and misunderstandings arise that can be clarified in personal or telephone contact. There is also the danger that small messages in teams can quickly be interpreted as a lot of things and lead to ambiguities. Issues such as bad moods can be better clarified in personal or telephone contact. Customer acceptance and satisfaction can suffer because, from the customer's point of view, answers are not given quickly enough and there is a loss of information. This means that you have already had negative experiences with digital communication being misinterpreted by the customer and leading to a bad image of you. Problems can also arise in the opposite direction, when the customer urgently asks for a call via a team message, but in the end only a small matter needs to be discussed. In such a case, a phone call might have made more sense in order to avoid misunderstandings.

Moderator:

Can you describe if there was a technological dependency that affected your work?

Interviewee IO14:

You have to think a little here. Basically, I would answer no, because the telephone still plays an important role. However, the work would be much more difficult without classic Microsoft tools like Outlook, Teams and Excel, as well as without a suitable CRM tool. From a commercial point of view, these are the main topics that are relevant for us at the moment. However, if we focus on management as property managers, our property management would

not work without our own software. This in turn means that we would need 20 different pieces of software for each function, which would make us unemployable.

Moderator:

How is the digitalisation strategy implemented in your company?

Interviewee IO14:

That is indeed part of our strategy. We are committed to being Germany's most innovative property manager. This means that we are the digital ones on the market and work as digitally as possible, which is also what we demand of ourselves.

Moderator:

Are there any other aspects that you have noticed negatively in relation to the digitalisation of real estate companies?

Interviewee IO14:

Maybe it's just another cost, but the aspect of digitalisation in the real estate industry in Germany is a big problem. For one thing, data protection is a huge issue, which makes the implementation of digital processes difficult. For another, the hurdles in Germany for implementing digitalisation are very high. Many long-established companies work with large software companies like SAP and in order to access their data, you often need expensive interfaces. This strongly slows down the development of new software and is a financial obstacle regardless of the size of the company. At the moment, it is difficult to make a clear statement as to whether we in the real estate industry are really at the cutting edge of digitalisation. One of the main reasons for this is the data protection issue, which plays a major role in Germany. Many processes could be digitised, but data protection concerns often prevent this. Another obstacle in Germany is that many companies work with large software providers such as SAP and in order to access the data from SAP, several interfaces are often necessary, which is very expensive. This slows down the development of new software a lot and causes

high costs. Therefore, we develop our own software in order not to be dependent on these big providers and in order to save costs.

Moderator:

What is the status with the regulations in this regard, are there any obstacles and risks?

Interviewee IO14:

The criticism is mainly directed against the legal regulations in Germany, which often stand in the way of the implementation of digital processes. For example, it is often easier to fill out applications manually than to deal with the complicated data protection regulations. On the other hand, digital solutions also offer many advantages, such as the remote reading of meters. Here, however, one again encounters data protection problems, as processing of the data is often only allowed after two weeks. Real-time processing would significantly improve efficiency and sustainability, but is not possible for data protection reasons.^[1]_[SEP] In my opinion, these regulations in Germany slow down technological development and hold it back in many areas. We are well positioned internally, but we have experienced with many major customers from abroad that they are years ahead of us in terms of digitalisation. In England, for example, what is possible here thanks to digitalisation has already been used for 15 years. In Germany, we are lagging a little behind because of data protection. In a European comparison, we are clearly lagging behind in the area of digitalisation. But there is a noticeable improvement and it is now slowly starting.

Moderator:

Thank you very much for the interview

Interview IO15

Moderator:

What has your proptech focused on?

Interviewee IO15:

Our company name, originally specialised in the digitalisation of the real estate industry, with a focus on data evaluation. This means that we support companies to collect, structure and evaluate data from different tools like SAP or Excel lists. Typically, our clients are managers who want their data restructured and evaluated. This is where we come in, by having the ability to link different departments together, where previously there were only isolated solutions, and thus introduce company-wide control. We started with the development of our first projects and products and then increasingly saw the need for an extension of the value chain to also get into the subject of process automation and data collection. We have found that the data is often not available in the form and quality necessary for a sensible evaluation. Then we started developing apps like web apps, desktop apps, etc. to additionally capture the data and automatically feed it back into this system. This is our core product or our core business area, and my role as Managing Director is mainly to lead this.

I am also involved in the structuring of such projects, which means that I advise the client on site and set out the goals. I then structure this for our developers, who start programming. At the same time, our projects also result in product developments, where we say that we can standardise the whole thing and offer it as a package.

Moderator:

What are your negative experiences with digitalisation?

Interviewee IO15:

Basically, we have more of a consulting approach. That's why you have to differentiate somewhat between products and our consulting activities. The reason why we have focused on the consulting approach until now is that standardisation is relatively difficult in the industry. There are simply no uniform data standards and everyone uses different tools. There are so many different tools that are all similar but have no market leader. Sometimes companies even use different providers in-house for the same processes, which is historically conditioned. This means you can't really bring everything together in a standardised way, which is expensive

because you don't have a standardised product, but rather a development project, which is definitely more expensive.

Moderator:

Can you explain why that is?

Interviewee IO15:

Turning the world upside down is, in my opinion, the problem in the real estate industry. There is no awareness of what is technically possible today. That is why my main task as a managing director is to show companies what is technically possible in the first place. In doing so, I have many conversations with my employees. My choice of words is such that I encourage them to be honest about what they want to achieve. They should leave their technical understanding out of it for the time being. The problem is that clients often say, "We would like this and this". In the back of my mind, I know that not everything is technically possible or very elaborate. My experience is that there are often big differences between the client's ideas and reality. As a vain manager, I have now realised that I play an important role in resolving these discrepancies. I know that certain tasks are very time-consuming. Sometimes there are tasks that you think can be done quickly. In reality, however, they require a complete structuring of a tool and are therefore very time-consuming. In the beginning we often have problems with this, but once we have the tool up and running, extensions are often small things or just a few clicks for us. However, the client thinks that this is super expensive. For me, that's actually the biggest problem, that it then leads to misunderstandings and the clients end up disappointed.

Moderator:

Can you explain to me why the understanding is not there?

Interviewee IO15:

I can definitely say that I have not received any input in this regard, at least from the people with whom I did the training or whom I have met in the last 5-6 years since I started my

scientific and business training. Neither in my studies, nor in my internship or as a working student.

Everything is limited to what is already available. If you don't get inputs on what is actually technically possible today, it becomes difficult to identify tasks in the company that can be automated.

Moderator:

Do you mean that the values are not taught at the beginning of the training?

Interviewee IO15:

Well, I see it that way, that here in the elective module "Sound Course" we go in the direction of innovation and digitalisation. However, not so many students have that to choose from. It's going in the right direction, but otherwise most lack a basic understanding of how to integrate software in a meaningful way - maybe it should go more in that direction in the Bachelor's programme. I thought of asking Jannis if he could help us with this. My point is that we are currently working on automating everyday tasks - steps that are repeated several times a week and are actually relatively mundane. Our clients can partly do it themselves with the tools, but if you don't know how to do it, you spend an hour every day doing it instead of sitting down and doing it once. In the long run, that costs time and money.

Moderator:

Was there a point where digitalisation made a process worse instead of better?

Interviewee IO15:

What I mean here is that there are too many providers in the real estate industry, but no clear market leaders. This is definitely a problem because without clear market leaders, no standards can be established and there will continue to be thousands of individual solutions. But that should not be the goal.

Moderator:

Have you had any negative experiences when transferring data and documents in relation to digitisation?

Interviewee IO15:

Well, with us it is already possible to adopt basic IT and digitalisation structures. That also works quite well and we always try to take a pioneering role in the industry. For example, we are currently focusing on the development of asset managers because we have ideas there. You can always sell the concept well, but mostly it's just about the concept. You can't just say, "You've already set up an infrastructure, now you just have to set up your interfaces and then it will work." Unfortunately, that doesn't always work smoothly. At the same time, I don't see much exchange between the companies directly. Yes, everyone is their own master, so to speak, and everyone pursues their own interests. A good example of this are the project developers. We are currently working on a digitisation solution for development or transactional cash flows. However, this solution is based on developers being able to keep their own cash flow invoices, as the process is too heterogeneous to offer a general solution in order. We cannot simply transfer this solution to the web. Every company has now built its own IT infrastructure. It is difficult to redesign it, so every company continues with its own structures and processes and hopes that it will somehow work out well. There are many individual solutions in the company, there is no general solution like SAP, for example, that is suitable for many departments in the company. It is basically good to have a solution that is suitable for many departments in the company, but most companies don't have that or have only partially implemented it. The data comes from different sources, in different formats, and each company, in turn, has different software from different providers. It is difficult to bring this data into a standardised form and merge it. The whole undertaking is also very costly if a company wants to change something in the infrastructure. Standardisation is a very costly and labour-intensive process, as each department will probably have to maintain everything twice for a while. This brings with it a

huge risk of mistakes happening, especially when transferring data from old to new systems. This is also very costly in addition to the expense.

Moderator:

Can this process of digitalisation in the real estate company be afforded at all?

Interviewee IO15:

Yes, that's true. In the case of medium-sized companies, especially the smaller ones, you can make a lot of difference with comparatively little money. However, it is unlikely that you will find a solution that changes everything. It will probably be another solution in the company. In terms of merging data, out of 30 different tools, you can possibly merge 5 to 10 databases that were created at some point. For example, the accounting department can merge their 34 tools into one database, and the Jannis asset managers can have their tools in a common database. You can do that relatively cost-effectively and it adds tremendous value

Moderator:

Can these companies also afford the software of established companies that may enable a better quality of work?

Interviewee IO15:

The problem for smaller companies is that there are either very comprehensive solutions such as SAP that are only suitable for large companies, nor there are no solutions comprehensive enough to cover most aspects of the business but are still fairly priced. For SMEs, SAP is often overkill as it has too many features, all of which come with a cost. It always requires an SAP consultant, which is very expensive, and therefore often not practical for SMEs. The products and solutions for digitalisation are often very specific and you often have several of them in one company. The problem is that real estate as an object is very heterogeneous by nature and that the market participants in this industry are also very heterogeneous, both in their investment style and in their functions. As a result, there is often no single solution for digitalisation, and companies need several specific solutions to meet their requirements. The target group for

which you can develop and standardise a product is often relatively small, which makes it unattractive to invest a lot of money in the industry or to develop a product. If there are too many different functions per user, the tool becomes too complex and everyone uses it a bit differently. There is a reason why Excel is so common in the real estate industry, because it is very flexible. However, it definitely has more disadvantages than advantages.

Moderator:

Can you name me one digital tool that has made the process worse in terms of efficiency?

Interviewee IO15:

Yes, it is definitely a challenge, as the flexibility of Excel is difficult to replace without having limitations that make the product fail. The high heterogeneity and closed nature of the real estate industry also makes it difficult to establish standards. The industry is very closed and holders are often sceptical about digitalisation. Compared to other industries, such as medical or automotive, the real estate industry is still very far behind in terms of digitalisation. It is a challenge, but there are also opportunities to be successful, as your experience shows.

Moderator:

Is the lack of transparency an obstacle to digitalisation?

Interviewee IO15:

There seems to be a consensus that the real estate industry is very heterogeneous and complex and that standardisation is a major challenge. However, it is also a task for companies that act as service providers in the industry to develop and establish solutions in order to overcome these challenges. It may require a lot of work and commitment, but it can also lead to great progress in the industry.

Moderator:

Do you think that public authorities do not exert enough pressure with regard to digitalisation?

Interviewee IO15:

No, I wouldn't go for regulation. I'm more surprised that too few companies have managed to digitalise their processes to such an extent that they have an advantage in success and stand out from others. It is possible to speed up processes enormously through digitalisation and thereby gain a competitive advantage. In my opinion, that should no longer be so far away. Companies have to create that in order to have an edge in the market tomorrow, and then the others are obliged to catch up. But as long as there are no interests that crystallise and thereby put pressure on others, it will be difficult for regulations to follow through. A dynamic aspect is coming in and where one can perhaps also hope that something like a data platform will advance the whole topic of building data. This is particularly important due to increasing reporting obligations, especially for those who have to create public reports. For them, working cleanly with data standards is crucial. If you don't take that into account from the beginning, you have too much data and you can't keep it under control unless everything works completely automated. That could maybe become a driver to say, "Okay, we have to put money in order now and pull the other structures along." I think that could happen. ESG and Articles 6,8,9 also create a certain financial pressure or possible advantage, which also arouses interest in promoting digitalisation in order to become ESG pioneers.

Moderator:

Can you name me one process that is difficult to replace by digitalisation?

Interviewee IO15:

I believe that the whole project development process has too many facets in order to achieve an extremely high degree of digitalisation. However, I believe that you can implement this process digitally supported, run it much more efficiently with more automation and thus minimise the times. I am convinced that we can digitise the entire process. But there are simply decisions that a human being has to make. With asset management, on the other hand, I see the potential to run almost everything automatically. There are simply too many individual aspects. Every

plot of land is different. Every federal state in Germany has its own building law. There are so many components that to make it automated would mean that you only have 10% or 20% of the work left. A lot still has to happen there. But I can already see that you can make the everyday life of project developers more IT-supported and bring in more structure through IT, which can lead to a certain degree of automation. A certain amount of human interaction and know-how is irreplaceable in many areas, including the real estate industry and project development. But digitalisation can make the process more efficient and support the work of project developers so that they can focus more on strategic decisions. So it's more about facilitating and supporting the work rather than completely automating it.

Moderator:

Thank you very much for the interview.

Interview IO16

Moderator:

What kind of risk experiences have you had so far with regard to digitalisation?

Interviewee IO16:

I think the real estate industry is very poorly digitised compared to other industries. There are hardly any products that are in use worldwide. Unlike the automotive sector, which has ten big players, the real estate sector lacks such a market and big investors. Therefore, it is more difficult to find a solution that can be implemented quickly as a standard and that covers the different requirements, regardless of whether it is the US or Europe. There is a lot of customisation and you have to contribute a lot to make the systems work. In terms of negative effects in such projects, long runtimes can occur. Automation does not always run as smoothly as desired and it requires a lot of work in the team. We strive to introduce automation solutions to achieve efficiency and scalability in our large portfolio.

Moderator:

You mentioned that there is no big player, can you elaborate on that?

Interviewee IO16:

In the real estate industry, there are global applications but no dominant market leader offering comprehensive market coverage. There are well-known larger providers offering solutions from property management to portfolio management, but these are often limited in features and less adaptable. However, for smaller players, such solutions can be a good fit. There are also specialists who focus on specific areas such as reporting, modelling, evaluation and planning. Examples include Altus in Canada, Bison in Germany and others. These providers often have a larger market presence, but are usually limited to specific regions or niches. There is no provider covering a market share of 40% or 30%, which would be necessary to establish a comprehensive standard. Such a standard would channel investment into a common solution and enable easier data exchange. Existing global providers have a presence in the US, Canada and Europe, but there are still gaps in terms of specific requirements and specifications, especially in Europe. The market introduction and further development of such solutions requires time and adaptations to different countries and regulatory requirements. There is no provider who had a global rollout in focus from the beginning. Development was gradual and based on core markets.

Moderator:

Can you perhaps also explain? Why hasn't there been much competition yet, or why haven't they rolled out more?

Interviewee IO16:

The market in the real estate industry is relatively small and fragmented, which is why it is difficult to achieve great market power. So far, there is a lack of sufficiently large associations and platforms that can establish uniform standards and data models. There are initiatives in this direction, such as in the DACH region, where larger facility and property management companies are coming together to discuss the development of a platform. Uniform data models

are an essential component of such a platform. There are already approaches like GIF in Germany or in France, but these are often limited to specific areas like asset management or pure data mapping. In our case, however, we need a platform that covers the entire range of our portfolio, including different building types, investment structures and financing products. Uniform data modelling would be the basis for software service providers to build on and enable easy data exchange. Imagine you are interested in a purchasing process or investment management. It would be ideal if the relevant data were available in a cloud and could be secured via secure methods such as blockchain. This would allow you to seamlessly integrate and edit the data in your own system instead of manually inserting and adjusting it in Excel or other systems.

The same applies to documents such as purchase contracts, rental agreements or supply contracts. With a uniform metadata model, these documents could easily be entered into a document management system (DMS) and exchanged. We have already started to develop such a standard with Skype and Fitch for our own document management system. Unfortunately, there are still too few companies that think in this direction and pursue similar approaches.

Moderator:

Is this due to a lack of pressure?

Interviewee IO16:

The pressure to make quick and informed decisions is increasing and our goal is to become a data-driven company. We strive to optimise the process of data generation and preparation to require less manual work. Instead, we want to keep the data in our systems and perform analyses based on it. This allows us to gain information from which we can make informed decisions. We even want to use predictive analytics, such as predictive maintenance, by linking market data with internal data to make predictions and simplify planning. Unfortunately, the market is currently not able to realise this vision. To achieve this on a larger scale, we might need to invest in IT companies and drive development. An alternative option would be to enter into a broader

collaboration with other service companies and invest together in a solution. At the moment, however, I don't see a larger group of companies willing to do this.

Moderator:

Do you also experience drops in efficiency and performance in the process?

Interviewee IO16:

Yes, many larger companies still work a lot with Excel. This often leads to system breaks and inaccuracies, as errors in formulas or cell references can lead to incorrect results. When data is needed for reporting or further processing, it has to be extracted from the Excel files, which can be a challenge. Our goal is to move away from this heavy reliance on Excel and implement data-based solutions in applications and databases. However, this requires a step-by-step process and cannot be implemented overnight. We are laying a foundation to be less dependent on Excel in the long term. It is important to recognise that this change will take time and effort, as existing processes need to be adapted and new technologies implemented. We are actively working to put our data on a solid basis and move away from Excel-based solutions.

Moderator:

Is there a flood of potential solutions and software?

Interviewee IO16:

Yes, that is always the question of which concept is best suited for projects. Best of breed would be the issue in this case. I look for the best solution for every detail I want to have. We made a conscious decision not to use a one-fits-all tool. The idea of covering as many processes as possible with one tool was simply too limited in terms of the degree of coverage of requirements and available functions. Therefore, we opted for a mix of different systems. We use standards as much as possible, but they also offer a certain flexibility to map company specifics. Thus, we have established four core applications/subsystems as central systems, including SAP, Schoko CM and other smaller tools. There are of course still interfaces and integrations with

other systems, but in the end all tools communicate with each other. For a global company with a portfolio of 90 billion and investments in 40 countries, I think this is a promising approach.

Moderator:

How is digitisation strategically mapped in your company, are there risks to be considered?

Interviewee IO16:

That is a good question. We have indeed derived our IT strategy from the business strategy. As part of the Allianz Group, we benefit from the major developments in the IT strategy of the insurance sector, but we have also developed our own IT strategy, which is closely linked to the business strategy. In this strategy, we define where we want to use machine components and where it makes sense to do so in order to increase scale and productivity. We look at the design of our offices and workplaces as well as our product range. Our goal is a unified IT landscape across all Skandia companies. In addition, we deal with management innovations in the field of smart buildings and look for ways to increase the attractiveness of our buildings through digitalisation. We always pay attention to security aspects and the added value that these measures bring. It is important that we keep an eye on the business use cases and consider which technologies are relevant for us. Not all the features that Chat GPT offers are useful for us, but we are interested in machine learning and structured data that we receive from our service providers and facility managers. How can we turn this information into usable structured data? Such topics are in focus so that we can align technological developments with our business strategy. If we want to open up new business areas, we have to check whether additional technical support is needed or whether we can use existing technologies.

Moderator:

Do you see cybersecurity as a major risk of digitalisation in capital-intensive industries?

Interviewee IO16:

This is indeed an important point. The technical side is one aspect, but the departments and business users are a decisive factor. We cannot afford to violate data protection guidelines, be

it the GDPR or other data protection regulations. We also need to make sure we comply with the US Cloud Act or other regulations when we process data from the US or other regions. Security is a key issue. We have daily network monitoring and a screening process. We cannot compromise on anything. We conduct regular risk assessments and penetration tests, both internally and externally. If critical vulnerabilities are identified during these, they are fixed immediately before the application goes live. We also have a strong corporate security department that continuously informs us about new threats. We are constantly updated and have a high service level agreement with our service providers to respond appropriately to security incidents. It's not just about money and protecting data, it's also about our reputation and standing. Compliance requirements, especially those related to the New York Stock Exchange, present additional challenges and we need to be audited regularly. Therefore, we employ specialised teams that deal exclusively with cybersecurity and information security. These teams have an independent role and act as a point of contact for security concerns. They are tasked with acting independently and highlighting risks to ensure that no power hierarchy compromises security measures.

Moderator:

Thank you for the interview

Interview IO17

Moderator:

What experiences have you had in. What are your experiences with the risks of digitalisation in the real estate industry?

Interviewee IO6

We went through the issue live, so to speak. In the course of the introduction of at my current employer at the end of 2017, this was an important development for property management.

The introduction of technical software for property management was relatively new at the time, as commercial software already existed, but technical solutions were still unfamiliar at that time.

Moderator:

So what were the negative aspects?

Interviewee IO17:

Well, that actually started at the beginning.

There was general opposition to such a project. The question was why do we need new software at all when everything works fine with paper. These concerns were widespread and led to resistance, even without the software even being used live in day-to-day business. However, the more that became known about the software and the clearer it became which processes it would change and influence, the greater the resistance became. There were preconceptions about how it would work and that it would be more cumbersome than before. Of course, there was another side, but we are now focusing on that particular side. Over time, the processes were actually changed and digitalised accordingly in the software. However, this led to some employees having difficulties and eventually leaving the company because they could not cope with the new digital way of working and data maintenance in the system. This was especially challenging for the technicians. Many of them, who considered themselves "old hands", could not come to terms with the fact that they now had to maintain their data. As a result, we actually lost a lot of staff. One could say that about one fifth of the technicians left the company. Of course, this did not happen all at once, but over a longer period of time. Much of it can be attributed to the fact that their way of working changed fundamentally. Especially older employees who had been doing the job for many years could not adapt or perhaps did not want to.

Moderator:

Were there any training courses or workshops that could have prevented this?

Interviewee IO17:

Yes, there was definitely training in connection with the software introduction, which is common in such cases. Workshops were also held in advance to clarify how the processes should be designed.

Of course, not every single technician could be fully included. It quickly became clear that there were essentially two groups, and then there were also some in the middle. One group was enthusiastic about the new software, while the other group wanted to continue sticking to their paper documents. This probably has a lot to do with IT skills. Younger generations have grown up with technology, while older generations have not. In general, I think it has to do with the technical aspect in this case. Some technicians prefer to work on site and don't necessarily want to enter data into the system just to have a green light in the system to ensure quality, for example. Sometimes they just don't see the point. There are also those who say, "I've done everything, why isn't it in the system?" These are typical issues. At some point we realised that we had to change something. That happened relatively early, about a year and a half later, towards the end of 2018. We created a whole new department that took care of data maintenance. This meant that we tried to take this task off the technicians' shoulders so that they could focus more on their work on the construction site and with the customer. This department usually had young IT professionals who enjoyed it and took over the data maintenance and many other tasks. So we redistributed these responsibilities. This basically means that the older generation was no longer willing to adapt to change and invest time in data management. We recognised this and made the change.

Moderator:

When the system was implemented, there was already a certain standard?

Interviewee IO17:

Before the software was introduced, there was already a certain standard written down, but it was mainly analogue. Everyone had their own branches and locations, which over the years led

to everyone developing their own standard. As a result, everyone could do their work as they saw fit. Although there was a written standard, no one actually adhered to it. You could say that this standard only existed on paper but was not implemented in practice.

Moderator:

What was the reason for that?

Interviewee IO17:

Yes, that was probably because there was no way to monitor this standard. It was difficult to determine whether someone was following the standard or not. The managers on the ground might have known, but they had often developed different standards for their sites themselves. There was simply no control because there were no tools or systems in place. An example of this is the procurement system. We had many external service providers for repairs and there was a standard for how these orders should be handled. However, this standard was analogue and could not be controlled. Communication was often by phone or email, but there was no record of the phone calls or a central repository of emails that could be accessed. So it was difficult to trace the exact process.

Moderator:

Were there any problems or risks in transferring data to other companies?

Interviewee IO17:

Yes, since we have the software, we can retrieve data at the push of a button, which is a positive aspect. However, there are also negative aspects. The whole real estate industry is unfortunately still built on the fact that there are no uniform data standards, especially in the commercial area. There are too many different systems, even in the financial area, which means that someone may be able to generate and export the data systematically. But the recipient receives Excel files and PDFs that he cannot import into his own system because they are completely different data standards. In such cases, we often have to manually transfer the data into our systems. I am staying in the field of technology and real estate here. For example, when we receive Excel files

from others, we usually have to manually enter this data into our system as if there had been no data before, even though there may have been existing data. The same applies when we pass on data to others. We might provide them with good Excel files and documents, but they might not be able to do anything with them either, because we might use a different system and thus have different data standards.

Moderator:

Can you explain why?

Interviewee IO17:

Various efforts have already been made in the industry, especially in the commercial sector, to create standards. But until now, unfortunately, it has not worked. It is probably a historical issue, because there are simply different systems and everyone started with a different system.

No one system has really caught on and you could say that all the others are bad. The four largest providers in Germany include SAP, MS and X Haus, to name but a few. Nowadays it is still common for everyone to look after their own system. For example, you hear statements like 'I'm switching from SAP to x house because it's better' or 'I'm staying with SAP because the others are stupid'. It has really become standard that everyone prefers their own system. It has not been said that all of us in the property management industry in Germany will agree on a common system and be satisfied with it. That will probably not happen in the future either. Politics will not prescribe a system. After all, it is a free market economy. Maybe in the future the systems will be developed to the point where the largest providers will have interfaces, but even that is complex because there are countless interfaces. All in all, there is no clear medium-term path to a uniform standard. I do not believe that this will happen in the foreseeable future. It is common nowadays that when we acquire a new client, in the best case scenario we generate an interface in the commercial area to transfer the data. However, at least 50% of the data is still entered manually with us, so we have our own teams to take care of these tasks. This is

because we do not receive the data in a usable form. So as a company, we have large teams that deal exclusively with manual data entry.

Moderator:

How is the concern handled strategically? Are such concerns taken over by external parties?

Interviewee IO17:

There is actually a lot of focus on this issue. I am very committed to it and try to push it forward, especially in the area of technology. There is a reason for this, because we are relatively well positioned in the commercial area. We are generally looking at this topic intensively and realise that we are still a long way from where we want to be. There are many ongoing projects and still many ideas for the future that will keep us busy for many years to come.

As far as systems are concerned, the focus is actually largely internal. Our SAP system was acquired many years ago and now belongs to the company. Aires is also the responsibility of internal IT. Both systems are not hosted by an external software provider, but are managed internally.

Moderator:

Why?

Interviewee IO17:

SAP was introduced to us many years ago and has been continuously developed since then. At that time, we managed our own funds and already had our own SAP programmers and consultants. Nowadays, we still have in-house SAP programmers and consulting experts. This is extremely advantageous because we can react flexibly to every customer request. We can develop customised solutions because we have our own programmers who have the necessary know-how and experience. This is a unique selling point (USP) and also plays an important role in our acquisition. With Aires, we were lucky that the developer is also the managing director at IC. This creates a close connection and a win-win situation. For the further development of the Aires system, we work together with external programmers who are commissioned by the

developer. So the actual development does not take place internally. With regard to start-ups, prototypes and similar topics, I have also covered this in a detailed podcast. I am open to such ideas and discussions. However, in property management it is very difficult to implement such projects or to recognise their relevance. This may also be due to the fact that we have already integrated many functions in our existing systems and thus there is less need for external solutions.

Moderator:

Because maybe I'll get straight to the last question. Can you explain why the real estate industry in general is so far behind in digitalisation?

Interviewee IO17:

Yes, I think that for a long time the real estate industry rested in a way. About 20 years ago or so, everyone realised that a system was needed for commercial management, tenancy agreements and accounting. It was a given, so to speak, and had been practised for a long time. After that, however, I think they rested on it and did the accounting while everything else kind of ran its course. It seems that for a long time, the real estate industry simply had it good enough. There was no need to monitor audits or record consumption data digitally. At best, you might have read the meter to produce the service charge statement, and that was it. There was no need for strict regulation or legal requirements, and the financial interest was not strong either. Therefore, the need to digitise and adapt was not recognised and the issue was not pushed. Now, with issues like energy efficiency, regulation and weather, the industry is slowly waking up and realising that action is needed. But of course, they are now already several years behind, as little progress has been made in the last 10 to 15 years. Another aspect is that many in the industry have difficulties dealing with the legal requirements and implementing digital solutions. You often hear about how important and great digitalisation is, but if you ask more closely what has been implemented so far, you often see few concrete results. It seems like there is a lot of talk about it, but implementation is often lacking.

Moderator:

Finally, maybe an open question, if you can think of anything else. Do you have another negative side effect or risk of digitalisation?

Interviewee IO17:

In the past, the issue of transparency was a big concern that put many off. Suddenly the boss could see how many orders you had or how productive you were. That triggered fears in many and many shied away from it. Nowadays, I don't think that's the case any more, because everyone actually realises that it's no longer possible without this transparency.

Another negative aspect is, of course, the question of economic efficiency and costs. It is not only about providing the financial means for the software, but also about the whole organisation. Good software alone is of no use if the processes and people in the organisation are not prepared for it. The conversion of the entire organisation requires considerable effort and respect. It is an interplay of both aspects. You cannot have one without addressing the other.

Moderator:

Thank you for the interview

Interview IO18

Moderator:

What negative experiences have you had with digitalisation?

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Interviewee IO18:

There are two main components that play a role in the way I work. The biggest drawback is that I am dependent on various factors. If the server crashes, there is no wifi or my battery is flat, I can't work. Our knowledge work requires that all systems function smoothly and interlock. This aspect has a major disadvantage, as we are heavily dependent. The second disadvantage is that

collaboration has changed due to digitalisation. We spend less time in the office, which leads to a decrease in knowledge transfer and exchange. In the past, you could follow interesting phone calls from colleagues in the open-plan office and pick up relevant information or interfaces for your own project. However, due to the increased work in the home office, this exchange is lost.

Moderator:

Let's go one step further, do you have any experience with the risks of digitalisation?

Interviewee IO18:

Another aspect that I find difficult is the risks related to data leakage and security. For example, if you have a physical piece of paper and you transport it from A to B, whether by post or in person, you know that this data exists only once or twice, depending on how many times you have printed it out. In contrast, storing data on a server is vulnerable and not so easily controlled. Although some barriers have now been created to protect data, it still remains uncertain how good and up-to-date these protective measures are. Hackers are constantly developing new skills and techniques. Therefore, you have to be extremely careful how you handle this data and information. As a knowledge worker, my credo still holds true: data is the new gold. It is extremely valuable because it allows you to identify the needs and desires of your customers and align your business model accordingly. The person who has access to this data has a huge competitive advantage. However, if it is tapped by someone else, it can lead to the entire foundation of a company being at risk. Therefore, there are really high risks associated with this area.

Moderator:

Have there been any performance problems in relation to digitalisation?

Interviewee IO18:

Another point I would like to make is about the problems that can arise when I have a bad connection, for example, or am confronted with media breaks. If I am working on a programme, be it CAD or another, and then want to transfer my plan with a lot of information into a snipping

tool, a lot of quality is often lost. There are also often problems when exporting or evaluating data for other projects. There are functions to transfer data in order, but they don't always work properly. You think everything looks fine, but after three hours you suddenly realise that something is wrong, that an error has occurred. The transfer from one system to another is therefore prone to errors. This requires a high level of attention and quality control in order to ensure that no information is lost.

Moderator:

Which companies can make better use of this situation and increase performance?

Interviewee IO18:

I'm not sure if you can say that across the board. In my opinion, younger people who are open to new solutions are perhaps in a better position at the beginning. Larger companies have had their established structures and the corresponding apparatus behind them for a long time. Switching to a new system there could be a lengthy task in order to integrate the data properly and create a uniform data basis. In contrast, smaller start-up companies may be able to transform more quickly because they are more flexible and have less lengthy decision-making and legitimisation processes.

Moderator:

You also talked about efficiency breaks before. Let's go into that in more detail. Can you describe what you mean by that?

Interviewee IO18:

Let's say I receive a PDF document that contains an Excel file. If I then want to export the Excel data into another format, e.g. back into Excel, a media break occurs. In the process, information may be lost because, for example, the Excel file contains thousands of rows and I may insert it into a PowerPoint presentation in order to make the data look appealing. But then the correctness of the calculations is not in the foreground, but rather the visual appearance. There are no solutions yet that can seamlessly combine both aspects. If I then notice an error, it is

often difficult to trace the error. You might realise that something is wrong and have to go all the way back to the Excel spreadsheet. Of course, you can also work directly in PowerPoint and link the data, but then the data becomes unwieldy again. You might end up using the snipping tool and find that a number has changed. In that case, you might have to change ten slides. That is inefficient. Of course, you try to build up the workflow logically and think that you will check everything at the end. But it happens more and more often that you find something else and have to go through the whole process again. There are so many inefficient steps. While it is important that the data is correct, there must be better solutions. In our advanced times, such solutions should actually be in place, but often you still have to check manually or by hand if everything fits. There are still many weak points. Of course, there may be solutions, but they have not yet arrived in everyday work. This is especially true for Excel. There are already good formulas and solutions, but often people only work with the standard formulas. When you have a problem, you think about whether it's worth looking for the right formula and researching it or whether you do it quickly by hand. You have to have a lot of knowledge

Moderator:

With regard to the strategic orientation, how is digitalisation handled in your company?

Interviewee IO18:

Since our philosophy is to be able to work from anywhere, we are very paperless. We print out as little as possible, as it is of great importance to us that all knowledge and documents are accessible in one place. We are well equipped in this respect so that we are ready to work from day 1. Everything worked for us and was set up from the beginning. This is especially important as we now have over 4000 employees. It would be impossible if we started filing documents and records centrally. It's really important that everyone can access everything, with the appropriate permissions of course. Of course, there are exceptions, such as in interior design, where physical material samples are ordered into the office. We live this digital way of working from the top down. Of course, we still carry out certain tasks, such as workshops with clients

who are not so familiar with the digital way of working. In such cases, we adapt to the clients. If we are on site and the client does not have digital equipment, we also work with pin boards and dry diagrams. That can be quite helpful. In our everyday work, however, we mostly work digitally. Of course, there are differences when we need to be creative. It can be helpful to shut ourselves off in a creative space and work out concepts there. Situations like that happen too.

Moderator:

Thank you very much

Interview IO19

Moderator:

What negative experiences have you had with digitalisation so far?

Interviewee IO19:

I have had negative experiences with a lack of digitalisation, I would say. Both in the transaction business and in asset management, the quality of the data is of immense importance. Incorrect data can lead to big problems or even prevent certain things from being possible at all. Therefore, from my point of view, the biggest problem at the moment is the lack of or poorly structured digitalisation. If you are talking about bad experiences, I can definitely confirm that I have had such experiences. Among other things, we worked in underwriting based on wrong information that was lost due to too many interfaces between, for example, city management, property management and asset management. There were errors that crept in due to too much manual input that was still required. I think we could automate the processes better in order to simplify them and avoid errors. This is of course related to data collection, which is certainly more difficult in the real estate sector than in other sectors. I believe that digital reading of electricity meters, for example, is easy to implement, but real estate is heterogeneous and there will always be areas that cannot be fully digitised. We continue to rely on people as an additional source of input. Complete digitisation is not possible, but there are many areas that can be

digitised well. As a company, we have been investing a lot of work in these areas for years. However, it is a long way to go in order to digitise all areas as much as possible.

Moderator:

What is your company's focus in terms of digitalisation?

Interviewee IO19:

In our own asset and portfolio management, we have already achieved the greatest possible digitalisation when it comes to recording all data related to our properties, such as rental income, service charge statements, etc. This is already working quite well. That already works quite well. But when it comes, for example, to electricity consumption in the buildings and examining the consumption patterns of individual tenants, it becomes more difficult. Why do some tenants consume more than others? Of course, this has an impact on our carbon footprint. I would say that all of this can still be managed well. But when it comes to technical asset management, it becomes difficult. For example, if defects occur, for example in individual areas of a property, then it becomes difficult. A tenant could say that the water tap no longer works. Things like that are difficult to digitise because someone has to come in to fix it. Orders have to be placed and quotations have to be obtained. These are processes that are difficult to digitise because people still have to act or think actively. Someone has to be on site in order to check it. It is not just a data point that you can read off, but something technical and physical in order. Here I am curious to see how start-ups and new technologies can enable more digitalisation in the future, because I currently find that it is incredibly difficult. Another aspect I would like to address is the problematic situation when you manage a portfolio of, say, 200 properties across Europe using the same property manager. Hopefully the property manager uses the same programme in all countries to collect tenant lists and property data, which is not a problem as long as you don't digitise your portfolio and collect the data in one place. But if you work with a different property manager in Spain than in Denmark, for example, you get different data from both property managers, which you then have to process again to make sense of it. This is

another problem I see in digitalisation, even when it comes to processes that are actually easy to digitalise. Many different tools are used, which brings additional challenges.

Moderator:

Now you have addressed the streamline of all the processes, can you go into more detail?

Interviewee IO19:

By this I mean, for example, that there is a kind of chain in how reports are prepared in the real estate sector. At the top sits the portfolio manager, who is presented with the final evaluated data and has to make decisions. Below that sits the asset manager, who receives inputs from other people and has to prepare them for the portfolio manager. Below that is the property manager. Further down are facility managers and possibly even caretakers. By the time a message about a deficiency or damage to a property reaches the portfolio manager, about 5 people are involved. Calls may have to be made and emails written. These are all processes that take time and where mistakes can also happen, especially if someone forgets something or is ill or on holiday. It would be ideal if there were tools and processes where the person recording, for example, water damage, enters this into a tool and the tool automatically enables further processing and automation of the processes. For example, company X could be automatically contacted for a quote and this quote would end up directly with the property manager, who could digitally present and sign the collected quotes. At the end, the portfolio manager would receive the evaluations, e.g. that €17,000 was invested last month and 5 measures were implemented. That's the goal, but in reality I can assure you that it often doesn't work that way. It happens that you only find out years later that, for example, a fire alarm system in a property has been broken since 2019 and nothing has been done. Such information is then discovered by chance because someone forgot to report it. These are processes where all the people involved in this value chain should work in as automated a process as possible to avoid mistakes.

Moderator:

Have there been any performance problems so far?

Interviewee IO19:

Definitely. A classic example is technical installations in a building that have to be checked every two years. In asset management, this usually still works well because they can be read out automatically from Excel tables. However, the closer you get to the actual building, the less digitalisation there is, in my opinion, and therefore the problems. A typical scenario is when significant deficiencies are found during the inspection of the facilities, especially in the case of safety or fire protection-relevant facilities. Then it can happen that the facility manager forgets to report this or to remedy the deficiencies. Two years later, the next inspection is due and the auditor finds that the deficiencies have not been corrected. A deadline of three months is set in order to correct the deficiencies. If this does not happen, the fire brigade can come and inspect the entire fire safety concept. This can even lead to a building being closed because there is no longer a valid fire safety concept. This is an extreme example, but it clearly shows that inefficient processes that rely heavily on human action can lead to efficiency losses and additional costs. If processes were simplified, such problems could be avoided. You notice this immediately once you have spent four weeks dealing with such matters.

Moderator:

Which company could manage this better or worse in the future?

Interviewee IO19:

From my point of view, you need a company that has digitised its internal processes, every single step of the way, so that people don't even have to forward emails anymore, but everything is done automatically. It should be someone who enters information into a tool and the system processes everything else so that people only have to sign or agree without having to evaluate what needs to be done. In our industry, especially those who work directly on the object are chronically overworked and there are too few resources. This means that there is always

something left undone because the processes are extremely time-consuming. If you can digitise defect management at properties, you can avoid a lot of problems and possibly prevent additional costs when tasks have not been completed.

Moderator:

In terms of company level, which companies can manage this better?

Interviewee IO19:

Companies with a technological focus can definitely contribute to improving performance. There are many interesting approaches and companies that may be small at the beginning but have good ideas. One example is companies that deal with ESG (Environmental, Social, and Governance). Integrating ESG aspects can definitely help improve performance, as you can identify problems in the properties well and optimise them. Especially in today's environment, this will be a big driver as ESG becomes more and more important. Note, however, that it is not as simple as complying with regulations such as S17 or trading in a liquid market.

The software that such companies use collects data from your objects and processes it for you. This is extremely useful if you want to make sense of such data. For example, if you think about platforms that help digitise your house and provide information about the materials and raw materials that are used in your house, this can be very helpful. Especially in this day and age, there is a lot of focus on what materials are used in a house and how they can be recycled or reused in order to reduce the carbon footprint. There are start-ups that collect such information and digitise a resource bank, so to speak. However, it is difficult because every house is unique. You can't simply analyse some company key figures like you do with shares. Houses are physical objects that are all different. It is difficult to find general tools that fit all and can be used in all situations. In the future, companies that have money and invest in digitalisation will definitely see an increase in performance by using ESG data as a competitive advantage.

Moderator:

Thank you very much for the interview.

