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VALUE FROM TWIN TRANSITION

Case: Finnish commercial properties

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TIIVISTELMÄ

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Kaksoissiirtymä on kasvava ilmiö, jossa digitaalinen ja vihreä siirtymä yhdessä informaation ja datan kanssa muuttavat kiinteistöliiketoimintaa. Tutkimustyön saralla ilmiötä on tutkittu toistaiseksi vähän ja sen vaikutukset kiinteistöjohtamisen arvoketjussa ovat täsmentämättömiä. Tutkimuksen tavoitteena oli ymmärtää ilmiön vaikutuksia suomalaisten liikekiinteistöjen johtamisessa sekä selvittää sen vaikutuksia arvolupaukseen sekä arvonluontiin. Työn teoriaosuus käsitteli digitaalista ja vihreää siirtymää, datan käyttöä, kiinteistöjohtamista sekä strategiaa ja arvoketjua. Esitetyt avainkäsitteet yhdessä alakäsitteineen linkittyivät vahvasti tutkittavaan ilmiöön, minkä vuoksi niiden laajempi tarkastelu oli tarpeen tutkimuksen tavoitteiden näkökulmasta.

Tutkimusfilosofiaksi valikoitui tulkinnallisuutta korostava pragmatismi, tutkimusotteen ollessa eksploratiivinen tapaustutkimus. Monimenetelmäisyyttä hyödyntäen, tutkimuksen empiiriset havainnot kerättiin kyselylomakkeella sekä puolistrukturoiduin teemahaastatteluin alan ammattilaisilta. Tutkimukseen osallistui yhdeksän vastaajaa kiinteistöjohtamisen eri ammateista. Tapaus käsitti kaikkiaan viisi kiinteistöliiketoiminnan keskeistä yritystä. Tutkimusaineisto litteroitiin propositiotasolla sekä analysoitiin tulkinnan ja temaattisen analyysin keinoin.

Tulokset osoittivat kaksoissiirtymän tuovan moninaisia hyötyjä, suhteessa kiinteistöjohtamisen arvoketjuun. Ilmiön avainteknologien ja ajatusmallien omaksuminen ja jalkauttaminen sisälsi positiivisia vaikutuksia arvolupauksen lunastamisessa sekä arvonluonnin näkökulmasta suomalaisissa liikekiinteistöissä. Haastateltavat myös pohtivat ilmiön vaikutuksia, hyötyjä ja lisäarvoa omassa työssään nyt sekä tulevaisuudessa. Tutkimuksen teoreettisen sekä empiirisen osuuden löydökset syntetisoitiin malliksi, joka kuvastaa mitä lisäarvoa kaksoissiirtymästä on kiinteistöjohtamisen arvoketjussa ja suomalaisille liikekiinteistöille. Yhteenvetona, tutkimus laajensi ymmärystä aiheesta sekä tuotti arvokkaita päätelmiä sovellettavaksi käytäntöön.

Avainsanat	kaksoissiirtymä, kiinteistöjohtaminen, liikekiinteistöt

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ABSTRACT

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Twin transition is an emerging phenomenon where digital and green transition alongside with data utilization are changing the real estate business. In the field of research the phenomenon is yet under-studied and the impacts considering the entire REM value chain remain unspecified. The study objective was to examine these effects in the context of Finnish commercial properties, discovering its impacts on customer value proposition as well as value creation in the industry. The key concepts of the theoretical framework were digital transition, green transition, information and data, real estate management and value chain, together with their relevant subconcepts with relevance to the focal phenomenon.

The research philosophy was interpretivistic pragmatism, with the research approach characterizing as exploratory case study. Utilizing mixed methods, the empirical findings were obtained with questionnaires and semi-structured interviews from experts in the field of REM. The case thus consisted of a total of five relevant companies regarding Finnish commercial property management and ownership, represented by nine participants in total. Thematic analysis, interpretation, and analytic generalizing were utilized for data analysis and coding of the research findings.

The findings of the study demonstrated various benefits from twin transition in relation to REM value chain. Implementing and adopting of the key technologies and paradigms has positive impacts on the customer value proposition as well as the value creation in Finnish commercial properties. Also, how the examinees today, and in the future may capitalize from twin transition in their own work, was discussed. Consequently, the theoretical and empirical findings of the study were synthesized for identifying the value from twin transition in the REM value chain. Adding to the existing comprehensions of the subject, the study also provided managerial implications to be applied in practise.

Keywords Twin Transition, Real Estate Management, Commercial Properties

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1 INTRODUCTION

1.1 Introduction to the topic

Economic forces are constantly impacting the business environment especially in the real estate and construction industry due to the changing regulatory and legislative landscape. Not only these movements emerge uncertainty, but may also be challenging for companies to adjust to. On both global and regional scales, geopolitical decisions hence mold the prevailing economic structures (Leväinen 2013, 31). Regarding national economy, certain macro indicators such as national income, productivity, employment rate, and development of prices and debt enable estimating the current state of the nation. These key figures, exemplified in figure 1, hence allow for observing where in the economic cycle the nation currently stands, to better prepare for upcoming conjunctures (Leväinen 2013, 149).

KEY FIGURES – FINNISH ECONOMY

	2018	2019	2020	2021	2022**	2023**
GDP (change in vol). %	1.1	1.2	-2.3*	3.3**	3.0	1.5
Change in exports. %	1.5	6.7	-7.5*	4.2**	5.6	3.7
Inflation. %	1.1	1.0	0.3	2.2	2.6	1.8
Unemployment rate. %	7.5	6.8	7.7	7.7	6.7	6.5
Private consumption. %	2.0	0.7	-4.7	3.0**	3.8	2.1

*Estimate **Forecast

Source: Statistics Finland. Ministry of Finance

Figure 1. Key Figures – Finnish economy (KTI 2022)

1.2 AI 4.0 programme

In 2020, Finland's Ministry of Economic Affairs and Employment launched a program with the purpose of increasing digital investments which would promote productivity and sustainability, diversify the ecosystems and services of manufacturing industries through new value creation and partnerships, and also strengthen Finland's position within actions that support the strategic autonomy of European Union (Finnish Government 2021). Thus, an executive committee was

assigned to plan and expedite the programme, which according to Finnish Government (2021) strives for the following:

> The action plan implements the strategy of green and digital recovery following the COVID-19 crisis and responds to Finland's specific challenges related to digitalisation, such as the relatively low level of digital investment, slow reform of value creation among SMEs and delays in strategic investments to promote the fourth industrial revolution in Finland (Finnish Government 2021, online).

In the publication event of the second interim report of the AI 4.0 programme on December 15 2021, the head of the steering group, Jussi Herlin (2021), in his speech described Finland to be considered as one of the globally advanced and frontier countries internationally, considering artificial intelligence. According to Herlin (2021) Finland was one of the first nations in the world to compile an international AI strategy in 2017, with the objective to forward the development of technology, implementation of AI solutions, and furthermore, to strengthen the strategic management of this progression and support multi-industrial partnerships.

The main focus in the AI 4.0 programme is especially on small and medium-sized enterprises: renewing their value creation by improving digital abilities, thus aiming to increase the number of top digitalized companies that will expand the use of AI and thus uplift the digitality among the entire SME sector. The action plan explains the strategy implementation of "green and digital recovery", and addresses Finland's specific challenges in relation with the concepts of twin transition (Finnish Government 2021). According to Herlin (2021), the preparation and launch of the program have been guided by the view that the most significant effects of AI will become visible when applied as part of a wider economic, technological, and social change. Herlin (2021) also stated that typically, the Finnish expertise hasn't been limited to the core technologies of AI but instead, Finnish companies possess good knowledge in creating digital services and developing system level solutions. One of the challenges that should be underlined considering AI is,

according to Herlin (2021), the constant progress and rapid development of technology, specifying that Finland cannot afford and therefore rely on its past achievements and results, in this regard.

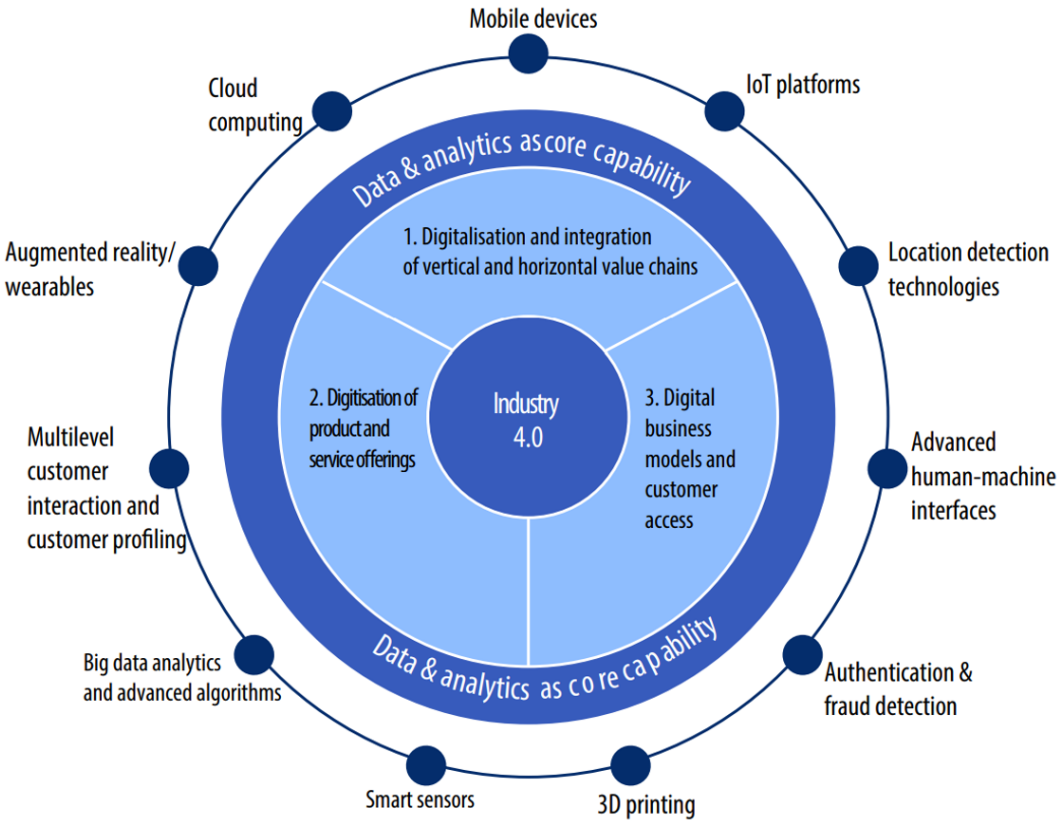

Figure 2. Industry 4.0 framework and digital technologies that support it (Finnish Government 2022)

The programme not only has to do with technological and economic transformation, but is also expected to "bring about deep and diverse changes in the society" (Finnish Government 2021). AI, alongside with other technologies presented in figure 2, are thus in the focal point of the establishment of the 4th industrial revolution. Combined with data utilization, the key technologies displayed in figure 2 are expected to enable real-time management of value chains as well as innovate new digital products and services and new customer-oriented business models. In addition, resolving environmental and sustainability challenges with modern technologies is also in the core of the AI 4.0 action plan. Correspondingly,

the main idea is to promote sustainable digitalisation as part of the arising industrial revolution, with AI as one of its key elements (Finnish Government 2021). In his speech Herlin (2021) stressed that the responsibility for the required actions will ultimately fall into the hands of private sector companies as well as the public sector. Furthermore, implementations that contribute to the green- and digital transition will also constitute a notable share of the overall international business practised by Finnish corporations in the future (Herlin 2021). In short, Finnish manufacturing is expected to become high performing, digital, and fuelled with clean energy, says Herlin (2021). Herlin (2021) goes on explaining Finland's vision regarding the twin transition in his speech into four separate objectives, shown in table 1.

Table 1. Vision of the Industrial Twin Transition (Herlin 2021)

1	Targeted investments to top technologies to ensure Finland as one of the top six AI utilizers in the world by putting effort on data economy, data-based value proposition, high-power and quantum computing, grid technology and compatibility of technologies (Herlin, 2021).
2	Finland to become a triple-time winner in sustainable development of by the end of 2035 by contributing simultaneously on environmental intelligence and digital solutions: environmentally intelligent, domestic companies will utilize digital technologies causing economic growth, better employment, welfare, and climatic and environmental benefits (Herlin, 2021).
3	Finnish industrial SMEs become digitally advanced on an international scale and they are also in the core of the Finnish national economy: national sustainable development highly relies on the capability of SMEs to increase their productivity and competitiveness and to reduce their environmental footprint with the help of new technologies (Herlin, 2021).
4	Finland to actively participate in creating and implementing the AI-, data-, and industrial strategies of the European Union (Herlin, 2021).

1.3 Twin transition

Herlin (2021) defines the "triple victory" of the twin transition as Finland becoming environmentally intelligent, implying that companies create economic, social, and environmental benefits for the society with their products and solutions. Regarding the digital development of Finnish SMEs, the primary challenges are considered to be "limited resources, everyday rush, and lack of skillset". According to Herlin (2021), overcoming these obstacles should be facilitated by means of economic life, and the manufacturing industry will play a key role in the development of AI, expedition of sustainable development, and fostering circular economy. Herlin (2021) summarizes that the efficient use of manufactured products and services produced with less resources will be essential, in which new technologies will assist Finland towards a more sustainable and competitive economy (Herlin 2021).

According to Finnish Government (2021), digitalization and AI are key concepts for reinventing the Finnish manufacturing and thereby achieving the objectives of the twin transition. Thus, the demand for modern solutions increases emerging whole new markets, where gaining a foothold early enough opens up new business opportunities for Finnish companies to exploit (Finnish Government 2021):

> In the manufacturing industry, AI will have positive impacts especially on proactive maintenance, process automation and control, delivery chain management and, in general, improving efficiency, flexibility and safety and reducing costs. Companies will be able to get their products into the market proactively, faster, at a lower cost and with a better quality. Other examples include anticipating trends in global markets, developing new business models and services and speeding up product development. Robotisation is also a key method for improving the productivity and quality of industrial work. Robots will become more widespread as technologies mature and prices are reduced. Modular, multi-use solutions have become more common, which means that robots' ability to perform multiple tasks has improved. This will lower the threshold for investing in them, even in smaller companies. Moving robots and ones that can work together with humans will proliferate (Finnish Government 2021, online).

On top of that, new technologies allow for companies to reduce their carbon footprint and use their business output to support other operators in accomplishing

their sustainability objectives. In terms of sustainable development and circular economy, targets regarding the expedition have been set both on the EU level as well as on a national scale, says Huttunen (2021). Huttunen (2021) also underlines that in this regard, Finland aims to become the "textbook example" with its first national circular economy roadmap compiled in 2016, courtesy of the Finnish innovation fund Sitra. In general the prospects are to raise circular economy into the center of economy, expedite transition to low carbon energy usage, consider the conciseness of natural resources, and change the prevailing consumption behavior. Moreover, these topics have only been emphasized since, as in 2021 Finland published its strategic promotion programme of circular economy. With ambitious targets to be reached by the year of 2035, the programme also involves several real estate and construction related actions (Huttunen 2021, 12).

Herlin (2021) discusses digital- and green transitions to become the most meaningful drivers for competitiveness and sustainability. On top of that, they are expected to encourage companies to invest more, hence having a significant economic impact. Explaining the interconnection between these two phenomena, Herlin (2021) claims that digitalization will support reaching both national, European, and global goals regarding carbon neutrality. This being said, the second interim report of AI. 4.0 discusses the significant growth potential for the Finnish manufacturing from exploiting information and data, regardless of the yet early stages of data utilization amongst Finnish industries (Finnish Government 2021). The report also refers to the term data economy as a business area where "business models are based on utilizing data and where business value is produced by collecting raw data from different sources, collating and analysing the data, and utilizing the findings in different business areas" (Finnish Government 2021, 26). Thus, via applying these three initiatives of twin transition, Finland's goal is to become one of the leading supportive countries of the 4th industrial revolution, Herlin (2021) summarizes. A summarizing statement about the key benefits of twin transition according to Finnish Government (2021), goes as follows:

> The fourth industrial revolution will regenerate the structures of economy, break down boundaries between sectors and alter their traditional division of labour and character. It will give rise to business ecosystems of a new type, in which the material and immaterial value creation enabled by seamless digitalisation will combine into customer-oriented innovation, production and service processes. In addition to the manufacturing industry, the fourth industrial revolution will extend to other sectors, including expert services, software development, trade, and logistics as well as society's infrastructures and energy production (Finnish Government, 2021, 12, online).

1.4 Research justification

Assigned by the Finnish Association of Building Owners and Construction Clients (RAKLI Ry) in the beginning of the decade, a real estate market statement from 2011 estimated the national wealth of Finland to be 814 billion euros in total (Sallinen, 2018). From this totality, the share of built environment was calculated to be 594 billion euros, approximately 73%. Today, not only the share of built environment from Finland's national wealth is already up to 83%, but the built environment also produces 15% of the annual GDP, secures 20% of the employment rate, takes part in 60% of all the investments, and covers 35% of the entire energy consumption in Finland (ROTI 2021). When observed in the light of various key figures, the influence of built environment in relation to the national economy has become increasingly significant over the years. Looking at the areas included in the built environment, figure 3 shows that majority of the wealth is bound to either residential or commercial properties. Prior to the launch of AI 4.0 programme, The Finnish Government (2021) also commissioned a nationwide survey on digitalization as a flexibility factor and its crucialness on customer service. Shown in figure 4, these findings were presented in the AI 4.0 reports, with four major industries in the Finnish economy under the scope. Conclusively, and compared to other major industries, the construction and real estate industry lags behind in valuing and utilizing digitalization, despite the significance of built environment not only as a socio-cultural asset but also in terms of the Finnish national economy.

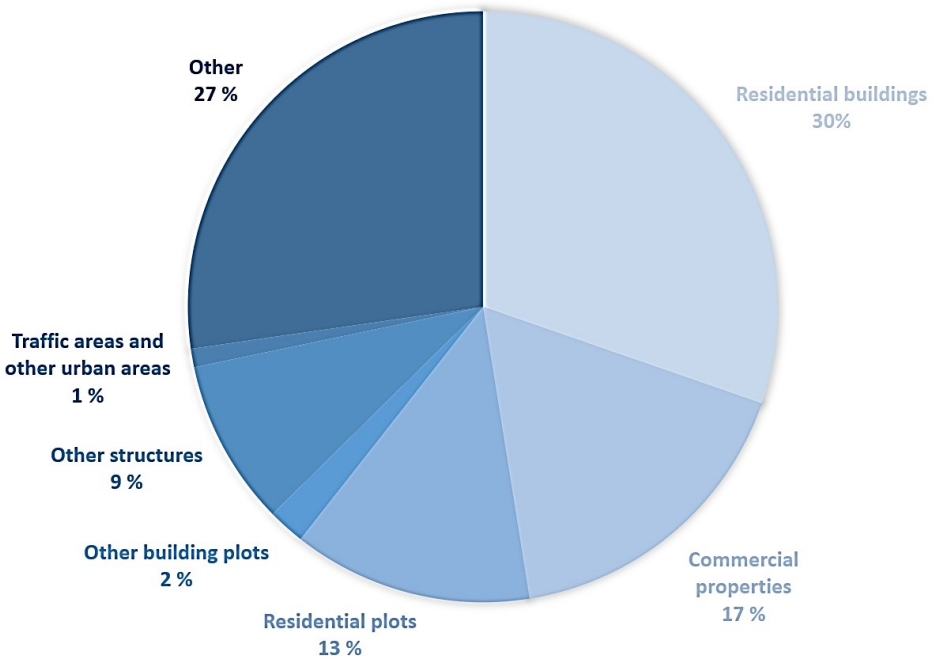

Figure 3. Built environment as a part of national wealth (Sallinen 2018)

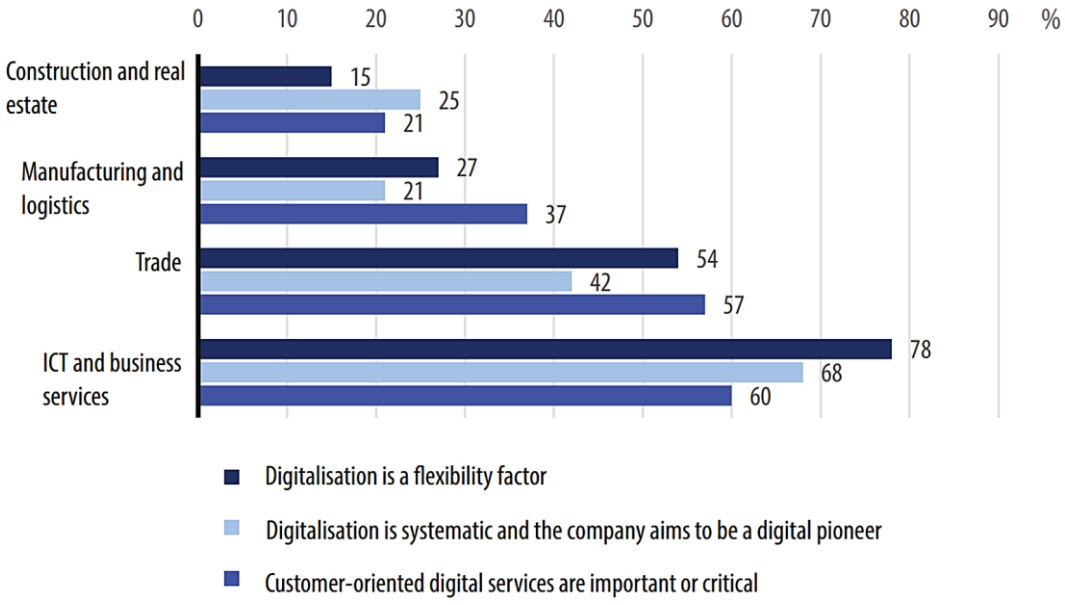

Figure 4. Differences between sectors in a survey on digitalization in spring 2021 (Finnish Government 2021, 20)

According to Leväinen (2013), one of today's challenges regarding real estates is how the old, inflexible buildings can be reinvented to align with modern trends and standards, which may challenge the functionality of the buildings as well as

compromise their original, intended use and technical life cycles. The statement by Leväinen (2013) also implies to flexibility to be emphasized more in the future, and preferably already from the planning phase of a building (Leväinen 2013, 32-33). Huttunen (2021) argues that as the built environment not only has major effects on emissions and the use of natural resources, but it also plays a key role in expediting circular economy. For the real estate industry, circular economy actualizes in the planning of multipurpose, long-lasting use of building parts and materials as well as in the avoidance of overconsumption and unnecessary waste production. The operational chains of real estate and construction industry should therefore become aligned with sustainability principles, following new economic frameworks in material and resource utilization, thus making the consumption patterns comprehensible with the carrying capacity of the planet (Huttunen 2021, 8-9).

Häkkinen (2021) states that the beginning of a global pandemic in 2019 accelerated new paradigms considering space utilization, and emphasizes the increased financial risk in property ownership especially in less favorable locations. Häkkinen (2021) continues that the rapidly changing requirements for facilities in this regard may cause uncertainty especially in commercial real estate ownership. Furthermore, Häkkinen (2021) says that ignoring sustainability in business models today, will cost companies later especially in real estate business. Leväinen (2013) suggests digitalization as multidimensional and applicable solution in many business areas of construction and real estate industry. Considering e.g. land use and construction where financially remarkable deals are made constantly, real estate management (REM) thus calls for diverse expertise as well as understanding of legislation and jurisprudence. Albeit buildings may hold a special meaning in representing the national cultural heritage, property investors often view at real estates as financial instruments providing consistent cash flow. Therefore, vacant facilities have no value for investors despite the societal point of view and in terms of economics, the built environment serves as the facilitator of business environments for companies to run their daily operations (Leväinen 2013, 31). All in all,

there are several areas and perspectives within the real estate business that the twin transition is expected to have an impact on. Especially in the current state of the world, real estate operators today need to adjust their way of operations in accordance with new trends and changing customer needs. According to Finnish Government (2021) the full impacts of the pandemic cannot be understood as of yet. Therefore, especially data utilization capacity and the capability of companies to innovatively remodel their business operations and value creation with digitalization and sustainability principles is still unknown (Finnish Government 2021).

1.5 Research questions and study objectives

Research is often turned into a problem that phases it into a logical process, for the study to begin with. A research problem that is clearly defined, enables the researcher to then consider, select and apply the best problem-solving methods. Moreover, solving a research problem often becomes easier by turning the problem into specific, separate research questions. These main research questions, however, should not be confused with the empirical questions of the study. Simply put, the primary research questions intend to steer the direction for selecting the most suitable research approach and methodologies for resolving the problem that has been set. The questions included in the empirical data set instead facilitate discussing phenomenon under examination, in order to understand and reveal new insights of it. The research findings should thus answer the main research questions and contribute to the research field in question (Kananen 2014, 21-27).

This study explicitly addresses the research gap of how twin transition impacts the real estate management of Finnish commercial properties. The aim of the study is to examine the phenomenon from its core viewpoints in relation to the real estate business. Furthermore, how twin transition contributes to the value proposition of the customer, and whether it can create value for stakeholders in the REM value chain, frames the research problem of the study. Via observing Finnish commercial properties as cases, the study involves the insights of various real estate managers in this regard to produce adequate research data. With the primary objectives to

identify the possible value from twin transition, the research aims at improved understanding, theoretical contributions and managerial implications from the issue. Thereby, in order to discover the value from twin transition within the REM value chain and Finnish commercial properties, the following research questions were derived to specify the research problem:

RQ1: “How does the twin transition impact the value proposition in real estate management?

RQ2: “What kind of added value or value added can be identified from twin transition in the real estate value chain?”

1.6 Key concepts and key papers

The key concepts of the study derive from twin transition as the focal phenomenon: digital transition, green transition, information and data. Primarily, the keywords in the study require further conceptualization including their relevant subsets. Hence, many of these subconcepts are explained in profound manner for them to to become understandable within the study context. This relates to subconcepts like digitalization and artificial intelligence (AI), sustainable development and circular economy as well as data collection and data utilization.

Considering the research field, real estate management (REM) along with its subconcepts are at the centre. As the research topic already addresses, value -associated terminology from the research field of strategy are introduced due to their relevance in relation to the research problem. In terms of the key papers of the study, it consists of literature, scientific articles and reviews of relevance regarding focal themes. Also, official publications as well as government level plans are constantly reviewed, for the phenomenon under the research scope deals with an ongoing event. Regarding the empirical data set, the research approach and methodological stance are conducted with diligence, as the study methods are both explained and selected with reference to relevant academic sources.

2 LITERATURE REVIEW

2.1 Real estate business

According to KTI Finland (2001), the term real estate business refers to property ownership, utilization and activities related to service provision with business-oriented objectives. Thus, it is an umbrella concept, that alludes to the commercialization and ability to provide genuine added value for customers through real estate related operations in terms of the entire building life cycle, from acquisiton, selling, leasing, development, maintenance to other activities (KTI 2001, 12). Leväinen (2013) sees a transition to service- and partnership thinking in the real estate business, primarily due to globalization. This has lead into specialized service providers entering the markets and, establishing service networks to grow in popularity. On top of this, economic occurences such as the worldwide depression in the 90's as well as progression of competition over the years has forced companies to pay more attention to their operating costs. As a result, companies have decided to rationalize and downsize their internal activities through outsourcing, considered as prominent tool for finding competitiveness (Leväinen 2013, 50).

2.2 Outsourcing

Outsourcing refers to contracting out some of the internal business operations of the company to a third party. In outsourcing, internal resources become replaced and the services are purchased from an external operator. Partnerships, however, imply to long term collaboration between a client and supplier organization, with the initial expectation of mutual financial benefits for both parties and improved quality on the service output (Leväinen 2013, 51-52). These paradigms have especially influenced the real estate business, considering the growing popularity of professional service networks in the industry today (Leväinen 2013, 80). According to Leväinen (2013), REM activities typically deal with both the strategic and the operational objectives of a company. The objective of corporate real estate management (CREM) is primarily to support the core business, to ensure and

strengthen the competitiveness of the business units. Meanwhile, considering property ownership as a business, the basic idea, similar to any limited company, is to maximize profit through diligent real estate management (REM) activities. Whether its CREM or REM in question, the total spend as well as the operational costs and capital expenditures of the property asset are monitored and managed by the REM unit, in principle with the corporate level strategy. The strategic aspect of REM thus aims at higher profits and consistency of operations in a long run, whereas operational decisions regarding company's property assets initially focus on supporting the general business needs. To reach a consensus, an organization must first have a vision and a mission that formulate the strategy, which will steer the direction as well as determine the roles of different stakeholders as well as explain the objectives from both organizational and individual standpoints. Strategy implementation is thus a process that may begin once the vision and mission are clear (Leväinen 2013, 34-35).

2.3 Real estate management

Leväinen (2013) argues that the roots of REM are in the United States as the concept has fundamentally developed from and around the concept of facility management since late 1970's, after the foundation of the International Facility Management Association (IFMA). On the other hand, the European Facility Management Network (EuroFM) founded later in 1987, characterizes as international network for companies, universities, and research institutes, focusing on developing activity regarding facility management across Europe, while in the Nordics the topic of REM started to gain popularity in 1992. A national compartment of IFMA, FIFMA, was founded in Finland in 1993 and specific education of REM began in 1994 in an institute currently known as Aalto University. Ever since, and to this day, especially facility management activities have become stabilized as a part of business operations and development for organizations; to align with modern requisites of manufacturing as well as for organizations to improve their operating environments and service provision (Leväinen 2013, 41).

Just like any business, REM activities are constantly under the influence of the prevailing market forces, economic trends, and societal phenomena. The concept of REM encases managing all the financial and functional actions that relate to real estate ownership: acquisition, service procurement, management, and all the way to giving away or selling the asset. As shown in figure 5, REM is a hypernym for other hyponyms that ultimately conceptualize it as a term (Leväinen 2013, 27-29).

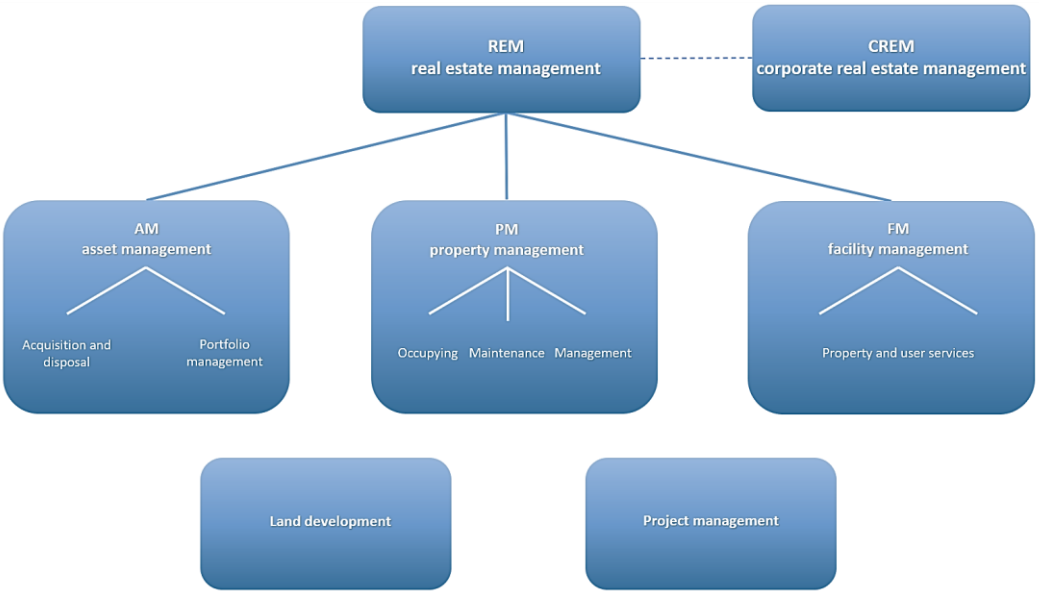

Figure 5. Concepts of REM (Leväinen 2013, 28)

Whereas CREM as a concept is considered as support activity for principally other core businesses, REM contains various support activities for real estate business and property ownership. When a property itself is the core business driver of the company, focusing primarily on the performances of the property portfolio as well as singular assets from economic and strategical standpoints, relates to asset management (Leväinen 2013, 15). Property management on the other hand deals with operational activities such as the maintenance, repairs and management of the property during occupancy and the period of ownership. On the contrary, the purpose of facility management is primarily to emphasize on the required tenant- and

user services. To clarify this precedence between the different activities in the REM value chain, property manager is often a synonym for the building landlord whereas facility management is commonly conducted externally via outsourcing or partnership. In most cases, however, both the aforementioned are commissioned by the asset manager who typically represents the proprietor, the owning company (Leväinen 2013, 28.). Moreover, land development and project management also characterize as relevant REM activities, as displayed in figure 5. Overall REM activities aim at supporting the business strategies of a company and have a role within the strategy implementation, for increasing operational productivity, or to strengthen the economy of the company (Leväinen 2013, 37).

2.3.1 Asset management

Leväinen (2013) characterizes the business idea behind property investing to be about maximizing profit as well as the return of equity (ROE) for the invested capital. Correspondingly, the approach in asset management is from a financial perspective, for it primarily has to do with the acquisition and transfer of properties as well as the portfolio management. Investing in real estate may not only provide protection to one's wealth against i.e. inflation, but in property ownership, the value appreciation of the assets can be expected although this would not necessarily become realized until the conveyance of the property (Leväinen 2013, 28). Leväinen (2013) suggests that improving cost efficiency and speeding up the rotation of capital are ought to increase the ROE, invested in the operations. Through dynamic financing, which means replacing equity partially with cheaper liabilities, the financial risks of properties can be managed better and the total cost of ownership may be reduced. Considering real estate portfolios, not only the suitable locations of the assets, but good understanding of the real estate markets and timely transfer of possession or acquisition decisions are vital. Also, development of outdated properties and premises, diligent maintenance documentation in a sufficient data base, and other risk management practices regarding the facilities

are fundamentally processes of asset management that create value to the organization and contribute to the asset-value growth (Leväinen 2013, 103).

2.3.2 Portfolio management

Wofford, Troila, & Dorchester (2011) stress that portfolio management involves especially developing, and communicating the real estate strategy as well as selecting adequate systems and networks for sufficient portfolio performance. Moreover, other attributes such as analyzation and effective communication of financial, socio-cultural, technological and other key aspects, relate to the management of property portfolio. Internal and external communication channels, as well as feasible dashboards specifically designed for overseeing and detecting changes and anomalities in the fund performance are of essence for a portfolio manager (Wofford, Troila, & Dorchester 2011). Leväinen (2013) argues that the flawlessness of real estate related operations may primarily reflect the quality different REM activities but ultimately, the property owner is responsible of determining the quality and level of desired services around the assets (Leväinen 2013, 30-31). Either via in-house or outsourced service provision, arranging all the adequate REM actitivities to serve both internal and external customers and support the building functionality results in succesful, professional property ownership today (Leväinen 2013, 29).

2.3.3 Facility management

Facility management means organizing and coordinating diverse facility- and user services that can be arranged either internally by the owning company or via outsourcing, Leväinen (2013) declares. Generally, as REM deals with the service procurement of the properties, the users of the facilities should be taken into consideration in regard of the provision of required facility services (Leväinen 2013, 36). Typically, the CREM unit of the organization supports other business units with their expertise, committed to providing quality and cost efficiency to the operations, by optimizing the facilities in accordance with the company's needs. Space

management as one of the key areas of facility management, thus often deriving from the corporate level strategies of the organization. Strategically, for example the selection of the business locations is often conducted in respect of the agreed financial- and environmental policies appointed by the upper management. Thereby, establishing high quality conditions and minimized costs during occupancy, has a lot to do with the facility service procurement conducted by the REM unit. Selecting adequate facility services, listed in table 2, also contributes to the main objective of REM activities of retaining and increasing the asset-values (Leväinen 2013, 37.)

Table 2. Facility services (Leväinen 2013, 49)

Facility management	Property management	Land management	Other
Space management	**Real estate/building**	**Maintenance**	
FM organization Working environment Removals Operation planning Space management Storages Cadastral systems Premises Facility services	Support for users Support for owner Budgeting Costs optimization Service procurement Service coordination Contract administration Assignment of a lease Construction contracting Documentation and reporting	Heating Electricity Gas Water and wastewater HVAC Cooling Lighting Elevators Automatic doors Communications system Security systems Gates Cables and network Data processing Laundry	Special services IT support Repair Restoration Architectural services Engineering services Project planning Competitive bidding
Central Services Security services Reception Switchboard Help desk Cleaning Maintenance of outdoor areas Gardening Pest control Mail room Travel services Office services Vehicles Removal services Archives Courier services Printing services Office accessories	**Accounting** Cost management Rent collection Leasehold Liquidity management Debt collection Taxation **Contracts** Conclusion (of a contract) Renewal (of a contract) Insurances **Leasing** Lease administration	**Technical support** Janitor Caretaker 24h service Systems maintenance Control room	

Facility management is estimated to be a market of over 650 billion euros in Europe. It is an integrated process to support and improve the core activities by providing the necessary support services for reaching the strategic organizational targets. Applying facility management to organizational strategy is necessary for the support services to be directed in the right places, and the output in the form of added value emerges when the organization gets the required support (Leväinen 2013, 41-42). Leväinen (2013) states that people, technology, and real estate together form the strategic heart of facility management. In practise, facility management is heavily linked with strategic management, change management, property administration, information technologies, service procurement and managing human resources. Hence, FM representatives are simultaneously ought to be customer-oriented leaders of people and things, entrepreneurs, diplomats, and most importantly, supporters (Leväinen 2013, 43). The main focus in facility management is to sustain low operational costs, provide good and healthy working conditions, retain customer satisfaction, ensure quality service output, and react quickly and flexibly to changes. For example in manufacturing, the primary stress factors are the safety and security, environmental compliance, and energy consumption of the business location (Leväinen 2013, 45). Meanwhile this can be addressed with adequate facility management, the maintenance and required repairs are forwarded for property managers to take care of. With the focus and epxertise on the functionality, usability and property administration, property management has a significant impact on the economic and operational performance of the property (Leväinen 2013, 28-29).

2.3.4 Property Management

According to Palm (2013) a property manager is responsible for coordinating and supervising all the operational activities of the the real estate, considering both the short- and long-term objectives. In the short term, maintenance, customer relations, leasing and rent reviews are at the center, and should be taken care of prior to striving for the long-term targets, which according to Palm (2013) can be

i.e. optimization of the building usage, ensuring the return of the investment (ROI), and extending the building's technical life cycle. In addition, Leväinen (2013) underlines that the procurement of maintenance and constructing services calls for knowledge and understanding of project- and cost management to be able to meet the customer needs. Thus, technical competence in terms of building systems, understanding of the property economy and real estate jurisprudence in terms of the limited liability companies act for instance, become a necessity in professional property management. On top of that, property managers should embrace good social skills and communication, when collaborating with different stakeholders with varying views and interests. A property manager is therefore responsible for monitoring the building service technology and utilizing the given resources effectively with the help of other experts, thus managing the entire stakeholder network to secure the overall functionality (Leväinen 2013, 33).

In reference to table 2 and facility services, property manager is also in charge of overseeing the compulsory administrative duties during the fiscal year of a property company, while planning and organizing the maintenance and repairs that in this particular table fall in the category of land management, courtesy of Leväinen (2013). In terms of operating costs in the domain of real estate and construction, maintenance and repair have covered the biggest share of the total spend in the field of real estate. Regarding the production of real estate and construction industry, around 16 billion euros were spent in maintenance and repair annually in 2008, according to figure 6 (Leväinen 2013, 15). Today, the maintenance and repair expenditures only show an increase year by year, according to the annual statistics of real estate maintenance costs maintained by Statistics Finland. On the timescale between 2015 and 2022 courtesy of Statistics Finland (2022), the total index in figure 7 indicates a significant increase regarding maintenance costs, which supports the idea of the discussed high impact of property management in terms of managing the organizational total spend and operating costs.

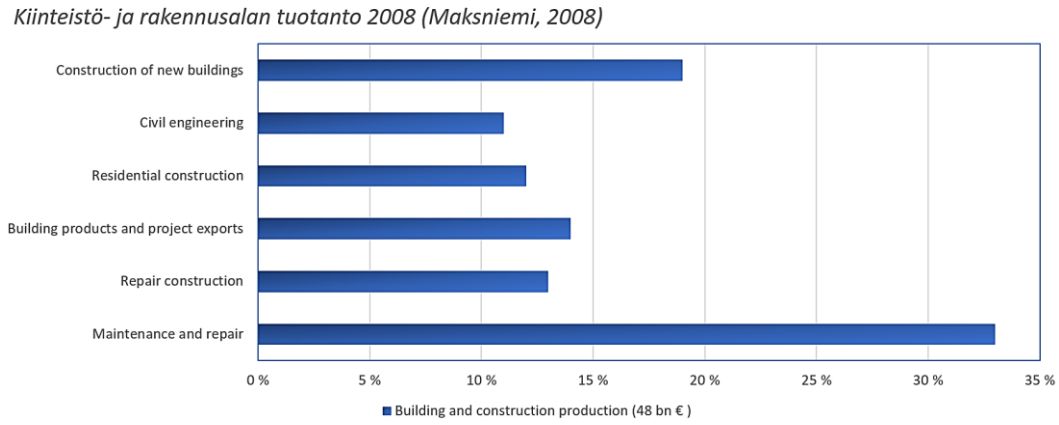

Figure 6. Production of real estate and construction industry (Leväinen 2013, 15)

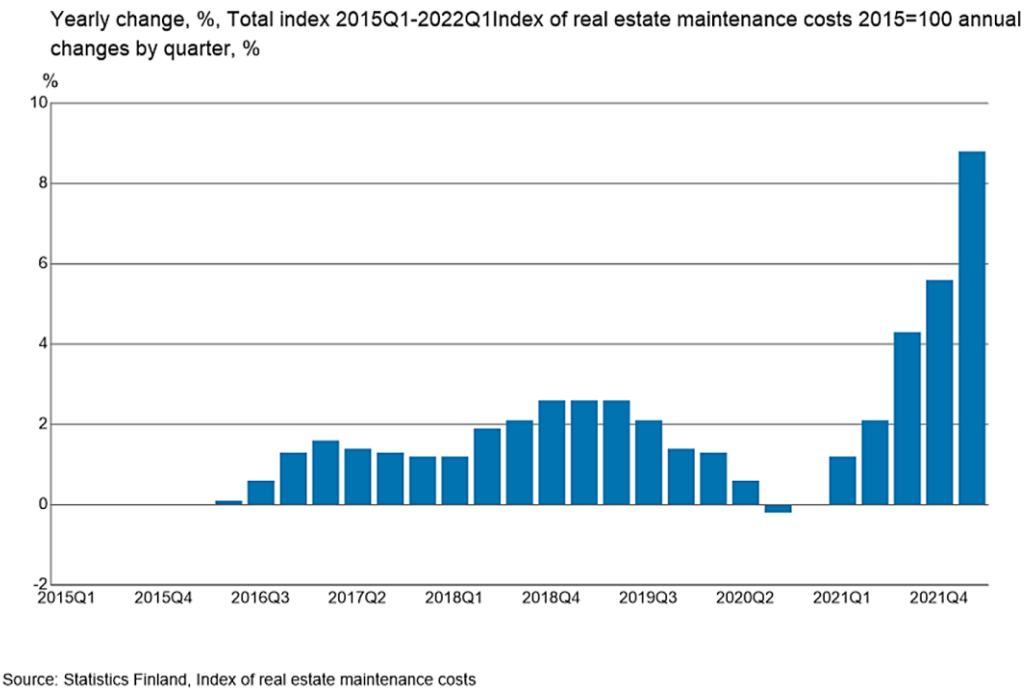

Figure 7. Index of real estate maintenance costs (Statistics Finland 2022)

2.4 Commercial properties

Considering how property ownership is divided in Finland in the first decade of the 21st century, Leväinen (2013) states that around a quarter of commercial real estates belong to private companies and financial institutions. Finland's building stock in general is relatively fresh, considering that most of the constrcution has taken place after the year of 1970. Over 40% of the building stock were in fact built during 1970s and 1980s, whereas in the 1990s and after the year 2000, nearly 30% of the buildings we see today, were put up. The public sector and public limited companies own around 18% of the totality, from which municipalities and municipal alliances possess approximately 12% (Leväinen 2013, 15).

According to Statistics Finland (2021), the Finnish building stock in terms of blocks or flats, other buildings and free time residences, consist of over 1,5 million buildings in total with the overall floor area of over 505 million squares as presented in table 2. Regardless of the fact that the majority of Finnish building stock are residential buildings as shown earlier in figure 4, this sector is excluded from scope of the study. Instead, the focus in the research is on commercial properties of which commercial buildings covered around 32 million squares of the entire total floor area of the building stock in 2021, and 20 million squares of the totality were in office use, according to table 2. A commercial property, according to KTI (2001), refers to facilities utilized for the mean of production of intangible or tangible commodities. Therefore, and considering this paper, the conceptualization of commercial property involves all types of buildings in accordance with this definition, except for the ones that are used in resdential purposes. Hence, in accordance with the definition of KTI (2001), office-, transport and communication-, industrial-, warehousing-, educational-, assembly-, healthcare-, public utilities-, as well as other commercial buildings are all considered as commercial properties under the examination. This being said, the case of the research consists of the building types displayed in table 3.

Table 3. Building stock 2020 (Statistics Finland 2021)

Classification of Buildings 2018	Buildings 2020	Floor area, m2	Per cent of floor area (%)
BUILDINGS TOTAL	1 536 650	505 285 969	100,0
0110, 0111 One and two-dwelling houses	1 169 903	169 521 401	33,5
0112 Terraced houses	84 022	36 374 762	7,2
012 Blocks of flats	65 479	107 857 851	21,3
013, 014 Residential buildings for communities, Dwellings for special groups	2 604	2 988 982	0,6
03 Commercial buildings	32 030	30 602 871	6,1
04 Office buildings	10 557	20 043 480	4,0
05 Transport and communications buildings	48 200	12 635 402	2,5
06 Buildings for institutional care	6 223	11 220 632	2,2
07 Assembly buildings	14 869	10 988 244	2,2
08 Educational buildings	12 231	22 261 387	4,4
09 Industrial and mining and quarrying buildings	33 657	50 124 201	9,9
10 Energy supply buildings	6 254	2 385 524	0,5
11 Public utility buildings	7 605	1 396 667	0,3
12 Warehouses	35 939	24 636 823	4,9
13 Rescue service buildings	2 382	1 441 348	0,3
19 Other buildings	4 695	806 394	0,2

Leväinen (2013) states that a commercial property can refer to any facilities intended for manufacturing and other operational or commercial purposes. Businesswise, the supply and demand for the occupancy of such facilities thereby correlates heavily with the number of operators in the service business. Especially the use of office premises has undergone quite a transition towards more and more efficient space utilization as of late. The manufacturing premises, i.e. factories, production units and storages, are designed for production and warehousing activities and especially transportational and logistics solutions are emphasized more today in the planning and construction of the buildings (Leväinen 2013, 15).

By and large, Palm (2013) identifies three primary management tasks of a commercial property to be maintenance, leasing, and customer service. Furthermore, Palm (2013) argues that the modern way for the commercial real estates to meet the customer criteria and service requirements, is putting the tenants and the users of the facilities are at the centre, while the stakeholder network around the building should align their business models with this (Palm, 2013).

2.5 Strategy

From a classical point of view, strategy can be seen as a rational process of implementing profoundly analyzed and deliberate choices (Palm 2018). Leväinen (2013) describes strategy as a plan for reaching the organizational target level via execution of certain tasks, emphasizing that strategy determines the methods for optimization and harmonization between the organizational goals, resources, operating environment, possibilities, and risks. Regardless of the different ways of defining strategy, it is undoubtedly in the heart of all operations and to a great degree specifically in the real estate business (Leväinen 2013, 93).

Often recognized as the father of modern field of strategy, Michael E. Porter in his theory of competitive strategy introduces a theoretical framework that unveils the differences between business strategies and explains how companies can find their own special positioning, a competitive edge, to determine a successful operating strategy (Leväinen 2013, 89-90). In short, Porter (1985) declares that a company can achieve competitiveness by producing a product or a service as cost efficiently as possible, as well as by differentiating with affordable product or service prices in the market. In 1979, Porter created a fabric of five competitive forces, displayed in figure 8. In reference to his fabric Porter describes that the strength of each of the five competitive forces is a function of “industry structure" which includes certain key elements, also explained in figure 8 in detail. Regardless of Porter (1985) portraying the industry structures to be relatively stable, he notes that these structures can however change over time as an industry evolves. Porter continues that particularly structural changes modify the overall relative strength

of the competitive forces, and may impact i.e. the industry profitability, positively or negatively. Furthermore, trends that are considered as the most important from strategic point of view, are the ones eventually modifying the prevailing economic structures of the industry (Porter 1985, 5).

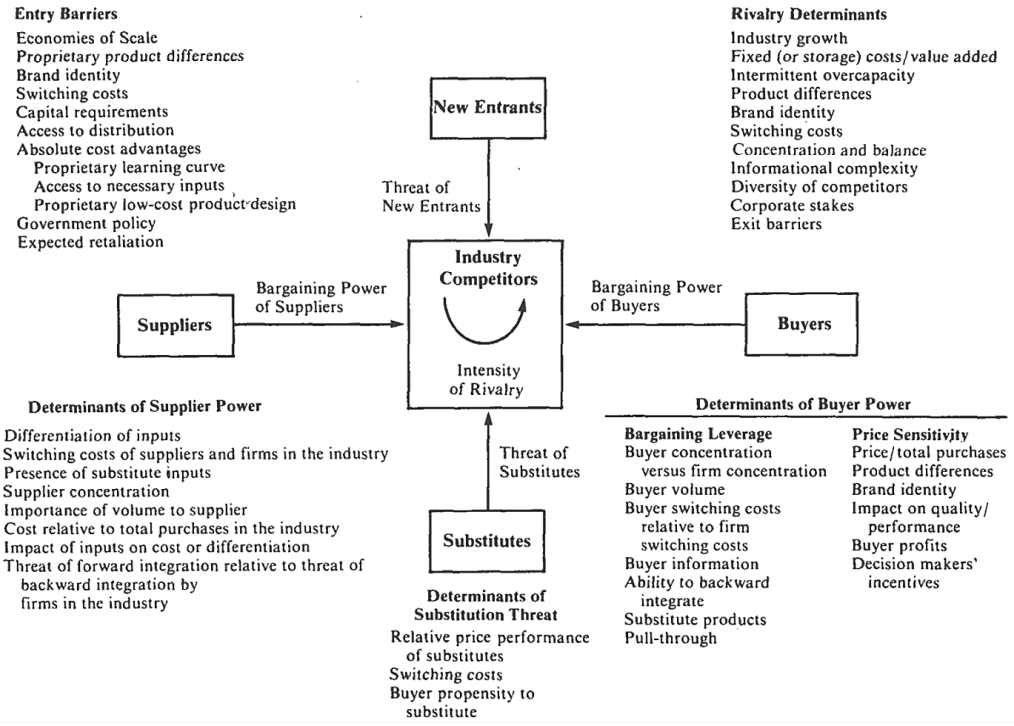

Figure 8. Five competitive forces that determine industry profitability & elements of industry structure (Porter 1985, 5)

Porter's theories have been said to lay the groundwork for strategy formulation in most businesses, and the "P5f" model presented in figure 8 can also be applied to the field of real estate business. According to Kananen & Puoltaival (2019), to develop the qualities valued by customers and become specialized with a certain function or customer segment, companies can improve their competitiveness (Kananen & Puoltaival 2019, 224). Leväinen (2013) also notes that due to the ever tightening competition and changes in operational landscapes, all parties are now subject to seek effectiveness and adequacy in their operations. Especially regarding labor and capital matters, companies must pay more attention to the potential use of resources in the contexts of efficiency and effectiveness (Leväinen 2013, 89-90). According to Porter (1985) each firm is a combination of activities, which are

first and foremost performed to design, produce, market, deliver, and support the main product or service. Palm (2018) underlines the term strategic capacity as a reflection of the organization's internal strengths, more specifically, its ability of performing the essential business activities. In addition, Palm (2018) argues that the different value-creating, interrelated activities of the company eventually bring forth the desired competitive edge.

Leväinen (2013) says that strategy realizes differently in corporate-, business-, and functional levels of the company. Corporate strategy steers guidelines for the entire operations, defining e.g. the guidelines of resource and finance allocation, and how the operations should be organized. In business strategy, the confluences with corporate strategy and the predetermined direction of operations in each business area, are determined in detail. Thus, business strategy traditionally concerns a single unit or business sector. In business strategy, the support activities of the company which are considered necessary for the core operations to function, are deliberated on. In the field of REM, these activities refer to the use of capital, labor, technology, information, and facilities, as the support activities aim for actualizing the upper-level corporate strategy. Hence, in a succesful strategy, detailed plans are made to present how different support activities contribute to the fruition of upper strategies. Excessive formalities may sometimes get in the way of concise strategy implementation, which is why employees can find it difficult to assimilate the operations with the strategic plans. Yet, in general, having a strategy plan is always better than leaving it undone, as the vision and mission which are the two cornerstones of stragegy, determine the common goals and clarify the objectives for the organization to pursue. Modern strategy planning includes assessing the situation and environment, a thorough scenario planning to consider the possibility of any unexpected or sudden changes. By means of vision and mission, both the shareholders, customers and employees however should know where the organization is heading and what the business stands for. Based on vision and mission, strategy thereby steers the operations on all business levels, within their contribution to the company main objectives (Leväinen 2013, 92-93).

2.5.1 Strategy development

According to Palm (2013) the main reason for strategic planning is to clarify the company's business model, which illustrates the internal and external possibilities and threats to the business. Lindholm, Gibler & Leväinen (2006) present three basic steps in formulating a real estate strategy which are analysis, solutions development and strategy implementation as displayed in figure 9.

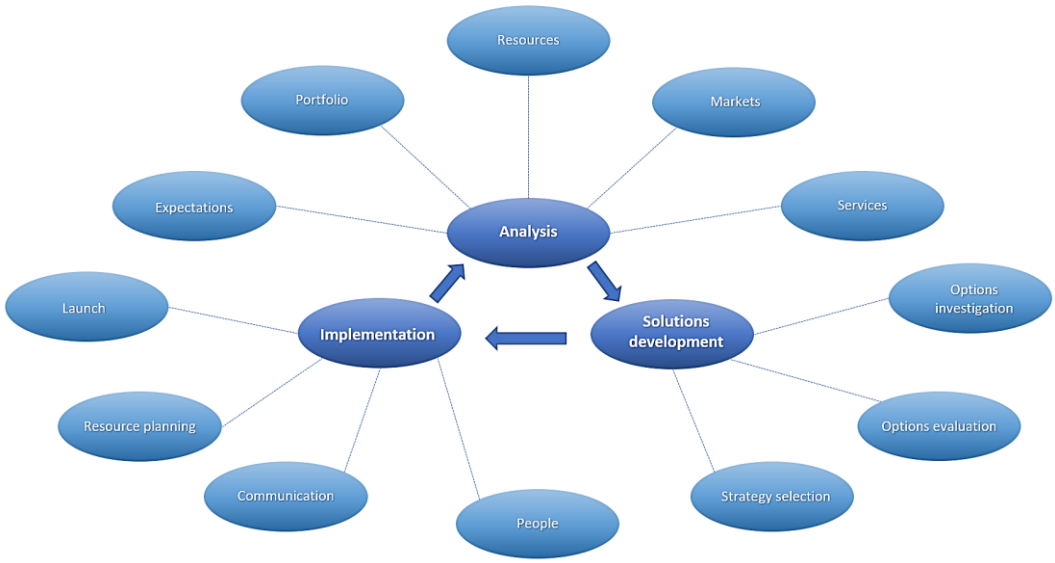

Figure 9. Developing real estate strategy by Lindholm, Gibler and Leväinen 2006 (Leväinen 2013, 95)

According to Kaplan & Norton (2000), the value proposition delivered to the customer lies at the core of any business strategy, connecting the internal processes of a company to result in improved business output in the eyes of customers (Kaplan & Norton 2000, 86). Kaplan & Norton (2000, 97) continue that the value proposition can therefore be considered as the most important step in the development of a strategy map. Leväinen (2013) states that in strategy formulation, the company needs are considered, and the core activities and support activities are separated from the other. First and foremost, the required resources and financing to organize both internal and external services are analysed and sorted. Both the short- and long-term budgets should be planned and compiled, after which

the procedures regarding the business output are designed. Subsequent to the strategy development phase, the continuous monitoring and measuring of the selected strategy should follow (Leväinen 2013, 95).

Furthermore, it should be deliberated on how external factors such as the prevailing market situation may influence the operations, in terms of i.e. spacing solutions. In the strategy analysis phase, also the objectives, needs, and expectations should be taken into consideration. Thereby, the most suitable business options should be identified during the development phase, where evaluation criteria, the key performance indicators, are determined and reflected with the operating alternatives. Espeically in terms of corporate real estate strategy, things to observed are e.g. development of the real estate portfolio, space utilization, and reviewing the existing resources, processes, and services. In strategy implementation, to inform the entire staff about the upcoming changes and internalize them with new solutions helps with engaging the employees to the strategy. Before applying the changes, the required labor force and other resources should thus be re-organized in accordance with the possibly renewed operating model. In reference to figure 9, a systematic implementation of a real estate strategy may be conducted by going through all the stages thoroughly (Leväinen 2013, 96).

2.5.2 Value chain

Value chain is another strategy-related business concept developed by Porter (1985) that reflects both a firm's history, past strategies, and their level of success in strategy implementation. Porter (1985) declares that the value chain shows the total value of a company as it consists of physically and technologically distinct value activities, as well as the margin, which is the remainder of total value and collective cost of value activities. The value chain divides the primary and secondary activities of the operations, reflecting the contemporaneous series of actions included in the formation of a product or service (Porter 1985, 38). Therefore, differentiating with value chain in relation to competitors, becomes essential for companies to gain competitive advantage, Porter (1985) writes.

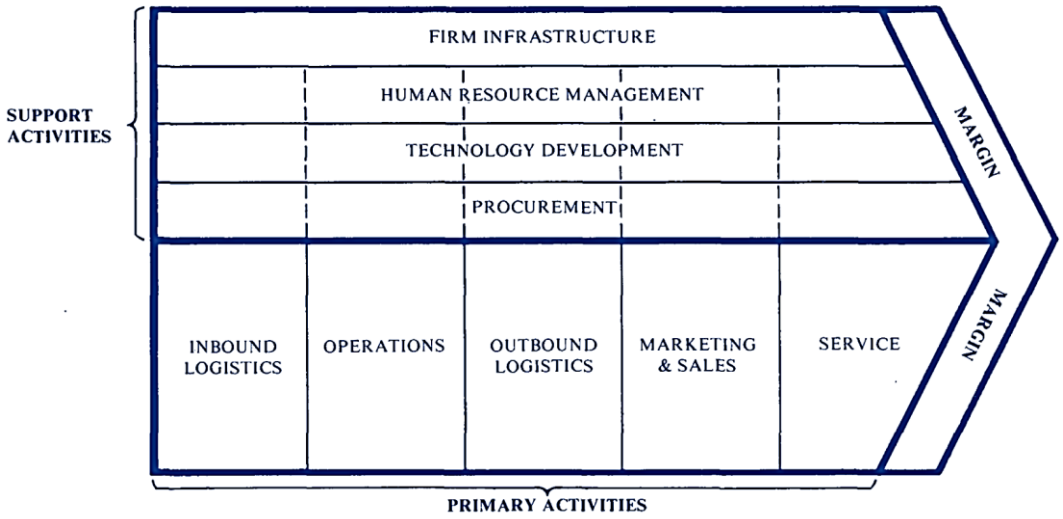

Figure 10. The Generic Value chain (Porter 1985, 37)

Porter (1985) explains that competitive advantage as a concept cannot be fully understood by looking at the entire corporation but instead, it stems from several discrete activities each of which possibly contribute to a company's position in terms of costs efficiency or differentiation in the markets. A firm may for example choose a broader competitive scope than its competitors, and be able to capitalize from this by e.g. forming coalitions with other firms. Hence, the value chain provides a tool for systematically examining the actions of a company, thus disaggregating the firm into its strategically relevant activities (Porter 1985, 33-35).

Furthermore, these contemporaneous and subsequent activities should provide added value for the entity, says Porter (1985). The concept of added value is often mixed with the term value added, which means the additional value resulting from a company's production – the difference between the selling price of the final product or service, and the purchasing price required for its production. Porter (1985) notes that since value added distinguishes raw materials from other inputs required in fully-functioning operations, it fails to emphasize the collaborative actions among different stakeholders that influence the costs or differentiation of the company in a sense. Thereby, instead of solely focusing on the value added, the competitive advantage can be examined better by analyzing the value chain

(Porter 1985, 38-39). Porter summarizes his idea of a generic value chain in his model presented in figure 10**.** Moreover, another model courtesy of Porter is presented in figure 11, explaining the large stream of activities companies are involved with; the value chains of suppliers, channels as well as the buyers (Porter 1985, 33-35).

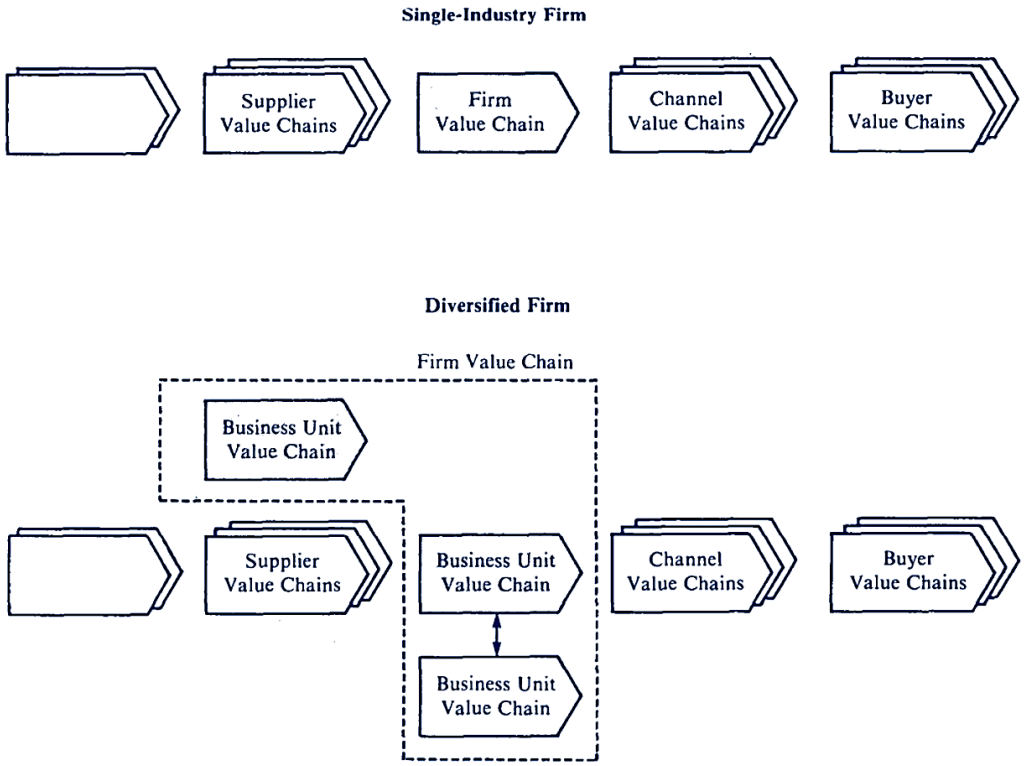

Figure 11. The Value System (Porter 1985, 35)

2.5.3 REM value chain

Porter (1985) finds it necessary to define the value chain of a company for competing in a particular industry for diagnosing exactly how to reach competitive advantage over the competitors. In his model of generic value shown in figure 10, the individual value activities of a company are first identified and what is more, each of the generic, primary business activities can be optimized and coordinated with a list of support activities. According to Leväinen (2013), value chain from

both the real estate owner's and users' standpoint can be observed by looking at activities of facility management, property management, asset management, and portfolio management. Courtesy of Leväinen (2013), figure 12 demonstrates the chain of REM activities that create value to the owner, whereas figure 13 respectively displays the value creation for the user of the real estate, instead.

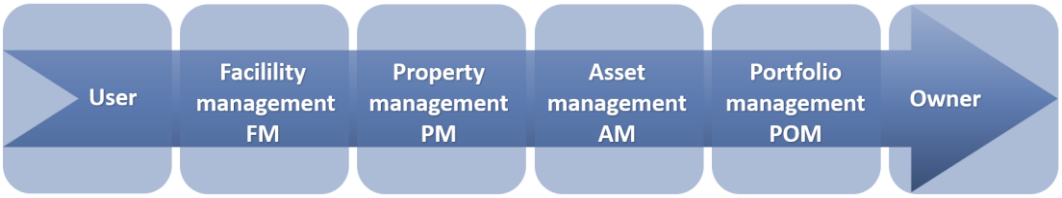

Figure 12. Real estate management value chain – value for the owner (Leväinen 2013, 99)

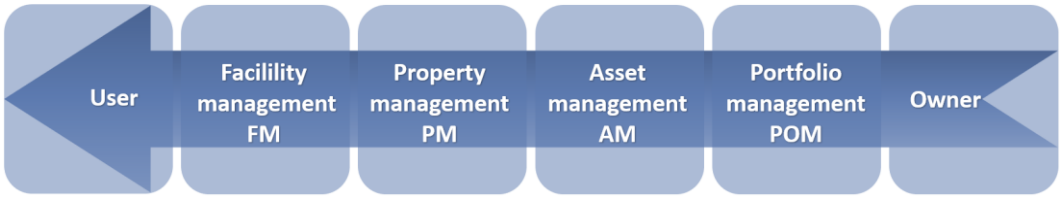

Figure 13. Real estate management value chain – value for the user (Leväinen 2013, 99)

2.5.4 Value proposition, added value & value added

Value proposition is described as the "unique mix of product, price, service, relationship and image that the provider offers its customers" (Kaplan & Norton 2000, 86). Kaplan & Norton (2000) continue that in the company's strategy map, value proposition connects upwards to the measurement of business outcomes in relation to the financial objectives, whereas downward it connects to the critical internal processes which establish the company to deliver its value proposition to targeted customers (Kaplan & Norton 2000, 90). As discussed, the term value added defines as the sales price of a product minus its direct production costs. Furthermore, it includes the incidental expenses and staff costs like salaries for

example, but also depreciations which in bookkeeping become reflected by means of cost savings. Also known as the surplus value, the value added thereby means the exceeding amount of profit a company gains in relation to the expected yield of the business. Thus, and in simple terms originally stated by Karl Marx, surplus value is the value created by the workers who produce an output value that is greater than what it costs hiring them (Leväinen 2013, 98). Added value, according to Leväinen (2013), indicates the improvement of product or service that contributes to the financial success, the profitability of the business. Added value can hence be observed from different aspects, one of which is the customer's point of view: when a product or a service is compared to a competing, similar one, the added value in fact comes from the increment value experienced by the customer. From this perspective, added value becomes a subjective feature regarding the product or service, determined by the customer eventually. Respectively, added value in terms of company's support activities refers to the value creation for the core operations and hereby, it is experienced and evaluated by an internal customer. In other words, the benefits that the internal customers recognize in their own work, and also in relation to the end customer's experience, ultimately determines what kind of added value for example REM activities may be able to bring forth (Leväinen 2013, 100).

2.5.5 Value adding attributes in REM

Since CREM units primarily exist for supporting the core process of a company, the value creation from CREM thereby has to do with each operation, service, product, and process considered as relevant in reaching the main objectives of the organization (Leväinen, 2013). Furthermore, Leväinen (2013) encases that REM attempts to enhance the core process, to increase its value in the eyes of the customers. Core business objectives, such as maximizing profits and asset value growth, are achieved through increased productivity and creating positive revenue and cash flow. According to Leväinen (2013) there are practically four ways for increasing

productivity: raising production volumes, more efficient use of resources and machinery, improving products and services for better pricing, or reducing operating expenses. In summary, productivity can thereby be improved via resource effectiveness and enhancing the prevailing cost structures. Oftentimes, the impacts of REM are in fact evaluated through productivity, and the tangible accomplishments are measured in cost savings, efficiency of space usage and effective use of capital. The most traditional indicators have been premises expenses (€/m2 or €/employee) which indicate the impacts of CREM to the productivity of the company, yet not to its economic growth. On the contrary, the development of the company revenue may, on the other hand, be affected through for example asset-value growth, expedition of marketing and sales, innovations, and via improving employee satisfaction. Again, the company productivity is expected to be influenced by the likes of improved employee satisfaction too, but also through better flexibility (Leväinen 2013, 100). In figure 14, originally presented by Lindholm et al. (2006), seven added value attributes are highlighted to connect with both the revenue and productivity growth, the two identified, essential drivers for maximizing the wealth of shareholders.

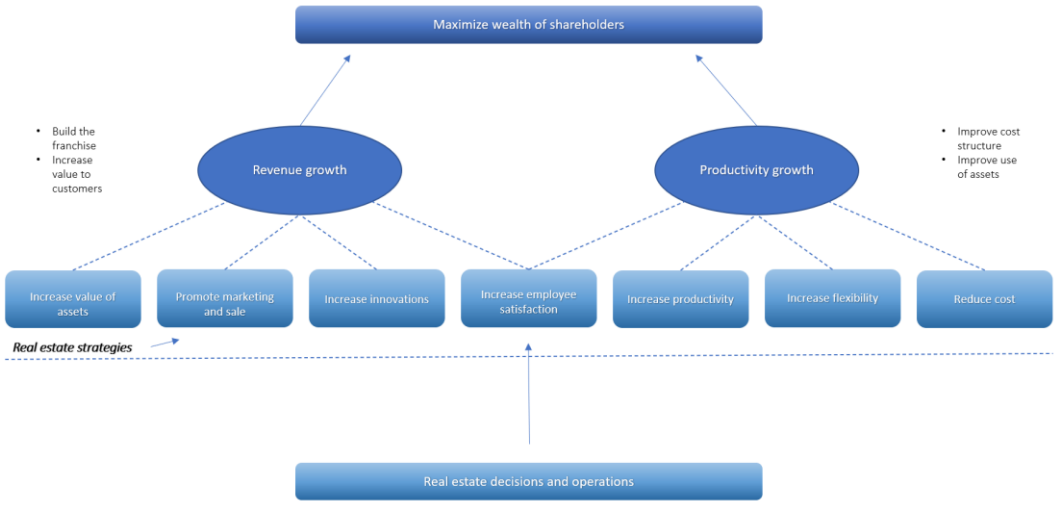

Figure 14. Added values according to Lindholm (Leväinen, 2013, 101)

Furthermore, and in reference to figure 15, Leväinen (2013) suggests that REM units should adopt adequate real estate strategies for developing the company core operations. In alingment with the corporate level strategy, the business level strategies should follow the added value process displayed in figure 15, where efficiency in resource utilization is attained from REM activities as a part of the customer strategy, meanwhile productivity growth should derive from the strategy of internal processes focusing on the improvement of resource values. As increasing the value of real estate portfolio, according to figure 15, relates to the CRE or REM strategy to support business level strategy implementation, actions such as portfolio evaluation, locations selection, risk management, leasing, acquisition, development, and adoption of the required information and communication systems become emphasized (Leväinen 2013, 112). Eventually, the success within the implementation decisions can be measured with different REM indicators presented in figure 15 or respectively, with other key performance indicators (KPI's).

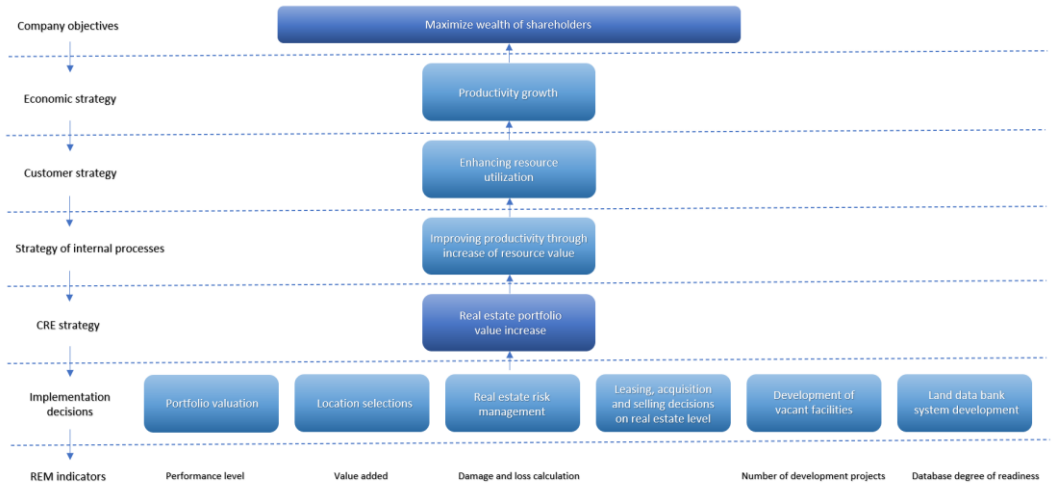

Figure 15. Added value process of CREM (Leväinen 2013, 112)

2.6 Key performance indicators in REM

According to Leväinen (2013), performance demonstrates the course of events resulting in a specific outcome, projecting the company's ability to reach its targets,

thus reflecting the success of REM activities (Leväinen 2013, 113). Leväinen (2013) states that organizational performance covers many areas and should therefore also be observed on different levels. First and foremost, the upper management is interested in the so-called bottom line and what is relevant and necessary to the core business. Therefore, the CREM units usually only report their most urgent matters to the upper management regardless of their involvement in all operating fields. Generally, evaluating the organizational performance should begin with defining the success factors, the focal issues relevant to the company's success. More specifically, critical success factors define as the key figures of business, for measuring success. A critical success factor can be either a cause or an effect, hence why it is essential to recgonize the invervening causalities in the chain of operations. For instance, the expertise of employees may partly explain the operational effectiveness, customer loyalty and even the number of sales of the company (Leväinen 2013, 113).

Leväinen (2013) notifies that there are certain factors that can be considered simultaneously as causes and effects. For example, profitability derives from operational effectiveness, meanwhile profitability also drives the operations development. As organizational success factors are typically divided into economic factors such as profitability, solvency, economic growth, liquidity and sales growth as well as into non-economic factors such as productivity, delivery time, customer satisfaction and quality, the success factors in REM can be categorized in a similar way (Leväinen 2013, 113-114). The economic success factors in REM are mainly cash flow and the gross revenue of the tied-up capital initially invested in the real estates. Non-economic success factors of REM can be the e.g. the quality of input resulting from the REM activities, and the satisfaction within workspaces and facilities among internal and external customers. Success factors can be either tangible or intangible in character, as tangible assets include e.g. the property assets, economic capital, and production machinery. Business processes and employee know-how can be considered as an example of intangible assets. While the success factors ultimately often depend on the core business objectives, identifying these

factors from within the selected REM activities is reasonable, for it eases the real estate strategy implementation process to say the least (Leväinen 2013, 114). For measuring the finacial impacts of property assets in relation to the core business operations, Leväinen (2013) lists different key figures, presented in table 4.

Table 4. REM key figures (Leväinen 2013, 139)

Costs	premise costs / surface area premise costs / revenue premise costs / total costs premise costs / person premise costs / net floor area premise costs / customer
Economic performance	costs / profits capital costs
Real estate portfolio	property assets value property asset importance to core business number of development projects transaction volume of needless property assets
Space utilization	surface area / employee utilization rate utilization of space / space in total
Flexibility	occupancy rate / owned premises length of leases amount of remote work
Employee productivity	workspaces / employee distance between employees number of meeting rooms number of break rooms indoor air quality (lighting, temperature, air conditioning, noise) interruptions from space arrangements removals / year
Satisfaction	satisfaction for workplace and facilities among internal customers customer satisfaction number of support contacts additional services of REM unit location (communications, local services, commutes)
REM unit's connection to strategic corporate level	participation in strategic planning connection to strategies of other industries communication with upper management meetings with company board
Productivity of REM unit	number of REM unit employees / all employees costs / REM unit employee sales costs / profits completed service requests response time / service request number of service providers
Quality of REM unit	service level agreements in use balanced score card in use auditions with service providers in use employee satisfaction in REM unit's expertise

2.6.1 Strategy models in REM

According to Kaplan & Norton (2000), value propositions for targeted customers can be defined with strategic themes divided into long, mid and short term. As the long-term refers to "building the franchise", mid-term implies to "increase customer value" and finally the short term insituates in "operational exellence". Regarding strategy models, balanced scorecard (BSC) strategy maps are of use in most businesses as they portray the cause-and-effect relationships of how the strategic themes drive improved customer and financial outcomes (Kaplan & Norton 2000, 81). In real estate business, strategic planning actualizes especially in portfolio management where the financial risk is decentralized between several assets. Portfolio management is thus often based on growth share matrix, which is a model for strategic planning commonly displayed in the style of balanced score card (BSC), although there are various forms of similar strategic tools available (Leväinen 2013, 94). Table 5, courtesy of Leväinen (2013), exemplifies these measures included in different REM activities by categorizing them under the relevant perspectives introduced in the BSC model.

Table 5. Examples of measures used in REM Balanced Score Card (Leväinen 2013, 119)

Economic	**Customer**	**Internal processes**	**Learning and developement**
Gross revenue Gross margin Return on assets Assets value Number of realised properties/realisation value Vacancy rate Lease ratio/number of premises Subleasing rate	Price-quality ratio of premises Price-quality ratio of facility services Customer satisfaction in premises (employee and end customer) Customer satisfaction in REM activities (service level, response time, quality, communication etc.) Customer satisfaction in facility services	ROE ratio Operational expenses (maintenance, energy utilities, etc) Vacancy rate Reaching sustainable development goals (amount of waste, energy consumption, recycling level, recyclables) Project/investment efficiency (reaching objectives, schedules, budgets etc.) Internal customer satisfaction in REM acitivies	Expertise Employee know-how Work atmosphere Incentives and motivation Employee absence rate Staff rotation Staff average age Number of R&D projects Number of education and development days

With BSC, the vision and strategy of the company are turned into objectives, measures, and action plans, where both economic and non-economic indicators

are utilized. BSC thus helps identifying success factors and determining the objectives and the key performance indicators. In the measurement systems, the key areas are called perspectives, of which there are four: economic, customer, internal processes, learning and development. Overall, the economic or operational performance assessment is also often conducted from these perspectives, which determine the business goals, measures, and desired values (Leväinen 2013, 116).

2.6.2 Target areas of REM

Leväinen (2013) declares that REM decisions can support the company's general business needs, when the decisions are considered from the various aspects, presented earlier in table 5. From the standpoint of real estate business, the strategic focus is on managing the porfolio and singular assets, whereas the operative focus typically comes down to cost management in terms of total cost of ownership. Referring back to the subsets of REM discussed in previous chapters, asset management observes the economic opportunities of the property assets for taking actions to improve the company's financial situation. The strategic management thus strives for high profits and consistency of operations in long run, which often and in practice means the ability to balance the resources sufficiently. Facility management and property management may primarily operate on the tactical and operative side of things, but also have significant impacts in reaching the strategic objectives too. For through diligent costs management on the operative level, the expenditures and total spend are controlled in consideration with the corporate strategy (Leväinen 2013, 34).

Strategy-wise, REM therefore deals with not only the upper management level, but also tactically in working with cooperation with the business units. Eventually, the impacts of REM towards the operations are measured with internal and external customers experiencing and evaluating the output quality of all the REM functions. Whereas a growing company may aim to multiply its resources for scaling its operations, an established company usually emphasizes on better productivity and utilization of the existing resources (Leväinen 2013, 101). As REM activities

typically support the latter, established companies to retain their competitiveness, improving the company's current assets value according to Leväinen (2013) means discovering added value from the existing functions, expected to bring better business results. As a part of the corporational strategic framework Lindholm, Gibler, Leväinen (2006) demonstrate the role of REM in figure 15. In addition, Lindholm, et al. (2006) have complemented the model of added values displayed in figure 14 by recommending different tactical and operational REM decisions in support of their suggested real estate strategies, displayed in figure 16.

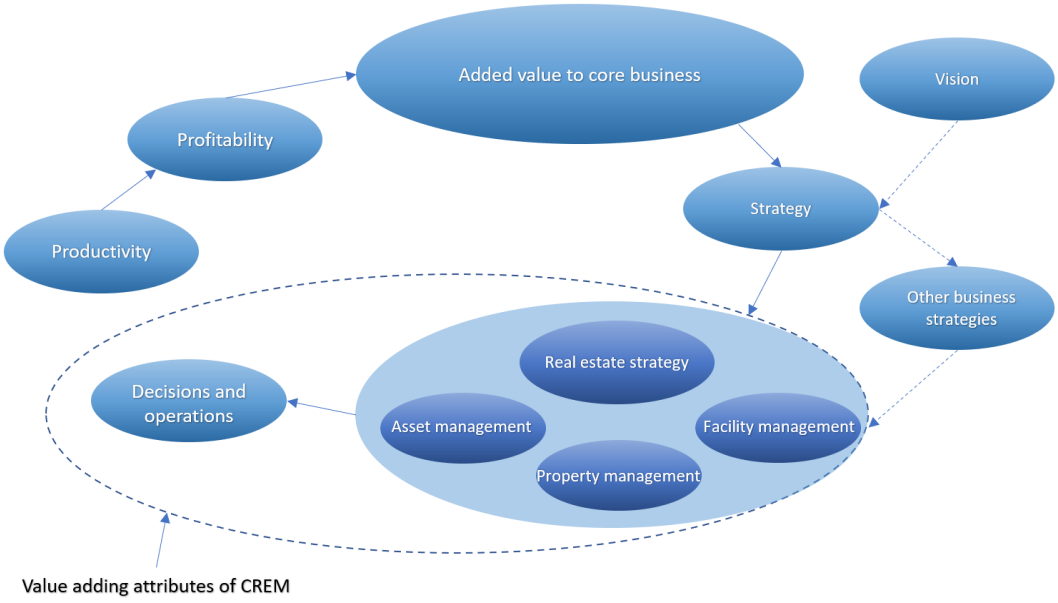

Figure 16. CREM as a part of the corporations' strategic framework by Lindholm, Gibler and Leväinen (2006)

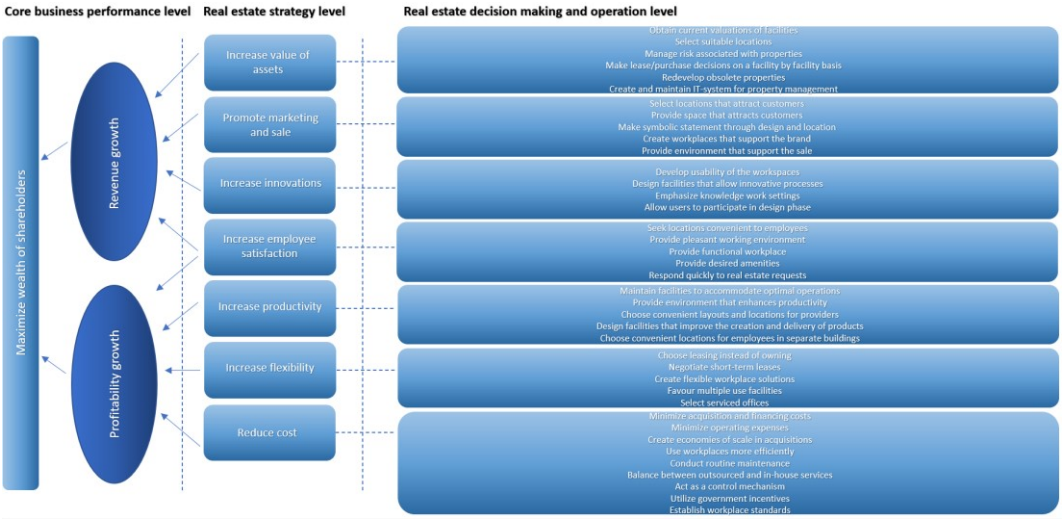

Figure 17. Possible tactical real estate decisions in support of alternative real estate strategies (Lindholm et al. 2006)

2.6.3 Value creation in REM

Leväinen (2013) notes that the direct surplus value of REM activities become reflected through different economic value adding attributes such as sales profits, diminshed costs, or positive changes in bookkeeping values. Elaborates this standpoint, Leväinen (2013) highlights the impacts of effective use of capital in figure 18, and how it connects to the wealth maximization of the shareholders in various ways. Since investment decisions considering real estates and the company's physical operating environment should alignt with the core objectives, investments should be predetermined and targeted so that in the end, the estimated paybacks outweigh the required initial capital costs (Leväinen 2013, 101-102). In summary, decision making in REM should be based on the idea of creating value to the owners and users via improved efficiency and effectiveness, directly or indirectly (Leväinen 2013, 94).

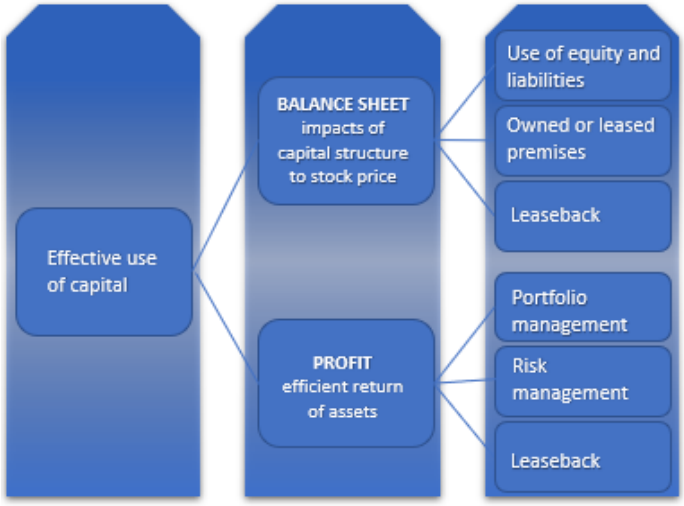

Figure 18. Effective use of capital (Leväinen 2013, 103)

Leväinen (2013) reminds that the selected real estate strategy should ideally support the company's main strategy, which steers the decisions and actions conducted in REM, both tactically and operationally. Since businesses are rarely similar to one another, a general added value model cannot be designed for real estate business, however it has been possible to identify separate elements from regarding REM added value strategies, presented earlier in figure 15. The strategic position of the company in the markets also has an effect on what kind of real estate strategy is suitable for the company, and what added value attributes should thus be looked for from the opeational landscape (Leväinen 2013, 101). Leväinen (2013) underlines that prior to property ownership, the service procurement, purchasing, leasing, construction and other property specific processes should be carefully addressed. During occupancy, administration of the mandatory processes of the fiscal year as well as monitoring everyday operations via diligent property management are the cornerstones of commercialized property ownership. Furthermore, the service level agreement (SLA) between the client and the managing agent company should initially predetermine the quality standards of different REM functions. However, since quality as a term may imply to anything that improves the desirability for the end service or product, there are many perspectives for experiencing quality also (Leväinen 2013, 75-76).

There are certain contractual quality indicators for evaluating the output performance of service providers in real estate business, says Leväinen (2013). Also, different measurement systems hepl illustrating how different stakeholders experience the quality of REM, in terms of i.e. facility services provision or technical functionality of the building. The sevice quality in the field of real estate can thereby be measured tangibly in many ways. Yet, sometimes, the image of the service provider may bias the actual quality experience, regardless of their actual level of performance and output quality. Overall the quality in REM is in fact a sum of many parts, such as effectiveness, flexibility, and customer satisfaction. As effectiveness also takes performance, impact, and efficiency ratio into accounts, flexibility as a term implies to reactivity and ability to adapt to changes (Leväinen 2013, 44-45). Leväinen (2013) describes customer satisfaction to commonly result in organizational succes too, emphasizing the customer perspective on the output quality. All in all, the selection of adequate strategies, service provision and networking as examples of REM activities, emerge value creation in the real estate business.

2.7 Digitalization and digital solutions

Kananen & Puoltaival (2019) state that for every industry, digitalization, computer technology and the internet have changed both organizational operating models and consumer behaviour radically. Also, delivering high quality services has become of essence for any company today, as customers are used to fast, multicasting, and personified service at all times. Companies must therefore pursue the service level exhibited by the leading companies, in order to stay competitive and be able to respond to the changing consumer habits and requirements. On the contrary, competing in service quality allows for smaller companies to also find an edge and challenge the current market positions (Kananen & Puoltaival 2019, 73.)

At its peak, digitalization can be a part of company's core operations and strategic decision making. It may even change the entire service design of the organization, for example, in case the core functions rely on AI solutions instead of human la-

bour (Kananen & Puoltaival 2019, 56). Kananen & Puoltaival (2019) say that implementing digitalization, digital solutions and AI requires teamwork and diverse expertise, and should begin with good perception about the organizational needs and the business environment. Also, understanding of the business processes and how human resources operate is crucial, for new technological solutions may only create value once the organizational behaviour aligns with them. Digital solutions can thus modify the value chain of a business significantly, or emerge innovativeness to say the least. When it comes to AI, companies can benefit from it despite having in-house expertise for creating an actual AI infrastructure themselves. Thereby, the main focus should be on the possibilities of AI in relation to the operational performance and creating added value, since the technical implementation of AI is rarely the stumbling block as long as the objectives are clear (Kananen & Puoltaival 2019, 56-60). Kananen & Puoltaival (2019) stress that determining the business challenges that AI can potentially help with, highly depends on the general facultative of the organization for data utilization, but also the working culture and the selected operating model. Companies that already exploit AI have thus typically digitalized parts of their operations, and are utilizing data in their operative decision making, often by making use of several technologies simultaenously. Implementing digital solutions often changes the business processes throughout the organization for the effects are usually interrelated between multiple processes. Therefore, how different tasks link to one another, how data acquired from various business functions are interpreted and utilized, and how this can benefit different departments inside the organization should be considered before applying digital solutions (Kananen & Puoltaival 2019, 55). Data can be seen as a basic unit in terms of both digitalization as well as AI solutions, and can appear in various forms, e.g. text, photos, numbers, counts, videos, etc. However, when meaning is added to data, it turns into applicable information. Conclusively, when information is then bound to a surrounding context, it allows meaningful insights to emerge, which is why data alone without the expertise to interpret and utilize it, is usually not enough to create value (Kananen & Puoltaival 2019, 71.)

2.7.1 Artificial Intelligence in business

Generalization of AI in today's business is primarily caused by the development of neural networks which have improved drastically during the first decade of the 21st century, according to Kananen & Puolitaival (2019), who continue underlining three dominant reasons for this. The first is said to be the inexpensiveness and availability of hardware and the multiplex computation capacity in modern computers. The second reason is the exploded increase in accessible data, as information systems and different IoT devices have opened up enormous data pools for companies to utilize. The third factor has to do with behavioral patterns, since the use of internet and various digital platforms combined with open-source technologies has made both learning and exchanging ideas effortless. What is more, education materials are now affordable and available for anyone to study and develop their knowledge and skills regarding AI. These factors explain the popularization of AI as a phenomenon, and have expedited its development and appliance in business (Kananen & Puolitaival 2019, 35). Kananen & Puoltaival (2019) carry on discussing that the most recent breakthroughs made in the field of AI research highlight the interaction between human and machine, with the results coming down to AI replicating human intelligence or being able to phsycially navigate in the real world with no human interference. Albeit AI technology is still relatively undeveloped, there are many solutions that can already be applied for business purposes, and the technology is developing exponentially (Kananen & Puoltaival 2019, 210). As emphasized by Herlin (2021) also in his speech during the first publication event of the AI 4.0 programme, AI expertise implies to not just technological knowledge, but a much larger entity that calls for knowledge also in business and jurisdiction for unveiling its potential to create value. Kananen & Puoltaival (2019) describe AI as a tool for conducting systematic tasks, and despite the acknowledged limitations, AI has already been proven superior to a human in performing certain tasks.

The way AI is able to conduct tasks today could be compared to instinctive human behavior and stimulation processing. Yet, and to state the obvious, it is still merely a fraction of human intelligence. Instead, AI constructs from algorithms, trained to react in a desirable way to an external stimulus. Regardless of many unrealistic expectations regarding the performance of AI and its capability to independent decision making, the fact is that thus far it is not possible to solve multi-dimensional problems with AI for it cannot understand complex causalities, and is uncapable of defining the actual problem independently. However, it can be faster, more accurate, unlimited, objective, and unbiased in terms of time in executing specific tasks (Kananen & Puolitaival 2019, 37). Generally, there are two types of AI: weak and strong. The currently available AI solutions most utilize weak AI although they might seem technologically advanced, such as autonomous vehicles. Weak AI is capable of solving problems in a simple manner and is being applied in areas like medical diagnosing, juristic counseling, and securities trading. Strong AI on the other hand is more advanced by being able to absorb and apply the available background information, which makes it universal and more comparable to the level of human thinking. The development of strong AI is however very much still in progress, despite the wild predictions regarding its limitless potential in the near future (Kananen & Puolitaival 2019, 38). As the potential of AI currently excels in situations that call for organizing, repetition, and handling massive amounts of data simultaneously, yet the strenghts and abilities of humans are irreplaceable in tasks that call for empathy, creativity and understanding of complicated entities. The performance of a human and a machine shouldn't thus be compared with one another directly, considering the fact that each comparison would after all be a simplification of a certain event. Nonetheless, many businesses today already utilize AI to replicate human behavior, e.g., by having a virtual customer service assistant. Whereas in manufacturing for instance, the need for humans to interfere with the production functions of the machinery is increasingly diminishing but yet, humans monitoring the process flows and minimizing any errors has become emphasized even more. All in all, the need for human input in the process usually

depends on how much interaction between the machine and a human is required for the business process (Kananen & Puolitaival 2019, 39).

2.7.2 Implementing Artificial Intelligence

Kananen & Puoltaival (2019) explain that AI involves different technologies and techniques, hence why the reckoning of AI has a varying emphasis amongst different schools of thought. First of all there are different mechanics for AI to function, and the most suitable methods for specific purposes should be considered prior to implementing it. This being said, the main subsets under the concept of AI are said to be machine learning, deep learning, and reinforcement learning (Kananen & Puoltaival 2019, 43). When it comes to training AI, there are generally three ways of doing it: supervised learning, unsupervised learning, and reinforcement learning, exemplified in figure 19. Unsupervised learning typically utilizes the ways of machine learning, whereas supervised learning uses both neural networks and machine learning mechanisms. It is also possible to use semi-supervised learning, to apply multiple methods and adding different algorithms concurrently, while training the machine for task execution (Kananen & Puoltaival 2019, 43). In order to function properly, both supervised and unsupervised learning require a vast amount of data entered into the machine to begin with, meanwhile reinforcement learning is based on methods that call for less initial data due to the training of AI in this case, to learn from trial and error throughout the process. Although less data may be required in reinforcement learning compared to the other methods, the circumstances for AI to operate in this particular case must be modelled diligently (Kananen & Puoltaival 2019, 45-46).

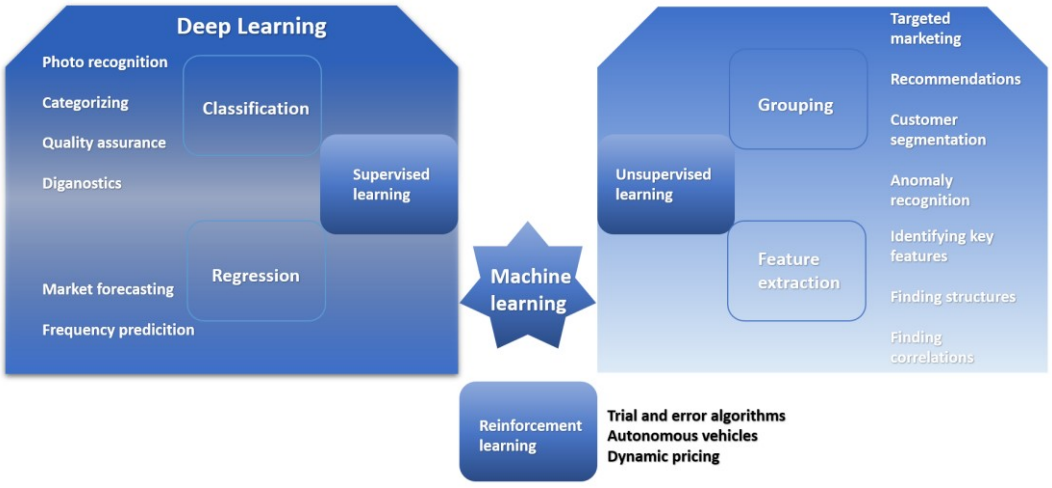

Figure 19. Three ways of training AI and typical fields of application (Kananen & Puolitaival 2019, 44)

Typically in business, supervised learning can be considered the most favoured form of machine learning. In supervised learning the training data is first labelled with all the relevant attributions, after which the machine is taught to recognize the alternatives that represent a correct answer or desired outcome. The training phase is central, and once conducted succesfully, additional data without specific labelling can be introduced to the machine and the AI is capable of identifying the best alternatives based on the previously learned pattern. Supervised learning is used in for example photo recognition, diagnosis, quality control, temperature forecasting, recommendations and pricing. Unlike in supervised learning, no correct answers are preset for the AI to recognize and replicate when it comes to unsupervised learning. In unsupervised learning, AI is trained to seek patterns and regularities from the given data set. The objective is for the AI to organize the data independently, without human interference. The main benefit of unsupervised learning is hence that all the specialties amongst the raw data do not require separate labelling, for the algorithm is set to identify these anomalies and changes in patterns. The idea is to instead determine the values for variables as well as structures for the objects, in accordance with the conformity and differentiation that occurs in the sample (Kananen & Puoltaival 2019, 50-51). In terms of classification, unsupervised learning is often applied with grouping and association algorithms,

where variables are associated with one another for the AI to identify the common explaining factors, a correlation. Unsupervised learning is also typical method when anomalies from data are being sought. In business, this can imply to e.g. delinquencies, frauds, booking errors, or other deviation from normality. Unsupervised learning models are thus useful in discovering hidden relations, specialities in events, or other actions that can be considered generative in nature. In manufacturing, most AI models are based on supervised or unsupervised learning, but it is also possible to build hybrid models in which both ways are utilized concurrently for problem solving or tasks execution (Kananen & Puoltaival 2019, 54).

2.8 Information and data

Especially in REM the information flows can be substantial, says Leväinen (2013). Luckily, systems like land data banks can preserve different technical, physical, juridical, and financial data, from which diversified information can be derived from and further applied in practise. The internal information in business is often quantitative in nature and is used primarily for tactical decision making, especially in the real estate business. External information, on the other hand, is typically more qualitative in character, and can be better exploited strategically. Regardless of the type, information and data are useful in both strategic, operative, and tactical planning, industry forecasting as well as decision making in general. Furthermore, refining the data into applicable information allows for companies to diagnose the business and the markets more profoundly, which according to Leväinen (2013) should be a persistent process in today's REM (Leväinen 2013, 33).

Kananen & Puoltaival (2019) agree that most companies today capture a lot of data from their operations and the most relevant data for the business, which can be about customers, sales, or online activity for instance, should be collected. The data may appear in many forms, i.e. text and images, vocal or written feedback, user experiences and instructions, visit frequencies of customers, maintenance information and consumption expenditures, or even conditional data captured by smart sensors, for that matter. Yet, the data must be assembled and organized

into coherent form, in a logical database (Kananen & Puoltaival 2019, 45). Kananen & Puoltaival (2019) emphasize that the data must also be high in quality for it to produce added value, simply because low quality data cannot be refined into useful information. Here, high quality implicates that the data must be unambiguous and concordant. For example, customer data may be difficult to utilize due to its multilateral or inadequate labelling. Thus, attention towards data quality should be paid in the use of all the operating systems in the organization, concurrently. Therefore, what kind of data is relevant for the business, should be considered. Moreover, in terms of the systems deployment, operating systems that are compatible with data interpretation and analyzation, should be selected. Data visualization and analytics tools are useful for facilitating data interpretation, which is why they are often used for example in administrative or customer reporting. Business Intelligence (BI) refers to data visualization and management tools that provide useful information from internal data (Kananen & Puoltaival 2019, 72). Examining the external data often exposes the KPI's for the business as well as the unveil the prevailing factors for competitiveness. Moreover, visualizing the business development with the help of BI platforms that combine different types of data enables easier monitoring and business forecasting. Data utilization can thus bring forth notable competitive edge for companies via assistance with i.e. to improve the customer experience, enhance processes, cutting of possibly overlapping operations as well as when developing new business models. The better the customer preferences are, understood the better the service output may become. By observing the internal data available and reflecting it with external data sources, the company can thus aquire a greater understanding of the customer needs, interests, values, and consumer habits. Hence, the more customers are served with targeted solutions based on this information, through accurate channels at the right time, the better the customer experience should be. On top of this, if the customer needs could somehow be anticipated and proactively reacted to, thus preventing an issue to emerge in the first place, the more likely the customer engages with the service (Kananen & Puoltaival 2019, 73-74).

2.8.1 Data utilization

According to Kananen & Puoltaival (2019) usually the most convenient way of proceeding with data utilization is to review the current processes and operating models and estimate what kind of data is produced by the primary and support activities of the company. Familiarizing the employees with data interpretation and data-driven decision making estabhlishes a data-oriented business approach. This is important especially before the deployment of any BI tools. In addition, most significant benefits from AI deployment also tend to emerge when data is used multilaterally on multiple different levels, which validates the reliability of the data-driven actions made by AI. Data utilization in any case, with the help of AI or not, requires certain level of cognitive capability from the entire organization to analyse, interpret, question, and act based on the given data. Enhancing the existing processes is a great place to start off with data utilization, and combining different data sources helps to draw a clear picture of the prevailing operational environment of the organization. Data thus brings forth facts to support the decision making, as long as the data reliability is confirmed. While it clarifies the company's current position, it may also spark innovation and new ideas for the future. It might even shed light to completely new business opportunities, or result in shifting the current, existing operating models (Kananen & Puoltaival 2019, 75). Although a lot of data accumulates from operational functions of organizations, there are certain pitfalls considered typical in data utilization that are listed by Kananen & Puoltaival (2019), as follows:

- data aggregation – data is not collected or saved
- data architecture – data is no stored
- data management – data cannot be exploited
- data analytics and automation – data is not analysed
- data visualization – findings are not communicated forward
- BI – data isn't being used for management and doesn't drive employee behaviour

In summary, data usage in organizations should typically start with the company recognizing the areas of the business where data is collected and in which data utilization can create value. The deployment of information and data thereby requires adequate data collection methods and a technological preparedness, ergo, data architecture, into which also the possible AI algorithms can be technically inserted. Understanding the current level of data use within the organization is vital for the technical deployment to be conducted as efficiently as possible. Hence, courtesy of Kananen & Puoltaival (2019), the organization should go through the following stages shown in figure 20, for it to become data-driven:

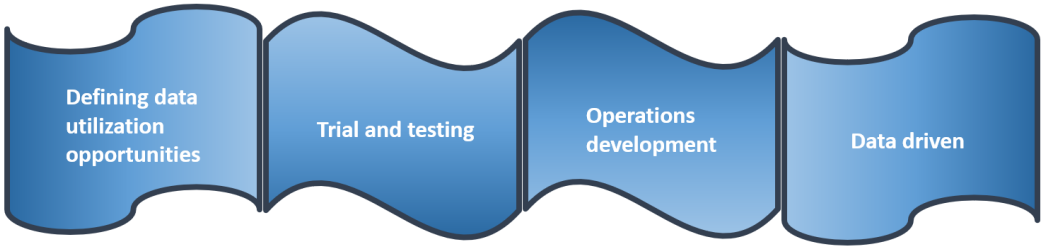

Figure 20. Stages of data utilization (Kananen & Puoltaival 2019, 76)

Usually organizational data utilization is limited and stuck in observing the events from the past. Moreover, data is hardly used as a part of strategy implementation. A company is only data driven, when it uses data in its core operations, makes decisions based on data, and innovates new services and products using data analytics. Data-driven companies use visualized data regularly, capitalize predictive analytics to estimate likely scenarios and even automatize some of the decision-making processes with AI (Kananen & Puoltaival 2019, 77). If the organization is not used to making decisions based on data, it can be difficult to also exploit the effectiveness of AI solutions in their full potential. From employee perspetive, it may be difficult to trust the ability and “judgement” of AI despite the advanced technologies behind them. Often a good way is to start with traditional reporting

and visualization, and deliberate on why and what has been happening, thus analyzing past performance. This already brings about prominent added value for developing the business operations in terms of moving forward. Moving on into utilizing data driven forecasts can then push the business towards the right direction. Advanced data usage for modelling future events as well as automated and data-based AI decisions however require highly data-oriented behaviour from the organization alongside with appropriate technical arrangements. This becomes emphasized especially, if the organization wishes to make AI solutions applicable and integrated into their day-to-day operations (Kananen & Puoltaival 2019, 77).

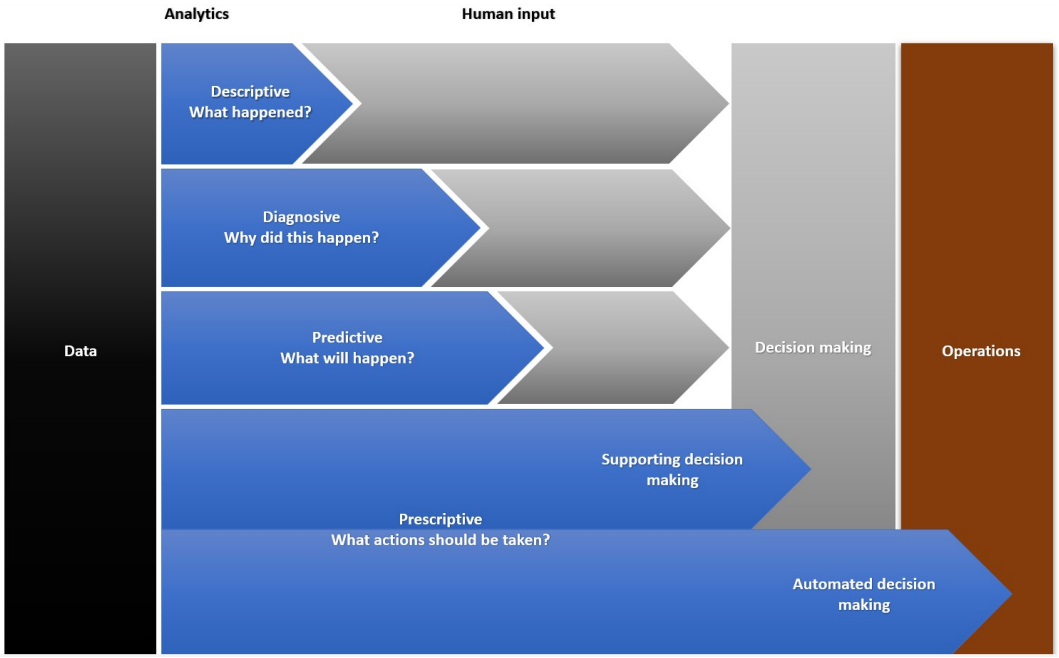

Figure 21. Identifying the level of data utilization, capability, understanding and expertise in the organization (Kananen & Puoltaival 2019, 78)

2.8.2 Data economy

Farboodi & Veldkamp (2021) address that lately, production has been increasingly revolving around information and data especially during the information age, adding that many succesful companies today are in fact valued on the basis of the data they accumulate and posses. In data economy, according to Farboodi & Veldkamp (2021), transactions of different commodities generate information which can be

either stored or traded, but either way information has become a form capital of its own that even depreciates over time. From this standpoint, data economy doesn't differ much from traditional production and innovation economies, Farboodi & Veldkamp (2021) claim.

Demchenko, Los & de Laat (2018) discuss that the development of data economy has a number of challenges, one of which is how to embrace the actionability from data – how businesses may derive reasonable conclusions to their business or operations in terms of i.e. improving customer experience or service quality. In industrial processes, actionable data must be extracted and included in the organization's process control systems for the capitalizing on its benefits. In the value chains of manufacturing, the spectrum of data utilization has broaden by means of AI, including i.e. data utilization in process monitoring, logistics, markets and user experiences (Demchenko, Los & de Laat 2018). According to Scelta et al. (2019) several functions such as data capturing, storing, transporting, analyzing and reporting of data outputs can create value for organizations, as displayed in figure 22.

Figure 22. The data market as a value chain: from data sources to economic impact (Scelta et al. 2019, 2)

Primarily, organizations interplay with data to achieve costs reduction as well as to maximize profits. However, in order to intergrate data in the entire value chain, businesses should capture, store, organize and analyse data for extracting useful insights of it, and the data may even be shared with third party sellers to create whole new markets around information and data (Scelta et al. 2019). Farboodi & Vedkamp (2021) add that data economy has bloomed alongside with recent breakthroughs in AI and especially machine learning, as it utilizes prediction algorithms

that requires valuable collection of naturally generated data from e.g. transactions. Data about the end usesr, such as buyer characteristics, can be textually analyzed from the user reviews or other evidence regarding their economic activity. This information can be then used to optimize operations, i.e., in terms of better forecasting the demand, costs, earnings, customer needs, target groups, future advertising, or the upcoming investment decisions (Farboodi & Vedkamp 2021, 2).

2.8.3 Digital transition and value chain

According to Kananen & Puoltaival (2019), a central question to be asked is whether digitalization can bring forth added value to the employees and the end customer, or do the benefits stay unexploited due to companies sticking to rigid structures and old, prevailing operating models. Also, it is important to consider if improving effectiveness in certain operations in reality enhances the whole chain of operations, or may instead result in congestion in the following stages of the process. As discussed, digitalization can be a valuable tool, and companies today should truly consider utilizing digitalization, digital solutions and AI in their business. Yet, the technical infrastructure must ensure capitalizing from this, and the information and data must be secured for it to not end up benefiting the competitors instead (Kananen & Puoltaival 2019, 206). Kananen & Puoltaival (2019) argue that AI utilization can provedly add value to the internal processes of the organization and also claim that it is allows for companies to reduce the operating costs significantly for example through improved lead times within the business processes. Moreover, AI utilization may replace, or even obviate some of the old operations and activities in the future entirely (Kananen & Puoltaival 2019, 200-201). Kananen & Puoltaival (2019) envision the added value potential of modern technologies, by stating the following:

> “Technology assists humans to do their work more efficiently and effectively, and can do things that humans alone are not capable of” (Kananen & Puoltaival 2019, 228)

In reference to Porter's theories as well as the BSC model presented in earlier chapters, Kananen & Puoltaival (2019) also agree that companies should focus on their value proposition, and what differentiates the company from its competitors. Therefore, the biggest value adding attributes should be identified within the business, and the development should be aimed at operations with potential of creating competitive edge. In terms of AI, it creates most value for companies when applied into operations that support the core strategy of the company. By identifying separate stages in the operational- and supply chains, and selecting an approach that supports the core business, AI can provide a tool for optimizing what Porter modelled as the value chain (Kananen & Puoltaival 2019, 224-225).

Something that Porter (1985) too has emphasized, Kananen & Puoltaival (2019) address the consideration of concurrent value chains that influence the business, so that developing singular operations may create added value to the entire stakeholder network as well as the end customer. When planning to implement AI into one operation, the multiplier effect to other operations through the causal effects, and towards the end customer's experience should thus be considered. Companies should, of course, primarily follow their strategic line also regarding AI implementation, deliberating on how and what the investments are in intended for. Strategically, AI implementation often has significant impacts, hence why it should align with the purpose, objectives, and values of the company. Organizations today are however increasingly intrested in investing into AI and tend to have high expectations of the achievable benefits from it. For example, AI may establish automatization of processes, optimization of planning and production, targeted marketing, and dynamic pricing. The reality is, however, that AI deployment to this day very much revolves around the assisting functions of the company, rather than its core operations (Kananen & Puoltaival 2019, 225). Kananen & Puoltaival (2019) describe that ideally, in AI based operating models, resources are reallocated effectively into actual value adding processes and activities. Typical features of successful companies in this regard, are considered as the ability for observing the long-term, and making genuine strategic choices based on information and facts.

On top of this, companies today should develop an openly questioning culture, where organizational learning and adopting latest of technological trends are considered as reviving, sustaining factors for the business (Kananen & Puoltaival 2019, 234).

2.9 Sustainable development

At publication event of the industry 4.0 second interim report, in his speech the chairman of the programme Jussi Herlin (2021) envisioned the triumphs of Finnish manufacturing to be sustainability, resilience and adaptability, becoming a technological trendsetter, and developing business solutions that would increase the national carbon handprint. Herlin (2021) carried on saying, that via integrating digitalization into Finnish businesses, Finland's national carbon emissions could also be decreased by 15% as a result. Considering sustainability in today's business, Issa, Chang & Issa (2010) emphasize the importance of social responsibility in corporate decision making and business operations, instead of solely focusing on the bottom line. To ensure companies to actually adhere sustainable development within their business operations, Issa et al. (2010) note that companies must discuss ways of creating value to both employees, users, and other stakeholders, thereby encouraging all parties to become "environmentally and socially responsible corporate citizens". Falkenbach, Lindholm & Schleich (2010) say that the legislation as well as other incentives regarding the so called green transition and sustainability, are pushing companies towards new operating methods and steer organizational decision-making especially in the real estate business: as sustainability, i.e., changes the taxation, calls for higher standards on material densities, and puts pressure on refurbishing the building stock, it also has significant impacts on financing- and insurance policies. Huttunen (2021) agrees that sustainable development can be viewed from not only economic but also from sosio-cultural standpoints. In terms of the external landscape, for instance the Paris climate agreement aims to limit global warming to preferably 1,5 degrees Celsius, in com-

parison with the pre-industrial levels. In addition, the United Nations has announced 17 separate sustainable development targets to be pursued on a global scale. Thereby, and so it happens, that the built environment can contribute to accomplishing the majority of these objectives (Huttunen 2021, 12).

2.9.1 Circular economy in built environment

Huttunen (2021) emphasizes the importance of circular economy in built environment, by explaining ways of implementing it in each and every process during the building life span. In figure 23, Huttunen (2021) exemplifies in detail how conducting circular economy in the built environment can bring about added value.

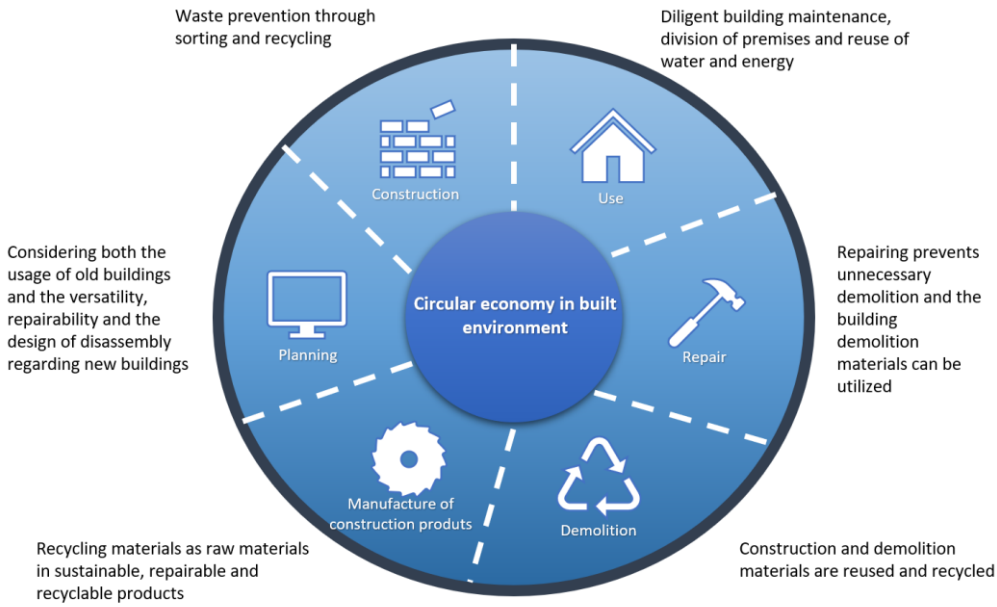

Figure 23. Ways to conduct circular economy during building life cycle (Huttunen 2021, 15)

Huttunen (2021) also addresses the importance of information and data when it comes to the building life cycle and real estate management. For instance, to store and document data from the materials used, ensure data accessibility in every step

of the way, as well as maintain the information about relevant repairs and development projects throughout the possession is highly important. Thus, embracing sustainable development and circular economy especially in real estate business calls for moderate mindset, which means finding solutions to decrease the overall resource consumption. In terms of built environment, this implies to what is necessary to be built, how the premises are optimized for their intended purposes and needs, and determining the level of satisfactory working conditions and measuring it. This leads back to resource effectiveness, a key concept regarding circular economy, which however isn't enough alone in terms of counterbalancing the prevailing overconsumption habits. Ideally in circular economy, no waste at all should emerge. For this reason, it is relevant to understand the environmental and climate impacts of built environment (Huttunen 2021, 10-14).

According to Jääskeläinen (2021), construction and the usage of the building stock are the biggest individual load factors for the environment. It has been calculated that heating of the building stock causes 17% of the greenhouse emissions in Finland, and respectively, around 76% of the annual carbon footprint of the built environment comes from heating and cooling. Furthermore, global warming has in fact resulted into cooling to now consume more energy than heating overall. On top of that, the share of construction materials regarding the carbon footprint of Finnish building stock is around 15%, meanwhile the rest comes from logicstics, demolishing and waste (Jääskeläinen 2021, 21). Huttunen (2021) argues that there is estimated potential for recuding emissions from building materials by 56% in the EU region, which would be a significant step in accomplishing the regional sustainability targets. Therefore, referring back to figure 23, there are many immediate actions as well as long term choices to be considered and implemented in especially REM activities for mitigating the environmental impacts and diminishing the carbon footprint of commercial properties.

2.9.2 Sustainability in REM

Despite the many responsibilities that relate to the expedition of sustainable development and circular economy, Falkenbach et al. (2010) see business potential for real estate owners in the compliance to local and global sustainability targets. Huttunen (2021) states that the built environment contributes massively to establishing an ecologically sustainable society, for buildings and construction produce approximately one third of all climate emissions, and consume as much as half of the natural resources globally. Futhermore, buildings and construction cover about a half of the consumed materials and energy, and a third of all the water use, according to the European Commission. Additionally, construction and demolishing also produce over a third of the waste in the European Union in total (Huttunen 2021, 11).

Overall, the biggest share of climate emissions caused by buildings are formed during the building usage phase although emissions from usage might reduce over time as fossil fuels become a less favoured method regarding future energy production. Huttunen (2021) adds that the greenhouse emissions from energy consumption, new construction, and repairs cause about 35% of the total emissions in Finland. Thus, climate impacts heavily connect to the construction materials that are used, which is why reaching complete carbon neutrality is practically impossible when it comes to real estates, regardless of the climate impacts being compensated in other ways. Therefore, reducing emissions in the material production and during the building usage today is crucial for the environment, but also in terms of extending the building lifespan. Today's contsruction should emphasize on selecting building parts and materials that are considered sustainable, and can be reused or recycled (Huttunen 2021, 11-12). Huttunen (2021) notifies that the real estate and construction industry is facing challenges as the availability of materials becomes more difficult, and due to the changes in the regulatory landscape. Moreover, the pressure from consumers as well as the society to take environmental impacts into consideration, constantly intensifies. Thereby, many of

today's business models may turn out as defunct later as a result, which is why now, in the early stages of the green transition, companies that are first to adopt new paradigms will achieve competitive edge (Huttunen 2021, 11).

Apart from the physical features of the building, what exerts influence on real estate business and its operators today, are the regulations and legislation of energy efficiency, waste management, and emissions reduction (Falkenbach et al. 2010). Thus, corporate responsibility and different environmental certifications have grown in popularity for validating the real estate owner's compliance with sustainable development, according to Falkenbach et al. (2010). In reference to their study review including multiple surveys about sustainability in the real estate business, Falkenbach et al. (2010) note that the rental levels for buildings that are considered as green and sustainable, were higher than in conventional buildings. Conclusively, the willingness of tenants to pay premiums for occupancy in sustainable premises was explained by the increased occupant productivity, potential image benefits towards customers and employees, and lower operating costs.

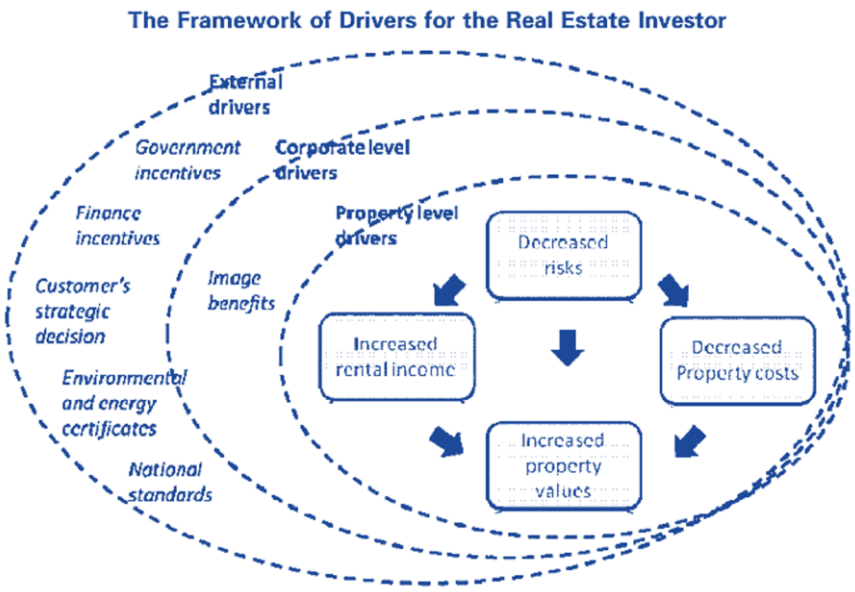

Figure 24. The Framework of Drivers for the Real Estate Investor (Falkenbach, Lindholm & Sleich 2010, 206)

As a conclusion of their study review, Falkenbach et al. (2010) address four separate property-level drivers regarding sustainability for real estate investors, in figure 24. Furthermore, this framework of drivers also addresses the corporate level driver of sustainability regarding the company image, as well as several external drivers such as the regulatory landscape, as a steering factor for investors' behavior in today's real estate business (Falkenbach et al. 2010).

2.9.3 Circular economy in REM

Huttunen (2021) says that the expedition of circular economy comes down to the everyday choices that eventually facilitate the impact on a larger scale. Thus, the paradigm must be acculturated into REM by adding regulative and economic guidance, special expertise, and embrace the habit of sharing of the best practises and knowledge. Altogether this allows safe and sufficient implementation of circular ecnomoy in construction and maintenance especially. Huttunen (2021) too addresses that on a global scale, neglect of mainenance regarding the built environment costs several billions annually. Considering construction, the benefits of circular economy will not carry into effect unless the entire chain of operations complies with the same principles (Huttunen 2021, 18-19).

Häkkinen (2021) says cities and areas as the building blocks for expediting circular economy should be addressed in terms of resource efficiency: how to develop them by utilizing primarily the existing structures and material flows. The areal concerns often have to do with the durability of individual properties in relation to zoning. In this regard, a lot comes down to how appealing the location of a building is in the eyes of different stakeholders now, and in the future. As zoning and detailed plan provisions may oblige to reshape the existing building stock, it also challenges the intended use of the existing properties as well as their flexibility and transferability (Häkkinen 2021, 90). Individual operators in the real estate sector are important influencers in regard of circular economy, such as property owners, architect firms, consults, product manufacturers, construction and demolition companies, etc. Huttunen (2021) also argues that once integrated into the

strategies of organizations, principles of circular economy are more likely to find their way into practice as well. Even if the contribution of singular organizations regarding circular economy may seem unimportant, yet when the best practices are applied even by some into the stakeholder network, the multiplier effect towards the entire chain of operations can be significant. Also, the society has a responsibility of turning circular economy into appealing business opportunity for companies to adopt (Huttunen 2021, 18). Instead of circular economy being viewed as a mandatory reaction against threats, Huttunen (2021) believes in turning it into an incentive for new business methods for strengthening the corporate image and general accountability of companies. In terms of resource effectiveness, sharing economy in service deliveries, rethinking the material cycles, space efficiency and sustainable working methods should be encouraged to by means of the economic life. In this regard, REM representatives are at the focal point in terms of conducting circular economy and minimizing the environmental impacts of the built environment in their daily work. Economically, circular economy helps satisfying the customer value proposition in real estate business, once the stakeholders in the value chain share this mindset (Huttunen 2021, 18-19).

2.9.4 Information and data in built environment

Häkkinen (2021) reminds that with adequate data, for instance the reuse of materials can be rationalized, and certain risk factors can be predestined more easily. Modern digital tools also make it easy to control the product information such as the material quantities and types. Perhaps the biggest challenge regarding information and data emerges from the longevity of the building life cycle, as properties include high number of different products with varying life spans in relation to one another (Häkkinen 2021, 90).

Häkkinen (2021) discusses that while the life cycle of a building itself is generally very long per se, it is of essence to recognize the most critical data and information regarding the building functionality, and how to store, maintain, and share all the

information from the conducted repairs and maintenance throughout the possession period. As discussed, organizations continuously seek to improve productivity and better quality from REM activities, and the more information there is about any upcoming renovations as well as past maintenance and repairs, the easier it becomes for also the constructors to proactively plan the renovation projects take the resource efficiency of materials and operating methods into consideration. Simply put, the process quality becomes improved when the project planning is based on reliable and valid initial data. Moreover, via embracing a more sustainable approach in the execution, the need for future repairs and maintenance , the repair debt may in fact become reduced in the long run (Häkkinen 2021, 90-91).

2.9.5 Sustainability and value chain

According to Falkenbach et al. (2010), sustainable buildings in relation to conventional buildings assumedly have a longer lifespan and a higher probability of occupancy. However, construction of green buildings has been typically considered expensive, hence why the counterweight for the property owners should realize in exchange to lower operational expenses during the occupancy. Considering this tradeoff, the traditional lease agreements may however become a question in this regard, according to Falkenbach et al. (2010). A change regarding the traditional contractual arrangements between landlords and tenants is called for by the scholars, if the owners wish to also benefit financially from building sustainability. This relates to the traditional lease agreements where rents are often fixed for the agreed period of time and the content of the agreements remain unchanged, despite the modern sustainability policies and regulations that are constantly arising. Thus, it may be difficult to engage the occupants to participate in sustainable practises. Yet, buildings with sustainable design might become easier for the property owner to let or sell, which is an incentive for the owner to embrace sustainability. Alongside with the discussed impacts of sustainability on rental incomes, rate of occupancy, and reduced operational costs and risks as, the properties may also increase in value (Falkenbach et al. 2010).

Circular economy is not just influencing real estate business by means of trends and regulations, but instead is a new economic framework, which attaches it into the REM value chain and property ownership (Häkkinen 2021, 90). Häkkinen (2021) discusses that in the real estate business, circular economy has by far referred mainly to recycling, construction and maintenance. However, the awareness of resource efficiency and overconsuming behavior among property owners and users has improved as of late. Due to this, as well as the growing interest in corporate accountability, for example the utilization of demolition waste is now viewed differently, perhaps even seen as a value adding attribute. Circular economy principles regarding the built environment consider mainly the usage of buildings, structures and infrastructures, but also sufficient data utilization and management becomes more and more emphasized. Since properties retain their value well, even appreciating in value over time, property ownership can be fundamentally seen as a long-term activity. Moreover, property ownership is always about finding a reasonable balance between short- and long-term benefits. Therefore, if sustainability and circular economy can make buildings to withstand time and enable a more diversified intended use, this would make sustainability a strategic incentive of its own for property owners (Häkkinen 2021, 90). A paradigm of adopting the objectives of circular economy into the entire REM value chain is presented in figure 25 courtesy of Häkkinen (2021).

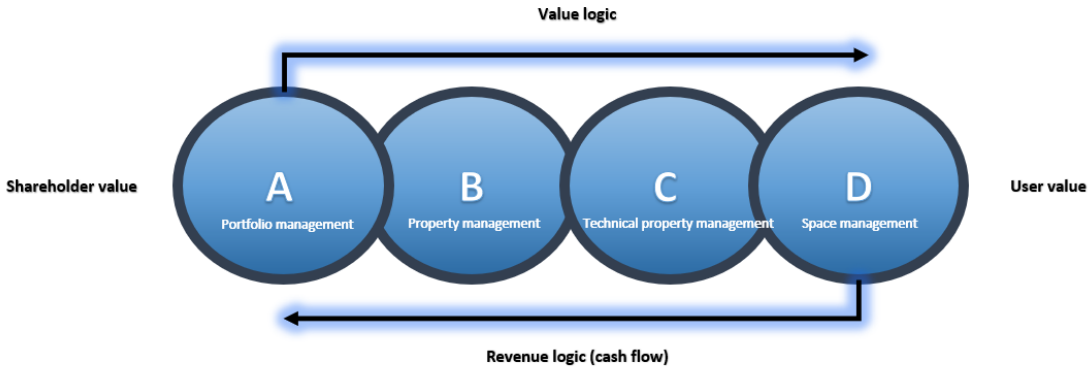

Figure 25. The objectives of circular economy must be taken into the entire REM value chain (Häkkinen 2021, 95)

According to Häkkinen (2021), property owners want the property assets to be good for leasing and selling still in 10-20 years, for they are considered a non-liquid type of investment and the disposal of an asset can be quite laborious. Real estates can thus be seen as low-risk investments in terms of capital gain, and oftentimes, there is hardly a need for proactively monitoring the appreciation of the assets. Yet, less and less corporations prefer owning their business premises, while the direction in property investing has also shifted towards centralization of ownership. As a result, the accountability of expediting sustainability might be considered as someone elses concern, and thus be avoided by companies (Häkkinen 2021, 92).

In reference to RAKLI ry's strategy from 2020, Häkkinen (2021) underlines that the development of real estate and constrtuction industry will not only involve the use of digital tools, but responsibility and accountability will become highlighted as the dwindling of virginal raw materials and the consideration of the planet will result in tangible cost disadvantages for companies, through the changes in taxation for instance. At the very least, and because of such economic incentives, companies should begin the transition towards more sustainably oriented business practices. As discussed, different requisites about environmental compliance to the private sector often have to do with their physical environments, of which the property owners also seem aware of. Hence, the popularization in pursuing the respected building ratings such as BREEAM and LEED certificiations amongst the property owners, is a reflection of this acknowledgement (Häkkinen 2021, 92). Häkkinen (2021) concludes by emphasizing that the regulatory landscape should support the paradigm of circular economy by design, so that gaining competitive edge from adopting sustainability may actualize for organizations.

2.10 Summary of the theoretical framework

The theoretical framework of the study is presented in figure 26. The research design frames the key areas and concepts of the literature review for clarifying the

research structure. Furthermore, the research design addresses all the relevant areas regarding the execution of the empirical part of the study.

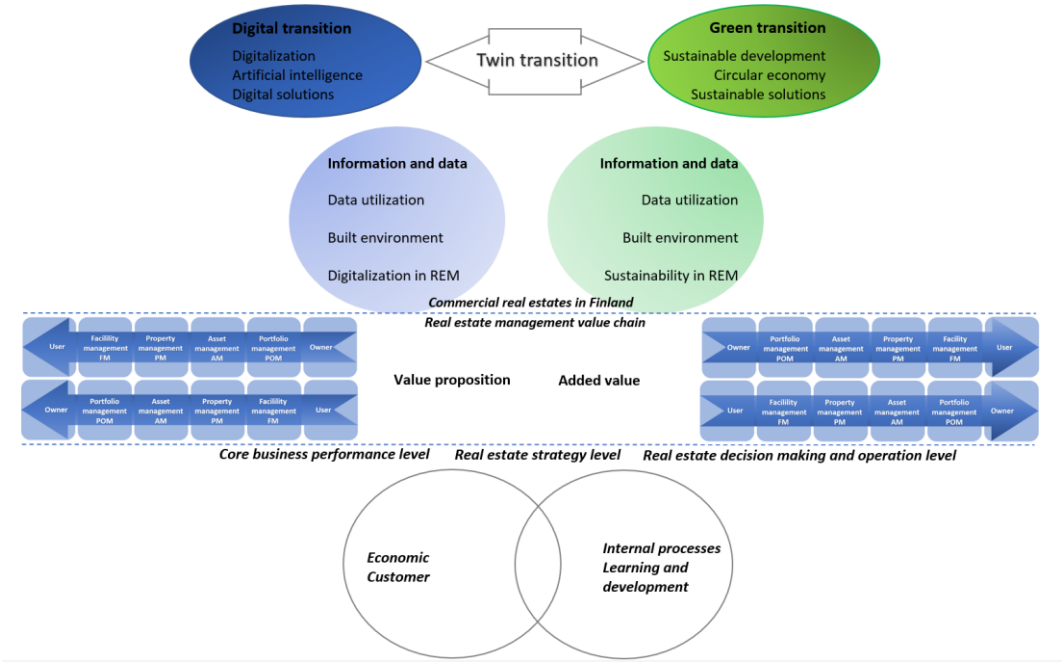

Figure 26. Research design

3 METHODOLOGY

The following chapter explains the research philosophy and paradigm, research approach as well as the selected data collection and analyzing methods of the study. Furthermore, how the empirical part of the study is constructed, and definition of the utilized data coding and analysis methods are described. At the end of the chapter, an overview to rationalize the suitability of the methodologies in terms of reaching the study objectives is presented.

3.1 Research philosophy

Scientific research is about continuously testing the eligibility of prevailing theories and models, and whether they still explain different phenomena that might have undergone certain changes due to societal development (Kananen 2014, 16). Figure 27, by Saunders, Lewis & Thornhill (2019), visualizes the process of adopting a research philosophy and approach, and the pathway to theory development.

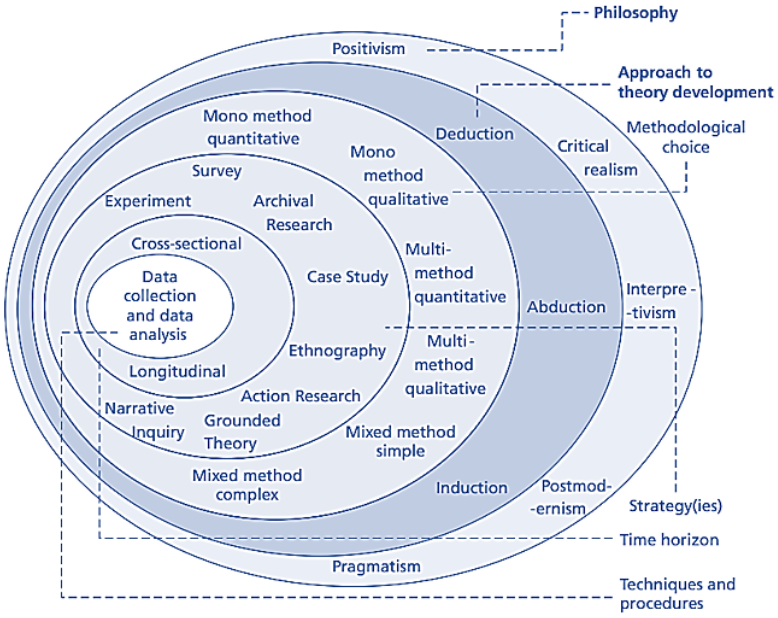

Figure 27. The Research Onion (Saunders, Lewis & Thornhill 2019)

According to Saunders et al (2019), regardless of the selected research philosophy, there are generally three assumptions of the essence involved: ontology, epistemology, and axiology. This being said, assumptions i.e., what constitutes acceptable, valid and legitimate knowledge and how they are communicated, is the guiding principle in epistemology. Especially in business and management research, different epistemologies are therefore often adopted by researchers, since the multidisciplinary context of business and management considers both numerical, textual and visual data, opinions and facts, as well as narratives and stories which may all be considered as legitimate types of knowledge. Thereby it often comes down to the researcher's own, specific epistemological assumptions, that govern the idea of legitimate knowledge in relation to the research (Saunders et al. 2019).

Pragmatism and interpretivism both characterize as major research philosophies. In short, emphasis in pragmatist ontology, epistemology and axiology is on "improving practice", which is why it's typical for pragmatism to follow the research questions and research problem via utilization of range of methods, and with its main focus on the practical solutions and outcomes of the study. Pragmatists in this fashion often adopt a broad range of research strategies, driven by the specific nature of their research problem. In pragmatist ontology, reality is viewed as complex, rich and external, describing reality as the practical consequence of ideas. It is thereupon considered as "flux of processes, experiences and practises", something that forces the researcher to also become a reflexive character (Saunders et al. 2019). Saunders et al. (2019) continue that epistemologically, pragmatism refers to the practical meaning of knowledge in specific contexts, where "true" theories and knowledge are the key for enabling succesful action, making it a research philosophy focalizing on problems, practises and relevance. The scope of pragmatism as a selected research philosophy thereby aims for "informed future practise". Meanwhile, axiology implies to the role of values which in pragmatism relate to a value driven research that can be initiated and sustained by researcher's personal doubts and beliefs. Interpretivism, according to Saunders et al. (2019), focuses on studying meanings to create new, richer understandings of organisational

realities. Saunders et al. (2019) also address that the interpretive research paradigm is therefore typical in especially business and management research too. In short, interpretivism aims at a wider understanding of a phenomenological complexity through examination of human experiences – by investigating what the research participants consider as meaningful (Saunders et al. 2019) In figure 28, it is explained in detail how the pragmatist and interpretivistic research philosophies position in relation to different philosophical commitments, the so called assumptions.

Ontology (nature of reality or being)	**Epistemology** (what constitutes acceptable knowledge)	**Axiology** (role of values)	**Typical methods**
	Interpretivism		
Complex, rich Socially constructed through culture and language Multiple meanings, interpretations, realities Flux of processes, experiences, practices	Theories and concepts too simplistic Focus on narratives, stories, perceptions and interpretations New understandings and worldviews as contribution	Value-bound research Researchers are part of what is researched, subjective Researcher interpretations key to contribution Researcher reflexive	Typically inductive. Small samples, in-depth investigations, qualitative methods of analysis, but a range of data can be interpreted
	Pragmatism		
Complex, rich, external 'Reality' is the practical consequences of ideas Flux of processes, experiences and practices	Practical meaning of knowledge in specific contexts 'True' theories and knowledge are those that enable successful action Focus on problems, practices and relevance Problem solving and informed future practice as contribution	Value-driven research Research initiated and sustained by researcher's doubts and beliefs Researcher reflexive	Following research problem and research question Range of methods: mixed, multiple, qualitative, quantitative, action research Emphasis on practical solutions and outcomes

Figure 28. Comparison of five research philosophical positions in business and management research (Saunders et al., 2019)

3.2 Research paradigm

It should be noted that research philosophies typically differ from one another regarding where the assumptions fall on the objectivism–subjectivism continua (Saunders et al. 2019). In reference to Burrel & Morgan (2017), research paradigm

is the ideological dimension of the research philosophy, with two opposing extremes: regulation and radical change. Furthermore, a research paradigm reflects the selected, ideological rationale of the research in terms of the opposition between regulation and radical change as well as objectivism and subjectivism (Saunders et al. 2019).

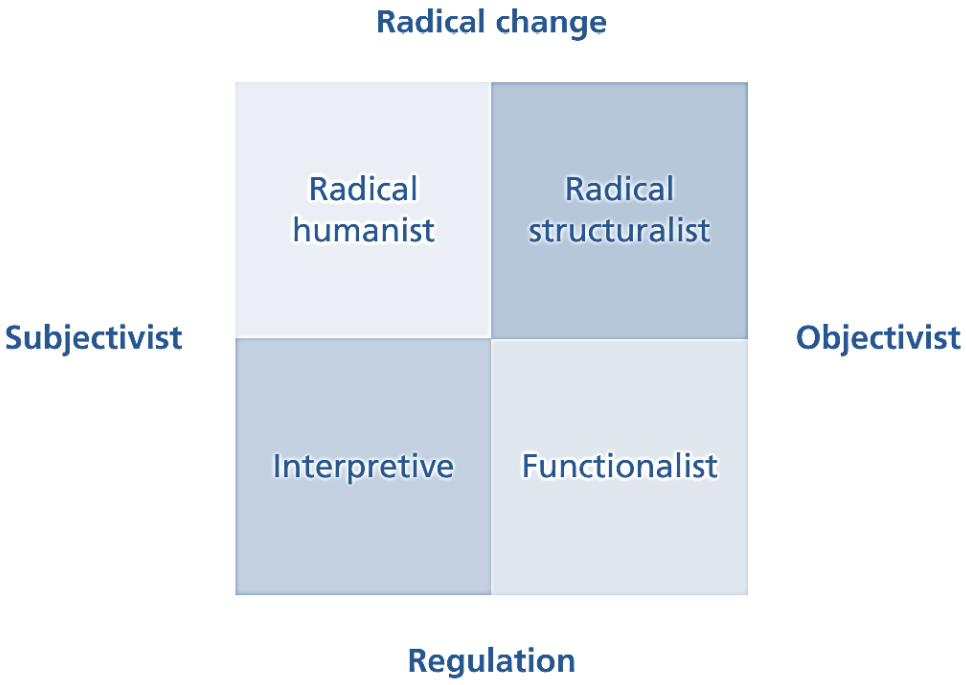

Figure 29. Four paradigms for organizational analysis (Burrel & Morgan 2017; Saunders et al. 2019)

Functionalist paradigm is an objective paradigmatic dimension commonly adopted in business and management research, as it is concerned with rational explanations and developing sets of recommendations in contribution to the prevailing knowledge. Theories and models used by functionalists are commonly generalised to other contexts based on the idea that they are universally applicable, once correctly implemented and monitored. Hence, rational explanations are expected to provide solutions for rational problems in this particular paradigm, which highlights objectivism. Interpretive paradigm on the other hand underpins the importance of subjectivism especially through different meanings provided by human groups and individuals. Instead of emphasizing rationality, the interpretive

paradigm aims at discovering multiple subjectivities; to ascertain the ways of individuals experiencing things, with an attempt to explore their unique interpretations and views in relation to specific contexts. Saunders et al. (2019) place the discussed dimensions of regulation and radical change by Burrel & Morgan (2017), as well as objectivism and subjectivism into a matrix, also locating different research paradigms for organizational analysis under the categories of relevance in figure 29.

Considering the interrelation between research philosophy and research paradigm, Saunders et al. (2019) note that for example objectivist epistemology aims at the discovery of truth by means of observable, measurable facts whereas in subjectivistic epistemology the focus relies on the opinions, narratives, interpretations and perceptions of social actors, who convey these realities. Yet, pragmatists seek to overcome such dichotomy between objectivism and subjectivism in their research, and rather strive for reconciling both dimensions by combining facts and values, accurate and rigorous knowledge as well as various contextualised experiences. This altogether leads to pragmatists considering theories, concepts, ideas, hypotheses and research findings in terms of how they manage to drive thinking and action within a specific context. The practical effects from the acquired insights and knowledge are thus held in high regard by pragmatists, for they believe this information to be carried out in practise succesfully. Simply put, pragmatism acknowledges that there are many ways of interpreting the world and especially undertaking a research, which is why methods that enable the collection of credible and well founded data to advance the research, should always be selected (Saunders et al. 2019).

3.3 Research approach

Kananen (2014) believes that the less is known about a phenomenon, the more likely it is qualitative research that comes in question as the most feasible way of doing research. Valli (2018) discusses that immersing into the field of study is typical in qualitative research, trying to understand the mindset of the target group

by this way and discover the personal meanings given to different phenomena by the research participants. Qualitative research therefore characterizes as a learning process for the researcher, where new, exploratory insights are born, and knowledge about the subject under the examination typically increases throughout the study (Valli 2018, 79.) Lee, Cullen & Collier (2007) find exploratory research a suitable approach especially when the examination of the issue at hand, is still at a preliminary stage. Babbie (2007) argues that even though the findings of exploratory research may alone not be enough to drive decision making, yet they often have a significant theoretical contribution to the situation at hand. On top of that, an exploratory approach can be considered as flexible, for it can address many types of research questions; what, why, and how (Babbie, 2007). According to Shields & Tajalli (2006), research strategies such as field research or case study are typical when it comes to the selection of exploratory research approach.

3.4 Theory development

Saunders et al. (2019) argue that if a researcher collects data to explore a phenomenon, identify themes from it, and explain patterns to generate new, or modify an existing theory, this method refers to abduction. In abduction, the primary logic is that known premises are used to generate testable conclusions. Therefore, for example generalizing in this case emerges from the interactions between the "specific and general". The data collection that is used to explore the phenomenon, identify themes and patterns and locate them in a conceptual framework, should also be tested through subsequent data collection regarding the theory development. Theoretical contribution through abduction hence means incorporating the research findings into prevailing theories, to build new or modify the existing understanding. Instead of moving deductively from theory to data or inductively from data to theory, an abductive approach in fact combines these two approaches by moving back and forth during the research process (Saunders et al. 2019).

3.5 Qualitative research

Kananen (2014) describes qualitative research to be the “mother” of research as it lays the groundwork for new theories and models. Furthermore, theories and models that describe the real world are developed through qualitative research (Kananen 2014, 16). Kananen (2014) assorts that in qualitative research, the aim is often in finding out what a phenomenon is about whereas quantitative research is usually preferred in a context where good theoretical perception of the subject already prevails. Qualitative research commonly focuses on a thorough examination of a certain observation units using qualitative research methods, yet typically disallowing wider generalizations of the research findings. Hence, the uncovered insights often emerge from exploration of the research participants’ experiences, and primarily apply to the observation units in question. The research data is thus collected interactively, from an individual or a group that is familiar with the field of study. The researcher becomes an operator, who may collect the study material in multiple forms; text, photos, statements and so on, which is why the empirical section of qualitative research often takes place in a natural environment. All in all, qualitative research aims at a holistic understanding of the phenomenon under examination, instead of authenticating information and facts that are already known (Kananen 2014, 16-17). Qualitative research therefore usually defines as inductive, recursive, and interactive. Also, it is common for qualitative research to produce and capture data in the form of words and phrases that can be interpreted for acquiring an in-depth understanding of the issue. In summary, qualitative research typically attempts to understand more, whereas quantitative research tends to authenticate and generalize (Kananen 2014, 17).

3.5.1 Case study

Simons (2009) defines case study as in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, or system in a real-life context. Simons (2009) carries on by further characterizing case study as “research based, inclusive of different methods, and evidence-led”

(Simons 2009, 21). According to Metsämuuronen (2008), case study can be considered as one of the most common research strategies in qualitative research, combining different kinds of information, collected in various forms. As case study often explores a current incidence or a person in its natural environment, it usually focuses on an on-going event (Metsämuuronen 2008, 15). Simons (2009) discusses the nature of case study to be flexible and particularly feasible in case of e.g. a change in policy, or when an unforeseen issue occurs that is expected to challenge the prevailing perceptions in the field of research.

According to Metsämuuronen (2008), identifying a case study may even be problematic sometimes, since practically anything between an individual to a group, a customer, an institution, or anything for that matter can represent the selected case. It is distinctive in a case study to collect and compile miscellaneous information from multiple sources regarding the case, using multiple methods. As a result, case study often provides a descriptive catalogue of evidence from which conclusions may then be drawn, which is why the findings of a case study are usually applied into practice as well (Metsämuuronen 2008. 15-18). Kananen (2014) argues that since there is no common agreement, a consensus, of a preferred research method when it comes to case study, it is often characterized more as a research strategy that may perhaps involve multiple research methods. According to Metsämuuronen (2008) the epistemologic question regarding case study comes down to what can be learned from singular case. Thus, an in-depth observation of a singular case enables intensive analyzation of a often multifaceted phenomena (Metsämuuronen 2008, 17.)

3.5.2 Mixed methods

Simons (2009) also advocates the idea of not compartmentalizing case study to any specific method but instead, what determines the methods should be the singularity, the concept, and boundary of the case. Theoretically, it is possible to conduct a case study using primarily quantitative methods if that is the most logical way of collecting evidence and information about the issue at hand. On another

note, it is equally possible to approach with a qualitative manner by i.e. engaging experts from the research field to provide a rich portrayal of the case, for example, of a certain event, project, or program. However, utilizing multiple, mixed methods may increase the researcher's options in terms of learning about the issue from several aspects, and is hence sometimes preferred by researchers who believe this to provide a firmer basis to inform policy (Simons 2009, 458). According to Kananen (2014) the term triangulation defines as a multiple-method study design in which different approaches, data collection and data analysis tools are used to examine a phenomenon for more profound and in-depth understanding of it. The subject under the scope may also simply appear to be too diverse for only one research method to deal with, and ensure the reliability and validity of the research data alone (Kananen 2014, 17.) Kananen (2014) therefore suggests that for one part of the research, a questionnaire may be of use, whereas for other purposes, i.e. interviews may be the most suitable data collection method.

3.6 Data collection

Hirsijärvi, Remes & Sajavaara (2009) address people to be the most favored object in terms of data collection in qualitative research. Thereby, data should be collected so that the voice and opinions of the examinees are allowed to be expressed naturally. Auerbach & Silverstein (2003) claim that in qualitative research, people who have direct life experience about a phenomenon are consdiered as the experts, usually possessing better knowledge about the study subject than the researcher. Therefore, researchers may simply ask about the experiences of the participants with an attempt to learn from their responses, instead of utilizing other, perhaps inaccurate ways of exploring certain issues (Auerbach & Silverstein 2003, 5). Suitable methods for collecting research data can be i.e. thematic interviews, participant observation and group interviews (Hirsijärvi, Remes & Sajavaara 2009, 164). According to Gillham (2000), when it comes to the data collection in case studies, all available and accessible evidence should be pulled into the study. This elaborates the already discussed idea of case study not following a singular

method only, although there can be a division between primary and secondary ways of data collection in the research (Gillham 2000, 10).

3.6.1 Sampling

Thompson (2012) defines sampling as selecting a part of population for observation, in order to estimate something about the whole population. The field of sampling concerns every aspect of how the research data is selected out of all the possibilities that could have been observed, and also how the data can be used later to make inferences about perhaps a larger group of interest (Thompson 2012, 1). Moreover, Valli (2018) emphasizes that unlike in traditional sampling techniques, the idea in theoretical sampling is to deepen the data collection so that it contributes to the theory development. The basic idea in theoretical sampling is hence that a theory that constructs during the research should determine what kind of data becomes collected. Thereby, the researcher must put emphasis on the theoretically critical parts arising from the findings, and pursue gathering more data of relevance (Valli 2018, 80-81).

Auerbach & Silverstein (2003) underline that the specific technique of theoretical sampling entails selecting participants who have relevant knowledge regarding the research problem. Instead of randomness, the theoretical background of the study should justify which type of participants the research sample should include (Auerbach & Silverstein 2003, 25). According to Hennink, Hutter & Bailey (2020) the guiding principle of determining an adequate sample size in qualitative research, is called saturation. It refers to a point where repetition in the findings amongst the replies, begin to occur. Conclusively, saturation indicates the point when reliable amount of data in terms of reliability and validity of the study, is collected. Furthermore, in case the sample size appears lacking, Hennink, Hutter & Bailey (2020) suggest that an additional sampling technique might be called for. Auerbach & Silverstein (2003) mention a sampling technique called snowball sampling, which means starting off with a convenient sample of participants who then recommend additional participants for complementing the study sample: as a result,

the original sample then grows in a way similar to a snowball, on its way down a hill. When the number of examinees seems enough for valid amount of information to emerge, the sample size can finally be considered sufficient (Auerbach & Silverstein 2003, 25).

3.6.2 Thematic interviews and questionnaires

Kananen (2012) proclaims thematic interviews as the most common data collection method for qualitative research. Also, it is not uncommon in thematic interviews that the interviewees are in fact operators in the particular field of research with special expertise of the matter (Ojasalo, Moilanen & Ritalahti 2009, 55). Thus, by using predominant themes as the foundation of the interviews, the researcher aims for in-depth understanding of the phenomenon (Kananen 2012, 99-100.) On a further note, Kananen (2014) describes themes as topics to help capture the data in a way that the researcher understands what the phenomenon stands for. A semi-structured interview is usually facilitated based on theories, concepts, and relevant themes around the research problem. In semi-structured interview, it is therefore not uncommon for other things also arise from the conversation than what the questions originally intend to find out. Thus, the interview structure in this case is not necessarily systematic, but rather more open for discussion (Kananen 2014, 24)

Questionnaires with structured questions are typical for quantitative research, while open questions are a more common way of capturing data in qualitative research. From open ended replies, the researcher may highlight different meanings considering the research problem. However with structured questions, the alternatives are often preset which enables the researcher for example compare the frequencies and incidences between the replies. Ultimately, a lot is up to the researcher's own judgement when it comes to qualitative research. This may increase the risk for bias, in comparison with quantitative research that is typically considered less influenced by the researcher's own values (Kananen 2014, 24-25).

3.7 Data analysis

According to Marshall & Rossman (2006), qualitative data analysis can be defined as “search for general statements about relationships and underlying themes”. Gibson & Brown (2009) stress that to understand data analysis, there must first be a realization of the context in which it actually refers to and is applied to. Hence, the emphasis in data analysis should be on the exploration of the structure of things (Gibson & Brown 2009, 6). Miles & Huberman (1994) detect three categories that should be extracted from the research data in data analysis: text-driven categories, coherence-driven categories, and theory-driven constructs. Likewise, Auerbach & Silverstein (2003) identify three ways categorizing the research data into low level text-based categories, middle level sensitizing concepts and high-level theoretical constructs. Auerbach & Silverstein (2003) yet note that this procedure doesn’t necessarily develop linearly from low to high, but instead, in a typical manner for qualitative research the categories should be continuously revised for the researcher to constantly unravel his interpretation of the text. Gibson (2009) exemplifies the process for qualitative data analysis to be for example transcribing, highlighting representations from within the data, and identifying themes from it (Gibson 2009, 8). According to Miles & Huberman (1994), regardless of the fact that analysing qualitative data may seem straightforward in terms of the recommended actions, the research data often masks a good deal of complexity behind what may appear as simple at first. It should be noted that each interaction encases its own specific social context, influecing the interpretation of both the participants and the researcher about the topic (Miles & Huberman 1994, 9-10).

3.7.1 Thematic analysis and data coding

Thematic analysis is a rigorous way of analyzing research data due to its suitability for examining the perspectives of research participants, underlining similarities and differences, and generating unanticipated insights (Nowell, Norris, White, & Moules 2017, 2). Sgier (2012) believes that thematic analysis and data coding implicitly or explicitly lie at the centre of qualitative data analysis, focusing primarily

on what the data says and identifying patterns from it. Belk, Fischer & Kozinets (2012) note that regardless of which qualitative data collection method is selected, data coding is always a crucial part of the analyzing process. Adu (2019) divides qualitative data analysis into different stages of preparing the research data; exploring, coding, underlining empirical indicators, developing categories or themes, and generating tables and diagrams (Adu 2019, 9). Auerbach & Silverstein (2003) point out that since examinees often use relatively equivalent words and phrases, text-driven categories usually appear to be the most visible category in the data coding process. As the text-given categories also commonly stand in logical or conceptual relation to one another, they can be easily organized further into coherence-based categories. Subsequently, the researcher may then compare them to theoretical concepts from the conducted literature review, or even formulate new hypotheses to turn the coherence-based categories, into theory-driven constructs (Auerbach & Silverstein 2003, 132).

3.7.2 Generalizing

Polit & Beck (2010) estimate that generalizing has grown in popularity also in qualitative research, despite the fact it has been traditionally connected to quantitative research. The idea of generalizing is to make inferences about the unobserved on the basis of the observed, which in this case implies that insights arising from qualitative inquiry should be recognized as relevant sources of evidence in practice as well. According to Yin (1994), analytic generalizing is often used to compare the results of a case study to a previously developed theory. Moreover, Leavy (2014) highlights cross-case generalization as a common approach in case studies, describing this as follows:

> In a collective or multi-site case study, each case is explored to see if issues that arise in one case also exist in other cases and what interconnecting themes there are between them. This kind of generalization has a degree of abstraction and potential for theorizing and is often welcomed by commissioners of research concerned that findings from the single case do not provide an adequate or “safe” basis for policy determination (Leavy 2014, 465).

The problem of generalization in terms of qualitative research, according to Polit & Beck (2010), is however that generalizing requires extrapolation, which can never be fully justified since the findings are always bound to a certain context. Therefore, in analytic generalization, conceptualizations of processes and human experiences through in-depth scrutiny and higher-order abstraction are developed instead, and as a result, generalizing the findings into a theory comes down to identifying evidence that support the conceptualizations (Polit & Beck 2010). Regardless of generalization being typically unorthodox for qualitative research, Metsämuuronen (2008) states that especially case study allows, and provides a natural ground for generalization. Also in terms of reporting the findings of in case study, it is common to present the findings in a popular and understandable form instead of following hermetic scientific slang, more typical in traditional research. Overall, the style of reporting the findings of a case study usually allows for the audience to draw their own conclusions of the research findings (Metsämuuronen 2008, 17).

3.8 Methodology overview

Defining as exploratory case study, this study follows a pragmatistic research philosophy with a hint of interpretivism involved, thus adopting both objectivist and subjectivist assumptions into the empirical part. In terms of research paradigm, the study positions in both interpretive and functionalist regulation, avoiding dichotomy between the ideological dimensions within the research paradigm, which is typical for pragmatism. The study encases a profound literature review and an empirical section, conducted with mixed methods. Fundamentally characterizing as qualitative research, the data collection was done by utilizing thematic interviews as the primary tool with underlying themes derived from the theoretical framework of the research, which was compiled in consideration of the research problem and research questions. Using multiple methods, additional questionnaires supplemented the data collection in the nature of the study design. The theory development was conducted abductively, moving back and forth in terms

of the theoretical and empirical parts of the study. In reference to figure 26, the research design steered also the structuring of the data collection with three guiding themes as the topics of the thematic interviews and questionnaires: digital transition, green transition and information and data.

As the main objectives of the questionnaires were to simply capture an overview of the sample group as well as the case under examination, it was also intented to complement the primary data collection. The data acquired from the questionnaires enabled a multifaceted way of data analyzation and reporting of the research findings in quantitative manner using different measurement methods and rating scales. All in all, the questionnaires were constructed to provide research data in discrete, numeric and categorical forms as explained in figure 30, also allowing for better generalizability of the examined case.

Questionnaire

Area	Aim	Questions	Location	Measurement
Basic information	To provide an overview of the sample group and the case	**1-7**	✔ Chapter 4.1 ✔ Chapter 4.2	Nominal
Introduction to the phenomenon	To capture a generalizing opinion about the impacts of the phenomenon towards real estate and construction industry as well as in relation to the respondents' own work	**8-10**	✔ Chapter 4.3.1	Nominal Ordinal
Digital transition	To assess the impact of the digital transition on the real estate and construction industry and on professionals in this field. To evaluate the impact on the value chain of the industry and identify added value attributes in relation to the digital transition. Identify the impacts of enabling technologies and infrastructure	**11-17**	✔ Chapter 4.3.1	Nominal Categorical Numeric Ordinal
Green transition	To assess the impact of sustainable development and the circular economy on the decision-making process of real estate and construction professionals. Identify the parties that have the most influence on expediting these goals in commercial properties, as well as the popularity of environmental certificates or other building rating systems	**18-22**	✔ Chapter 4.3.1	Nominal Categorical Numeric Ordinal
Information and data	To address the methods and types of data collection and processing currently being used in commercial properties and identifying areas that may need further development	**23-27**	✔ Chapter 4.3.2	Nominal Categorical Numeric Ordinal

Figure 30. Questionnaire overview

As the primary data collection method, the thematic interviews were expected to produce textual research data to be processed and analyzed into valid findings. The structure of the thematic interviews consisting of the three guiding themes is explained in figure 31.

Thematic interview

Theme	Aim	Questions	Location	Perspective	Key concepts	Levels
Digital transition	To assess the impact of the digital transition on the real estate business and REM professions. To evaluate the impacts on the REM value chain and identify added value attributes from the phenomenon considering Finnish commercial properties. To estimate the significance and meaning of different enabling technologies and infrastructure in commercial properties. To discuss future opportunities and development.	10	✔ Chapter 4.4.1	Customer Economic Internal processes Learning and development	Artificial Intelligence Digitalization Digital solutions	Operational Strategic Tactical
Green transition	To assess the impact of sustainable development and circular economy on the real estate business and REM professions. To evaluate the impacts on the REM value chain and identify added value attributes from the phenomenon considering Finnish commercial properties. To identify how green transition realizes in the daily operations considering REM and commercial buildings and adduce the best practices. To discuss future opportunities and development.	9	✔ Chapter 4.4.2		Circular economy Sustainable development Sustainable solutions	
Information and data	To assess the ways of data collection and utilization in Finnish commercial properties. To address the impacts of information and data in real estate business and the work of REM professionals. To evaluate the impacts on the REM value chain and identify potential value from data solutions. To discuss future opportunities and development.	10	✔ Chapter 4.4.3		Data collection Data solutions Data utilization	

Figure 31. Thematic interview overview

3.8.1 Empirical data set

In reference to Kananen (2014;17), a multiple method study design was utilized in the study for an in-depth orientation into the phenomenon. In reference to appendix 1, the questionnaires were created with Google Forms, enabling easy harnessing, analyzing and visualization of the research data into presentable research findings. Regarding the semi-structured interviews presented in appendix 2, the raw data was manually transcribed from nine interview sessions in total and recorded with Microsoft Teams, with average length of singular interview being approximately 1 hour. The edited transcriptions were translated into English, from which relevant statements, saturation between the replies, and points of relevance regarding the theoretical framework were highlighted as a part of data coding. Next, thematic analysis was used for interpreting and summarizing the statements into conclusions. Overall, the data collection as well as the reporting of the findings was conducted in respect of the anonymity of the participants, and in the limits of the general data protection regulation (GDPR) as well as common confidentiality priviliges addressed for thesis processes.

4 RESULTS

The results of the study are categorized under the key themes in a logical, consecutive order. The findings reflect the insights of the research participants, and are displayed in a summarizing form. Key takeaways from each set of questions asked in the questionnaires and the semi-structured interviews are explained under relevant subtopics, which derive from the theoretical framework. Furthermore, direct quotes considered relevant are highlighted to support the summarizing descriptions. Characterizing as case study, the research also allows its audience to objectively interpret the results and thus, the complete scripts of the original responses can be found in the appendices and are processed with edited transcribing for readability and conciseness.

4.1 Sample overview

Sample group

The study sample consisted of nine participants in total. In figure 32, the sample group is defined, displaying the gender, group of age, length of work experience in REM, and current job titles of the examinees. In addition, the respondents were asked to select all the relevant REM activities involved within their profession.

Figure 32. Basic information of the sample group

Commercial properties

The distribution of the building types that the reseach participants actively deal with in their profession, are displayed in figure 33. Conclusively, commercial, office, warehouse, and logistics properties as well as buildings for institutional care appeard as the four major building types within the research case. Considering the definition of commercial properties displayed earlier in table 2, the study sample turned out having no involvement with transport and communication buildings, assembly buildings, public utility buildings or energy supply buldings. Therefore, the study results aren't applicable to these particular building types due to lack of connection and experience with these kind of properties among the sample group.

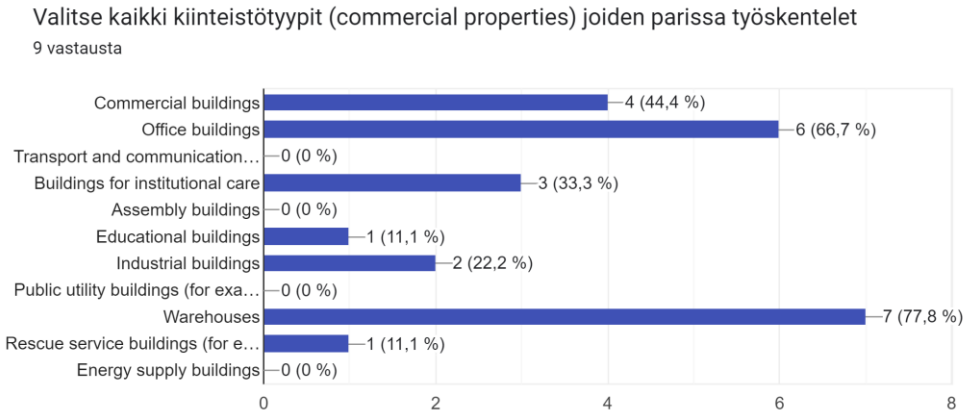

Figure 33. Building types involved in the work of research participants

4.2 Case overview

Case companies

The research sample group consisted of REM and CREM professionals from various occupational groups and companies, considered relevant regarding the Finnish real estate and construction industry. Therefore, the case is a representation of commercial real estates from all across Finland, covering five different companies

in total involved with property possession, ownership or REM. With varying emphasis regarding the core businesses of the companies included in the case, the distribution of building types can be considered diverse. Thus, these companies make relevant observation units in relation to the study objectives. Simply, the case involves the public and the private sector as well as limited and listed companies, with representation from both managing agent firms, CREM units, and representatives from property owning companies. All the companies invovled in the case, which were represented by 9 separate REM professionals in total, were:

- Kesko Oyj
- Mileway
- Newsec Property Asset Management Finland Oy
- Posti Kiinteistöt Oy
- Tredu Kiinteistöt Oy

Kesko Oyj

Kesko Oyj is a Finnish, commonly recognized private listed company with core business focused on the retail sector (K Group 2022). According to the information found in the company webpage, the store sites of Kesko are divided into four categories: strategic properties, basic properties, realisation properties, and development properties. Strategic properties are described as the most relevant for the company's business operations, classifying as properties that Kesko "wants to own", and thus covering 62% share of their portfolio in the 2nd quarter of 2022. Basic properties are something that the company currently owns, but in their own words "could sell and then lease back", covering 25% of Kesko's property portfolio. Development properties again refer to plots and properties that require "development to fit their planned purpose", with the share being 13% of the totality. Finally, realisation properties by the company's own definition, define as property assets that the company "no longer has use for", with the share of such buildings being 0% of the portfolio in the second quarter of 2022 (K Group 2023).

Tredu-Kiinteistöt Oy

As discussed, the public sector and public limited companies own around 18% of the totality of the Finnish building stock, and by means of Tredu-Kiinteistöt Oy, this segment was represented in the study case. Tredu-Kiinteistöt Oy is a jointly owned, limited company with several property assets located in western Finland, with the ownership being divided between multiple cities and municipalities mostly from the same region. Furthermore, the City of Tampere holds the highest share of ownership of the company, 66,46% of the totality. In the company's own words, Tredu-Kiinteistöt focuses on the construction, lease and maintenance of educational buildings primarily (Tredu-Kiinteistöt Oy, 2021).

Posti Kiinteistöt Oy

Posti Kiinteistöt Oy is a limited company, however it reflects both the public and pricate sector in a sense and sheds light especially from the CREM aspect regarding the research case. According to the examinee from this particular company, the key purpose of Posti Kiinteistöt Oy is at first hand to serve as supportive, non-profit organization for Posti Oy which is a state owned delivery and postal company in Finland. More specifically, and according to the information provided online by Posti Group Oyj (2023), Posti Oy is a subsidiary of Posti Group Oyj which is a leading delivery and fullfillment corporation operating across Finland, Sweden and Baltics.

Newsec

Newsec (2018) is fundamentally owned by Stronghold Invest, a holding company that by definition "owns, invests and develops real estate companies in Northern Europe". Furthermore, Newsec as a company characterizes as the "leading services company in real estate and renewable energy". Representing one of the five core business areas of this managing agent company from the Nordics, Newsec Property Asset Management offers "full-range portfolio management" to its clients from "hands-on technical services to strategic analysis and planning" (Newsec 2018). Regarding the case, this company comprises all the areas included in the

REM value chain, from asset management to property-, leasing, facilities and project management.

Mileway

Mileway, in the company's own words, is the "leading last mile logistics real estate company in Europe". Hence, it is an international company with the core business oriented towards real estate investing and property ownership. Regardless of the company operating in several nations across Europe, Mileway Finland specificially possesses a portfolio of 20+ assets located in urban areas across Finland (Mileway 2023). This being said, Mileway provides an adequate representation of property ownership and real estate investing to the research case, providing insights from portfolio and asset management explicitly.

4.3 Questionnaire results

As shown earlier in figure 30, the questionnaire consisted of five sections with a different aim in each set of questions. The results for the empirical questions in the questionnaires are presented in the following subchapters by addressing the themes of twin transition separately.

4.3.1 Twin transition

The questionnaire began with examining twin transition as a phenomenon by capturing the opinions of the research participants in this regard, shown in figure 34. With questions supported with certain images presented in appendix 1, the respondents were asked to estimate the significance of real estate and construction industry in this context, and also to evaluate the impacts of digital- and green transitions towards their own profession now and in the future. Moreover, from the alternatives also shown in appendix 1, the examinees were asked to estimate the significance of the enabling technologies and infrastucture as well as the high-impact applied technologies of industry 4.0, in relation to real estate and construction industry.

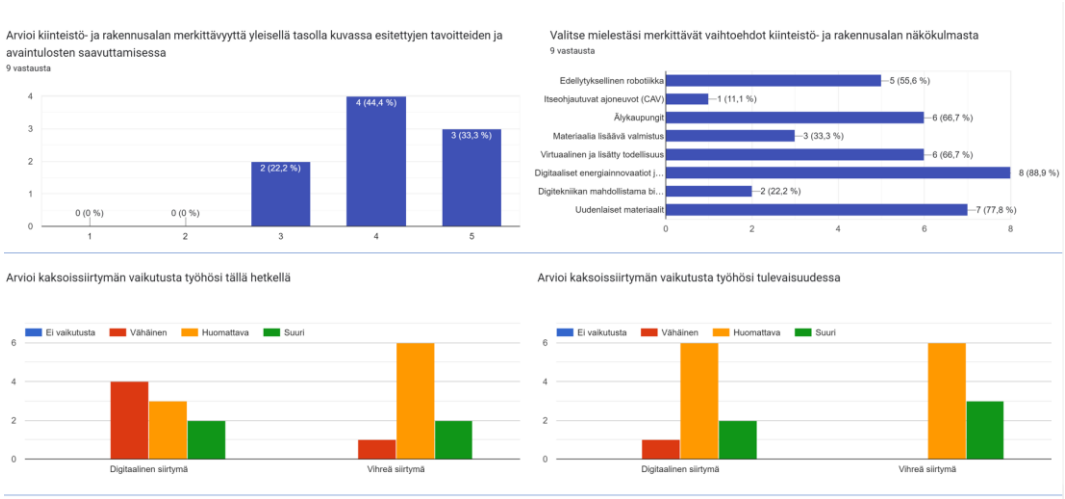

Figure 34. Influence of the twin transition

As shown in figure 35, digital transition was addressed next in the questionnaire in more detail, in questions 11-17.

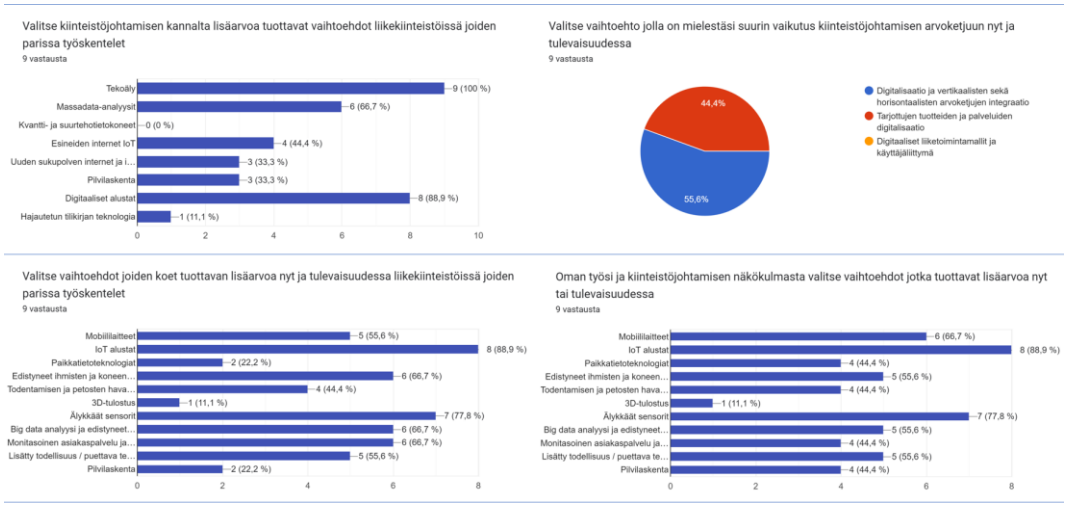

Figure 35. Digital transition – impacts in the REM value chain and the added value attributes

In reference to appendix 1, question 12 was a follow up question to question 11, producing two open replies in total:

> R1: "The digitizing of technical appliances is increasing rapidly."
>
> R2: "Considering the entire real estate value chain, the maximum benefits from digitalization should be obtained."

Furthermore, questions 18-22 addressed the impacts of green transition towards commercial property as well as REM, and the results are displayed in figure 36.

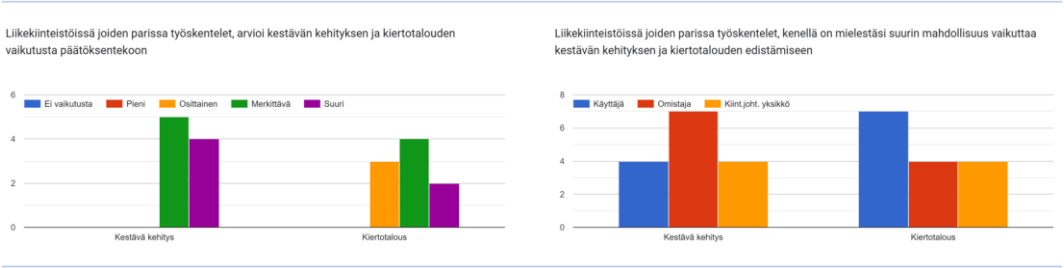

Figure 36. The infuence of green transition and the most important parties in its expedition

Again, shown in appendix 1, question 20 was an optional question which allowed the respondents to argue their choices, producing five open responses in total:

> R1: “Sustainable development solutions usually call for investments and capital. Succeeding in the circular economy solutions requires engagement from the users.”
>
> R2: “Everybody has their own role. The user observes the property on a daily basis and reports to the manager, who in collaboration with the owner discusses the matter based on the evidence found from data and observations.”
>
> R3: “Primarily the owner has the main responsibility of the expedition, and thus steers the actions around sustainable development and circular economy.”
>
> R4: “For one's part, all parties are capable of having an impact on these things.”
>
> R5: “The user's accountability is significant by means of i.e. correct waste management or commuting via public transport, by bicycle or by foot.”

Distribution and popularity of potential environmental certificates amongst the commercial properties that the respondents deal with in their profession, was also examined in this chapter of green transition, with the following outcome displayed in figure 37.

Regarding previous question, select the environmental certification or address other possible building rating systems

LEED	BREEAM	LEED & BREEAM	OTHER
-	1	5	-

Figure 37. Popularity of environmental certificates within the case

4.3.2 Information and data

The third and final theme, information and data, was discussed in questions 23-27 with the results being shown in the following figures 36 and 37.

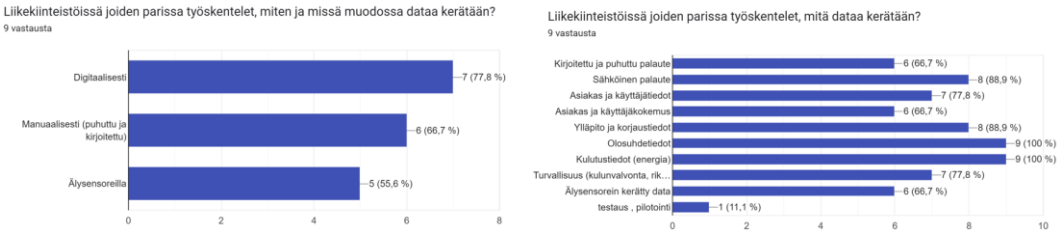

Figure 38. Data collection methods and types of data in commercial properties

Figure 39. Current level of data utilization and future development areas

In the final question of the questionnaire, the respondents were allowed to argue their opinion to question 26, resulting in two open replies as follows:

> R1: “Real estates contain a lot of technology and appliances which create data. Applications for data aggregation, modification, and visualization have not lived up to the digital development and therefore the produced and available information cannot yet be utilized in management sufficiently.”
>
> R2: “All the (data) factors that are listed in question 26, are still very much in their infancy.”

4.4 Interview results

Similar to presenting the findings from the questionnaires, the findings from the interviews are categorized under the themes of digital transition, green transition and information and data. From the complete interview scripts shown in appendix 2, a synopsis to address the focal areas of each theme, is presented under separate subchapters. Referring back to figure 31, each theme included 9-10 questions in total, starting off with 4-5 questions which addressed the key concepts, the focal areas. The second section of the interviews dealt with the concepts of value proposition, added value and value added from economic and customer perspectives. The final part in each theme elaborated on the internal processes, learning and development perspectives, in relation to Finnish commercial properties and REM. Referring to appendix 2, some of the questions were supported with certain, suggested perspectives, for framing the interviews.

4.4.1 Digital transition

The first section of the interviews focused on digital transition, in a way described in figure 40. The first questions addressed the concepts of digital transition in REM and commercial properties, suggesting perspectives such as process, human, space, effectiveness, flexibility, customer satisfaction, for diversified insights. Also,

the examinees were encouraged to embrace both strategic, tactical, and operational standpoints in their replies to some questions, as shown in appendix 2.

Theme: digital transition

Focal areas	Aim	Questions	Location	Focus
Digitalization Digital solutions Artificial Intelligence	To understand the use and impact of digital solutions and artificial intelligence in real estate management and commercial properties, from various perspectives including process, human, space, effectiveness, flexibility, customer satisfaction. To observe the phenomenon holistically on strategic, tactical, and operational levels.	**1-5**	✔ Chapter 4.4.1	Phenomenon
Value proposition Added Value Value added	To understand the impacts digitalization, AI, and digital solutions can have on the REM value chain and the value proposition for owners and users of commercial properties. To identify the added value and value added that can be obtained from these technologies in the real estate business and REM.	**6-7**	✔ Chapter 4.4.1	Economic perspective Customer perspective
REM activities Operations and services Future opportunities	To identify the potential benefits from digital transition in the operations of Finnish commercial properties and REM. To detect areas where digitalization, digital solutions and AI can help considering efficiency and flexibility and improving customer satisfaction. To discuss possible development areas and future trends.	**8-10**	✔ Chapter 4.4.1	Internal processes Learning Development

Figure 40. Theme 1 – digital transition

<u>Digitalization</u>

According to the participants, digitalization has been used in the planning of real estate and construction for some time already, and is being used in the management and maintenance of commercial properties daily. Digital interfaces, such as subdistribution boards in the building automation systems, enable overseeing the technical functionality of the buildings in real-time. Digitalization also enables the collection and utilization of operational data, such as systems failures, anomalies in energy consumption, or technical malfunctions, but also information regarding occupancy or customer experiences. Most respondents agreed with the idea that digitalization allows for remotely monitoring, controlling and managing buildings systems and functions as well as REM processes in commercial properties.

> R1: ”The first thing that comes in mind is the planning of real estates based on data. This has of course been used in architectural planning for a long time and that way the facilities can be turned to a virtual based model (--). Second, utilizing digitalization in the usage and maintenance of commercial properties requires exceptionally high amount and reliable data and therefore the data aggregation, saving and storing all the available data and so

> forth, kind of lay the groundwork for the utilization of digitalization in property usage and management."
>
> R2: "For example an electric building service manual, through which basically all the daily processes are run (--). That is pretty much the cornerstone for procuring the maintenance services and repairs as well as saving the important information, and also overall in terms of management. Then, considering for example the communications and contacting the users of the facilities, digital monitors placed in staircases as well as info screens in the hallways are growing in popularity and thus diminish the old fashioned paper communication so that the information gets exchanged in real time"
>
> R4: "(--) at least from the perspective of leasing and ownership, digitalization highly relates to different systems, how and what kind of data is collected from various sources and how it is utilized. Therefore, and especially in commercial real estates, a lot of data is collected from the users, i.e. experiences from occupancy, that in my own profession at least is strongly present. And digitalization in general has such a huge role in this job in general, that it is hard to separate to whatever digitalization may imply to since it is happening around you in silence continously. (--) As major share of the work is done via computer anyway, and the rest is about interacting with a customer face to face, negotiating and so forth. So thereby digitalization for me personally means the easiness these applications and systems provide that are used in daily work to help with handling and closing out i.e. the negotiation processes."
>
> R6:"In many commercial properties or shopping centres specifically that I work with, most solutions are digital whether it is about REM, customer, or internal, team related activities that they concern so there is like three different aspects to it. Thus, digital solutions enable working with multiple shopping centres simultaneously, for the processes are basically the same between these buildings. Of course, they are all physical, individual assets that are separately located somewhere in the area, but most solutions within them are digital."
>
> R8: "From REM standpoint, the digital solutions relate more heavily to the maintenance side of things so that energy efficient, both operations and circumstances, are thus monitored."

In summary, digitalization enables predictive and proactive maintenance and repairs to be conducted, as well as remote surveillance of building conditions. Therefore, it allows for retaining the conditional stability and safety of the building, and for its occupants. Furthermore, controlling the building conditions today increasingly happens through a digital service, i.e. cloud services and other platforms and

applications. The participants suggest that with digitalization, capturing the customer data as well as service requests via digital channels should allow for the proprietor to provide better customer service for the property users. Not only does this improve the customer satisfaction, but also brings about resource efficiency by reducing the need for human input and manual work. It could be stated that the benefits of digitalization in commercial properties actualize in better conditional and operative quality and improved efficiency and effectiveness in terms of technical processes and REM. Overall, satisfied tenants and users contributes to higher rates of occupancy, which results in increased profitability.

Artificial Intelligence

The respondents underlined the importance of AI utilization in various systems such as automatic doors and heating, ventilation, and air conditioning (HVAC), to optimize the building functions based on data from various conditional indicators.

> R1: ”Artificial intelligence has over the years slided into different systems. For example in today’s automatic door systems there are intelligence boxes measuring the use frequency, thereby predicting the need for future maintenance or repair, hence providing this information to the property management unit. Also, the AC and automation and the entire HVAC system follows the spatial tempteratrures, carbon oxides, humidity and so forth via programmed automation, and according to the user volumes and frequencies it can steer the building automation system to intelligently produce enough heat, air exchange, etc.”

> R6: ”From the standpoint of a shopping centre, or the customer, AI is utilized a lot in for example marketing solutions (--). For customer recognition for instance, to whom targeted marketing can be pointed at in social media or something, but also in the facilities it can be detected i.e. what kind of registration numbers in terms of region are driving into the building. Thereby, acquiring information where the customers are coming from allows to deliberate on the economic target areas of the shopping centre and prepare targeted marketing for attracting those customers in specific and who frequently visit us, bringing more money to the owner too. During the COVID era, we had dicsussions about the two most important indicators regarding our business, the visitors and sales, for which we had measurement systems prepared at each entrance of the building for daily monitoring. So in a way, my job was to bring in more customers meanwhile the

> status quo was to avoid crowdedness and gathering in the same place. So with our supplier, who provided the systems for calculating the visitors, we came up with different ideas with AI involved to i.e. estimating the number of concurrent customers. I've also heard that somewhere in foreign countries there were even solutions for diagnosing the disease via temperature measuring. Yet, and apart from corona, such applications and solutions could even create 3D modelling and provide me with customer data; whether it is adults or children, men or women from different groups of age, that are visiting us at the time. However due to certain GDPR regulations that prevail in Finland, the utilization of these solutions has been only partial, yet there has been many ideas on the table."
>
> R5: "In this moment of time the magnitude in which AI is utilized in commercial properties or in REM is very little, but for sure if we look at building automation, there is AI to some extent. Like, in all types of measuring, steering and optimization of processes are driven by some type of AI. But again and in terms of REM, there is not much that comes in mind, so maybe that is for the future then."
>
> R7: "There is AI involved in for example twilight switches for indoor and outdoor lighting, constantly detecting the level of daylight as in the amount of lux units, and once it falls under a certain ratio the lights are switched on. And it is also supported with a back up system, in this case, an astronomical clock so if by any means the twilight switch became dysfunctional, it will automatically follow the astronomical clock that is configured with the standard lux levels of the region or the nation. Also, in each property we posses, we have building automation systems through which everything is run: cooling, AC, temperatures. So everything that we have decided to connect with the building automation, hence why I believe it is the highest form of AI that we currently have supporting our operations."

In terms of energy management, the respondents addressed AI's ability to interpret e.g. the weather and even optimize heating and cooling predictively and accordingly. AI utilization also realizes in smart sensors, used to measure for example the carbon dioxide levels in the indoor air. With AI determining the conditions of operating environments, it may adjust e.g. ventilation by itself and completely autonomously. The respondets argue that as of late, AI has also been implemented more and more into lighting systems including motion detection mechanisms and the ability to identify lux-levels, but on the contrary, it is much applied in marketing solutions such as targeted advertising and customer recognition also. Argued

by some, AI is currently not very widely used in the REM or internal processes specifically, however the respondets expect this to grow in popularity in the future. In summary, the respondents exemplify the most useful abilities of AI regarding commercial properties to be the conditions optimization and adjusting, as the most visible form of it.

> R5: ”The building automation system itself both stores and produces digital data that can be then utilized in REM. Surely, the BAS thus becomes the most evident tool for real estate management. But especially and already from the standpoint of green transition, during the years of 2021-2022 we as a company have had an enormous emphasis on both constructing renewable energy and energy management systems overall. This means, and in relation to digital solutions, that we have constructed 0,6MW of solar power connected via inverters to our energy management system and cloud service in real time, with personalised user access. Furthermore, these inverters are transmitting data to the info TVs of our educational buildings about the energy production, which again can be used for not only marketing purposes but also for the users to simply keep track about the energy consumption of the building as well as the generation capacity of the renewable energy themselves.”

Digital solutions

The responses suggest that digital tools and electronic platforms are used in various stages of a property's life cycle, including planning, construction, and occupancy. Respectively, digital tools allow for more efficient operations and maintenance, by exploiting the building automation to optimize the technical building functions as well as the energy usage. Potential use of virtual and augmented realities in marketing and user guidance within retail properties and shopping centers especially, were addressed by some participants. Also, electronic devices for workflow surveillance and facilitating the Working Time Act policies, with employees clocking in and out digitally, reflect how digital solutions secure compliance with organizational policies and support corporate management. Moreover, different analytics tools for reporting the technical status of building equipment and

machinery such as the HVAC systems, also received notable attention by the respondents and were exemplified with specific real-life cases.

> R8: ”The digital service to which I referred to earlier, the HVAC analytics, is also heavily based on AI. It follows the building automation functions and more specifically the energy consumption patterns, which is where the AI comes in play for example in terms of identifying anomalies through calculations with a certain formula, thus predicting a potential consumptional increase or decrease based on its observations. (--) and yes, this system is a cloud-based service. Diving deeper into AI, the building automation systems surely utilize it to some extent too. So in a way, these are pre-programmed systems, but at least in the modern ones, AI operates spontaneously i.e. via detecting the daylight and motion, so that the lighting and AC for example are optimized autonomously and automatically based on the space usage ratio or other external stimulus which can be measured.“

Conclusively, the use of sensors and smart technology has established real-time measurement of building conditions and indentification of changes, which triggers the implementation of cost-efficient operating models and enhancement of the building usage. However, a discrepancy may occur in the implementation of modern technologies, as the perparedness and technical infrastructure for digital solutions to be applied, appears to be more advanced in some properties than others. The importance of considering the financial aspect when implementing such technologies are emphasized by most participants, also pointing out the need for data accessibility and integrating the applicable information acquired from various portals. Impacts of e-commerce on the core business of commercial properties is worth considering, for online shopping appears to be a competitor for shopping centers and retail properties today. Hence, the development of digitalization should be taken into account to adjust to the changing consumer behaviors and needs, in the real estate sector. The respondents saw integrating AI with REM operations as a possibility, with potential to provide property owners valid information to support investment decisions explicitly. Overall, the incorporation of digitalization and information management into REM activities has the potential of improving efficiency and accuracy in decision-making, despite the challenges regarding the integration and data accessibility, noted by the respondents.

> R1: ”Considering management, and from the perspective of financial management especially, the more, and more reliably any information is acquired about the building usage in terms of i.e. energy consumption or how through digitalization and developing information management the conditions can be optimized, these things obviously have an impact on getting specified understanding of the most cost-efficient operating models regarding the real estate. Then of course, with all these sensors which have frequently been advancing into so called smart sensors, the conditions and changes in the buildings can be measured in real time e.g. in case of a variance in the internal or external conditions such as the weather.”

> R9: ”Managing the big picture and the contractual side of things as well as the overseeing the property development and capital expenditures and so on, are the primary tasks of an asset manager. So in our world and within these practises, we still use a very basic type of reporting. For instance, to compile the building management plans, no automated solution hasn’t yet been developed for this from my perspective or at least this is something that is yet to be discovered. So many things are still conducted manually.”

Value from digital transition

Regarding the customer value proposition, the findings imply that the benefits from digital transition have to do with cost savings, better economic and technical efficiency, and increased knowledge and understanding of the building operations. Automated processes and real-time monitoring through digital platforms and services were estimated to reduce the need for manual work and labor, also downsizing the amount of maintenance debt, which benefits the property owner. Digitalization, digital solutions and AI altogether can be seen as the fundamentals of gathering property data such as consumption levels and usage patterns, which can be exploited to improve operative and business performances as well as customer satisfaction. Digitalization was said to elevate communication between owners, managers, and tenants, allowing for a more collaborative approach to exchanging feedback as well as to make accurate decisions. In addition, modern technology assists leasing and marketing processes by providing adequate information for e.g. promotional and contractual purposes. Thus, digitalization clearly contributes to the transparency and reliability of property-specific information,

and thereby strengthens the credibility of the building for its occupants and to the public. Overall, based on the findings, there is potential for value growth and advanced technical performance for the property assets from adopting the key technologies of digital transition into the building operations and real estate business, as this should provide convenience and cost savings to all the stakeholders.

> R1: ”I believe that by following correct data and information, it can be pointed out if the building, in terms of energy efficiency for example, reaches a level which in comparison to other, corresponding properties, certifies it as a valuable object of investment. (--) from the user's viewpoint I would emphasize the reliability, predictability and safety regarding the occupancy and of course for the building to be environmentally friendly. The idea, that with factual information we can assure the users that the building meets all the quality requirements verified in reliable data, and via information management as well as real time monitoring the conditions will also maintain their correct course, should emerge credibility and trust amongst the users about their selected place of operations. So that they have made the right choice also from the building perspective.“

> R4: ”In terms of REM, let’s say we have a certain asset that we are desperately trying to sell, or a premise to lease. So the property owner naturally draws the big picture regarding management, coordination and strategy, while the duty of the managers is to go on and implement and expedite these things in practice. The value proposition, how a customer benefits from our service or product, is that in our leasing processes for instance, certain types of values and pledges determine the actions taken in reaching the goal of finding new tenants. And as we also represent the owner in these activities, we are the one creating the environment and the community together with our service providers, within the properties. So despite the starting point, for us to be able to develop things according to the received feedback and plans that have been made are of essence, striving for meeting our value proposition and the idea that the users may focus on their own core business meanwhile we ensure that the digitalization in the buildings lives up to the standards of today.“

Based on the replies, adopting digital transition establishes better working conditions for users and tenants. More so, digitalization provides data that can be used by tenants in their own marketing efforts, such as by promoting the energy efficiency of their business premises. Considering property users, there is also massive

potential in digitalization for improving the customer experience, for it enables providing more personified services for the end customers especially in shopping centers. Overall, the respondents address many ways for enhancing the value proposition for users and tenants by providing a high-quality, and convenient environment for occupancy. Regarding the value proposition towards the property owner, discussed by participants from managing agent companies, digitalization assists with accurate, data-driven decision-making and timely actions which are likely to increase the value growth, attractiveness and funtionality of the property assets.

> R2: ”For instance, AI provides direct surplus value through the building automation system optimization as we gain straight cost savings through the energy savings from heating, air exchange and lighting, that can be very distinct actions yet with significant financial impacts. So, solely and in terms of the money that is being put into the buildings, it costs less once the usage is optimized by AI.“

> R8: ”This particular owner and the properties I am responsible of managing are representing very strong green values. So their object is to gain energy savings as well as reduce the CO2 emissions from their buildings that can also be reported to the public. And from my point of view, with digitalization and digital solutions such as the HVAC analytics or development of the building automation system, reaching these objectives is possible. So in this case, a year after the launch of the analytics service, a summarizing report was made from which we found that we had managed to diminish the energy consumption of the building by 24%, which measured in euros implied to a 75K of cost savings annually. The investment cost into this service is 5,6K a year, so it was immediately paid back for over the next ten years. For users, the value proposition of safe and secure premises actualizes with the conditions complying with the official indoor standards. In this particular building, the classification of indoor environment was examined to be S2 generally, some premises even reaching the S3 level. This observation was also purely discovered via the analytics service, that has sensors measuring the air content which could then be benchmarked with the standard values for identifying the deficits. According to the anomalies found, we took action regarding the premises that didn't reach the desired levels and managed to implement certain changes. (--) S3 being the minimum level that the Finnish Society of Indoor Air and Quality have set, in liters per second per person. And the highest grade, best level of conditions is S1, which from my understanding can only be reached in rare occasions. So the most common level is S2 which is already very good. Respectively,

> similar actions can be taken considering the optimal temperature levels. In the summer or in winter, based on the analytics we know whether the conditions of certain premises aren't right which often implies that the building technology such as cooling, or heating may be insufficient or malfunctioning.“

The key benefits discussed by the participants relate to the acquisition and utilization of reliable data regarding energy usage and technical solutions, which can improve the level of management and usage of a property. AI is mentioned by majority of the participants as a way to optimize the BAS and produce direct cost savings. Digitalization is expected to add value to a property, both in terms of cocrete asset value growth and for the stakeholders too. For example, reaching high quality physical conditions in the building can result in environmental certification that benefits both the tenant and the owner. Respectively, digital solutions seem to make the daily operations easier and more effective for each party in the REM value chain, based on the replies. Digital solutions were primarily viewed as a tools for optimizing maintenance and service procurement, but some respondents also addressed the ability to improve customer experience through digital processes which reduce the lead times of customers. Potential challenges of adopting digitalization were also discussed, considering the initial costs of implementing new technology and the required long-term attitude, in order to find success from it. The substantial suggestion was, however, that applying digital technologies should outweigh most of the initial investments in the long run.

> R5: ”If we look at a very typical version of a lease agreement where all the maintenance costs are allocated inside the rent of the tenant, we use the term called maintenance charges. So the savings that the owner is able to achieve through certain investments contributes to these maintenance costs which also realizes for the tenants through diminished maintenance charges as in direct surplus value, and also brings forth added value to the property owner in terms of PR so to speak. With digitalization it is possible for us to also optimize a major share of our service procurement overall, to outsource services more effectively. We may also determine the level of maintenance, i.e. the cleaning a lot more effectively via utilizing certain,

enhancing maintenance solutions, again actualizing within the maintenance charges which eventually concretises for the tenants.“

R8: ”Cost savings of course within the maintenance charges in this case, which also realizes to the users in a sense that the rent is reduced in case of a maintenance fee type of lease agreement. But also the emissions of the building are reduced, CO2 for example. Furthermore, good building rating in the form of environmental certificates can be acquired which is an indirect added value again for the owner, for when applying an environmental certificate, the energy efficiency in the building operations allows for a higher score. For the users, the example of value added relates to the level of maintenance charges. So, in terms of property economics, via enhancing the energy efficiency, the consumption and the energy costs can be reduced for the users directly impacting their fixed costs through diminished maintenance charges. An indirect point of view could be, typical for bigger organizations at least, reaching the corporate level emissions reduction targets that are supported naturally when occupying in a energy efficient property with a low carbon footprint.”

Internal processes, development and learning

According to the participants, digital transition at best supports the property administration and management through real-time tracking and improved understanding of any arising economic or operational issues. Additionally, digitalization enables automating certain tasks such as marketing, and allows for location-independent and flexible working methods for the REM experts. It was suggested that implementing digital solutions often calls for a positive attitude for the output to become positive as well, and a certain level of preparedness for data management and analyzation to begin with. Operating systems that are user friendly and feasible turned out as great tools in the daily work of REM experts, bringing easiness.

R2: ”Via digital services and solutions we get closer to the premises functioning in an optimal way, so that we can react to changing circumstances and conditions more effectively with AI tirelessly monitoring the building. We get all the automation alerts and other critical signals that are possibly ongoing, so it is essential and would be unorthodox instead not to exploit such services or possibilities in today's professional building management“

R5: ”At best, and when discussing knowledge management, to find the information in the right place and effectively can be seen as a donkey bridge to job satisfaction when a simple task requires less time and things proceed effortlessly and in a desired manner. (--) strategically, the property owner is responsible of guiding the suppliers to provide maintenance services in a certain way. And having the data from the costs for example about the maintenance expenses per cost centre, we can manage the property-specific service output of our suppliers better. I personally prefer the term levels of maintenance as something that in our company we actively monitor. So there might be assets to which we are willing to provide a full range of services, so that the technical conditions and circumstances exceed a certain level that we are hoping to reach. Whereas regarding some properties in our possession, we strategically see only having a life cycle of no more than 1-5 years left, which is where we naturally arrange a level of upkeep that aligns with our real estate strategy in this regard. So that the asset remains feasible for the next five years and is maintained for the conditions to remain healthy and safe, but aren't necessarily being improved. This way the cost level we are pursuing also remains reasonable considering the future plans for the assets and a possible exit.”

R8: ”In my opinion, the operational reliability of the properties increases significantly when there are less functions relying on the human input. Not to belittle the position of a human in this regard, but the fact that whatever the building automation can control autonomously in accordance with signals from different sensors, a machine is much more capable in processing these massive information flows compared to a person trying to manage such entirety. (--) so not only reliability, but also the traceability will improve as often these digital building solutions comprise a way of monitoring their expected output, whether it is the lighting or the AC that is under observation.”

R7: ”Surely digital solutions ease my work drastically by bringing forth effectiveness. So that I can see the processes digitally and get the reports. So instead of walking around with a temperature meter on site, but through different applications I may monitor the operations and make the required changes which is definitely something that brings effectiveness in our processes.“

Regarding the future development of digital transition, ideas of process automatization and use of robots in REM activities and building operations, were discussed. On top of that, some respondents even argued that due to the superiority of AI in conducting certain tasks, there is a possibility for it to replace a human completely

in some cases. All in all, the responses suggested that the adoption of digital solutions in REM activities can lead to improved efficiency, effectiveness and job satisfaction.

> R6: ”Since all the technical devices have become smarter through digitalization and automation, whenever there is a risk of some sort, the sensors to reach alarming levels, we get the alerts immediately with no presence required on site. For example regarding waste containers or other machinery that include sensors, which notify the need for emptying effectively in real time. Resulting in velocity and rapidity, and obviating the need for humans to be present all the time monitoring the conditions. (--) another viewpoint which came to my mind regarding the prevailing labor shortages, is that with AI and robots, this shortage could be responded to at least in shopping centres for certain businesses. That is something that could bring added value and cost efficiency, considering i.e. cleaning robots or automated solutions in outdoor maintenance. We even have our first tenants considering such solutions in restaurants; robots to pick up the dishes and deliver meals to customers. Furthermore, the robots could be programmed with simplest of greetings such as enjoy and thank you, which all in all is something that could provide first aid to the entrepreneurs, in case their option is to close out the restaurants due to lack of workforce.“

> R7: ”Considering maintenance, one of the major expenditures that we have comes from cleaning. Together with the cleaning company we have now discussed developing the process, to clean some of our premises with robots perhaps. As our cleaning costs per year are several millions, we hope to release at least some of the staff for other important tasks, and utilize robots for cleaning up large surface areas such as the terminal floors, for instance. (--) I assume this type of solution has its pros and cons, for the users always see threats in such scenarios, e.g., the robots causing a collision course in the production facilities. Yet, and on the other hand, they are interested in reducing their costs and developing the processes. So I believe a good discussion will arise from this topic, with certain compromises required from each parties to find a common ground."

4.4.2 Green transition

With a structure similar to the first theme, green transition and its focal areas were addressed in the next theme of the semi-structured interviews as displayed in figure 41.

Theme: green transition

Focal areas	Aim	Questions	Location	Focus
Sustainable development Circular economy Sustainable solutions	To discover how the principles of sustainable development impact REM in commercial properties within the case, from the standpoints of facility services, maintenance and repair, constructing, leasing, ownership, sales and marketing. Identifying the areas where circular economy realizes in the operations of commercial properties as well as pointing out tangible impacts of the green transition considering processes, spaces and humans. To examine the overall effects on the operations and services in commercial properties from the aspects of effectiveness, flexibility, and customer satisfaction.	1-5	✔ Chapter 4.4.2	Phenomenon
Value proposition Added Value Value added	To underline the impacts that green transition can have on the value proposition for owners and users of commercial properties. To identify the added value and value added that can be obtained from the key areas of green transition in commercial properties, both directly and indirectly. Specify the benefits and potential value from green transition for the stakeholders included in the REM value chain.	6-7	✔ Chapter 4.4.2	Economic perspective Customer perspective
REM activities Operations and services Future opportunities	To detect what kind of added value that can be obtained from green transition in the operations and REM of commercial properties, and in the work of the people involved in these processes. To highlight the opportunities that sustainable development and circular economy present for developing the operations of commercial properties and the REM value proposition. Evaluate the added value and value added in terms of efficiency, flexibility, customer satisfaction, and the possible impacts of green transition on processes, people, and space on strategical, operational and tactical levels of business.	8-10	✔ Chapter 4.4.2	Internal processes Learning Development

Figure 41. Theme 2 – green transition

Sustainable development

It appears that sustainable development is an important consideration in today's planning, construction, usage, and maintenance of commercial properties, thereby connecting it to the entire building life cycle. Regarding sustainable development, the participants discussed the increasing usage of energy-efficient solutions, selecting sustainable and eco-friendly materials and technical devices with long lifespans, and lowering the environmental impacts of commercial properties via accurate maintenance and repairing. Simply put, regular and timely actions regarding the property upkeep were claimed to extend the intended building life cycle and bring about multiple economic and environmental benefits for each stakeholder in the value chain. From business perspective, sustainable development has become a factor in attracting new as well as retaining current tenants. The respondents suggest that since most businesses today have certain accountability standards and goals regarding sustainability, companies now prefer business locations and occupancy in properties that emphasize and reflect green values. Correspondingly, even the institutional investors today appear to prioritize

sustainable development as a matter of image and reputation. As diverse examples of expediting sustainable development arose from the replies, most participants underlined especially the adoption of energy management systems and other digital tools for tackling any business concerns and exhibiting corporate responsibility.

> R5: ”Our company compared to other major property owners may have adopted the so called ESG concerns a bit late, but in 2021 we began developing our energy management process for instance. So first, we put our energy management systems in order by acquiring a suitable application and ensured the inclusion of accurate metadata. We made sure that 100% of our consumption data was transmitted into the systems after which we procured energy management services and consultancy for managing our energy efficiency. The way how this becomes realized to the property owner is primarily that to be able to diminish our energy usage, causing direct cost savings. This again actualizes for our end users in the maintenance charges of the tenants and expenditures in facility services, resulting in improved customer satisfaction. Our rental levels hence decrease meanwhile our customer satisfaction grows, and in addition, considering the values we want to communicate, that we take the environment into consideration, we are now on board with this type of development by demonstrating sustainability more actively in our operations.”

> R9: ”Sustainable development, more specifically ESG which is the official term used in our department, and corporate responsibility in general, strongly relate to our core business and is something the customers also want. Hence, it is something we want to expedite for it is such a hot topic and a huge driver for everyone's operations. And if not directly, it is at least affecting in the backgrounds constantly. So as much as economic things are a business priority for companies, today, the corporate responsibility matters are equally so."

Circular economy

According to majority of the respondents, circular economy has played an important role in the real estate sector particularly in terms of waste management and recycling for quite some time already. On top of this, sorting and processing hazardous waste and providing recycling options for different types of materials has been emphasized more over the recent years, partially due to the tightening

regulatory landscape and legislation, but also as a result of increased environmental awareness. Yet, and due to the distribution of liability in traditional lease agreement types, the tenants are often responsible for handling their own production waste, which is why the most eco-friendly waste management and recycling practises may not be embraced by default, by the property owners and managers.

> R2: ”Merely it can be seen in the provision of different recycling and waste management alternatives, and in case there is a specific business operation going on in the facilities that produces certain type of hazardous waste, that this could be effectively processed and sorted. But on the other hand, the operators are often the ones responsible for this, instead of the property management having to deal with these concerns.“

> R9: ”Waste management, in terms of complying with legislation and all that, has been a topic for quite some time. The level of reuse is more difficult to evaluate at least in our profession, for it is highly dependent on the operator and ofc this regulatory landscape, what can be recycled and reused from the emerging waste. On the other hand, also steered by legislation but more importantly the customer needs of today, create pressure on selecting more environmentally friendly solutions. We of course hope that in this case the costs also remain reasonable for all parties. For example, constructing green buildings with i.e. roof coatings that neutralize nitrogen oxides in the indoor air or so, the overall benefits of such solutions should always be considered in relation to the investment cost. Something that the customers address and what is also steered by legislation nowadays would be the recharging points for electrical vehicles. Then there is solar panels and green energy in various forms, which we have to consider and surely link to the operational side of things in a tangible way."

The conversations shed light especially on the trend of reusing construction materials particularly in premise modifications and in the context of renovating, as the respondents explained how this type of endeavour is more supported today including various initiatives. Regarding REM and specifically the procurement and tendering processes, the contractor’s commitment to green values and circular economy were held in high regard, which reflects to the entire chain of operations. Moreover, the respondents argued that these values may even drive the entire-supplier selection. On top of that, more efficient utilization of technology and adopting systems to support a self-sustaining energy production of buildings, were discussed: recycling of heat loss or e.g. installation of local power plants on site.

R3: ”I often try to guide the contractors already in the tendering stage with the query list that underline the reuse of materials if practicable and also to prefer products with CE marking that are classified as environmentally friendly by default. Nowadays considering the properties that I deal with the recycling is pretty advanced, having separate containers for paper, metal, glass, mixed waste and biowaste for instance. (--) the pressure in this regard is pretty much internal, to align our operating methods in terms of the query lists and documentation. And once someone notices a development area, it is actively brought up into the table. We also have a person that keeps the documentation up to date. Moreover regarding the environmental solutions and reuse, there is a responsible code of conduct being used with one of our clients that specifically emphasizes in the tendering stage. Practically, it aims for getting the contractors to address multiple areas regarding sustainable development and the construction materials, recycling of wood and metal and so forth. This pushes the contractors to pay even more attention to their service solutions, and this way the suppliers with the most sustainable endeavor may be selected for the job at least in this customership.“

R4: ”There is a waste disposal point for every property and the more it includes containers for different waste, the more satisfied the users are. We have put a lot effort into this during the last years and especially property management representatives have developed these services. Regarding reuse which is often relevant in modifications, lets say a wall should be moved by 1 metre to one way or another, to be able to reuse the old wall but instead reuse it is something at is emphasized surely, so that anything feasible is either stored or somehow exploited. Cardboard and the regular office waste surely has been collected for a long time, but for example what we have done this year based on our user feed back, is arranging containers for plastic waste for our users a lot.“

R1: ”In the retail sector circular economy has been highly emphasized in terms of waste management and recycling at least. For example bottle recycling regarding the required technical solutions is something that comes to mind first, utilizing the high-end technology at the time. Also, for the retail sector identifies as the forerunner in refrigeration system solutions and efficiency in this regard, another important thing is to of course set the reuse of the condensation heat, so that the excessive heat is recycled in the buildings. So once the refrigeration systems produce condensation heat, it is stored and recycled to support the heating systems. And thereby the retail property may have a self-sustaining heat production for major part of the year."

Storing and exploitation of reusable materials were linked to modern property development and project managent activities by the respondents, almost as a prerequisite. The participants also deliberated on the “green code of conduct”, considering the procurement and purchasing processes in REM. It appears that today, evaluating the carbon footprint of the actions as well as the selecting the most evironmentally friendly construction methods and materials, are in favour. Moreover, some participants argued that avoiding demolition of properties may even be a guiding principle in their selected real estate strategy, driving them to prioritize sustainability and life cycle thinking in the financial planning and property development. Ultimately, to engage all the stakeholders in the value chain into the consideration of environmental impacts and carbon footprint, appears to be worthwhile in today’s REM.

> R5: ”We prefer the term service network, so as the property owner, and regarding our properties, the construction is steered by the service network of our end users. In case a property is let from the service network, we primarily attempt to recycle and reuse the existing furniture. And once the property is excluded, or ends up vacant, it becomes a development property for us, resulting into a possible realisation, development in land use planning, or subleasing. So principally, we avoid the demolition of the properties and regarding major renovations, new construction, and for some of the smaller projects, we bring along the carbon foorprint calculations, comparing the carbon footprint of different construction methods. Say, we have a property that is approaching the end of its technical life cycle thus calling for an overhaul or demolition prior to new construction, which is where we consider the options from the carbon footprint perspective and apply this into our final decision making.“

Sustainable solutions

As discussed, various sustainable solutions in commercial properties highlighted by the respondents such as the exploitation of heat recovery within the air conditioning and refrigeration systems, to support the initial heat production with recycled waste waste energy. Other, more traditional examples of sustainable solutions had to do with the provision of waste management alternatives within the buildings, i.e. providing separate containers for different types of materials. Yet,

the respondents mentioned ways of advancing the waste disposal with smart sensor technology to monitor the utilization rate, resulting in diminished emptying frequencies for the containers.

> R7: ”We have separate locations for containing different types of waste that are then disposed to larger containers at the waste dock. We also have suppliers for emptying these containers, and via our energy reporting systems we are able to specify how many tons of waste each emptying has included for using them on full capacity, to reduce the need for emptying overall. Simply because that is disadvantageous financially and for the environment too, to empty half a waste press.“

Furthermore, a few respondents discussed new opportunities from locally producing either electricity or other commodities on site, which could also be a way of maximizing the space utilization rate of the property by utilizing the rooftop for instance. Such innovations along with other sustainable solutions also contribute to applying an environmental certificate, which appear to be highly appreciated by both the owners and the users. These certifications, however, often call for high standards and may require major overhauls and renovations prior to applying for these certificates.

> R6: ”If you look at property owners, in a sense they compete in terms of who is the most capable expediting the green values, for the built environment infamously is considered to load the environment heavily. So sustainable development surely is a part of our everyday work in various ways. Considering both the supply and demand in tenancy, there is a competition between property owners to be able to provide the greenest possible outcome and services. And some brands are very strict in terms of occupying just any property, but instead they tender out the available business premises based on these green values. And in construction this is considered a lot of course, which can be seen in decisions made by the owners. It is important to have environmental certificates today and be able to communicate this, but also something more visible that is done for the customers lately at least in shopping centers is that we i.e. have a beehive on the rooftop for local honey production for our cafeterias to utilize as for one example out of many. (--) LEED and BREEAM have been the desired certificates which are pursued, to first achieve and then be retained within all our properties. Today, however, it isn't enough to have just any certificate, but it has to exceed a certain level as well. So, thinking back five years when something might have been enough, now the baseline is to only apply for

the certification once it is guaranteed to reach a certain level. The level good is pretty much a prerequisite in each of our properties, but even with this there might be challenges due to the original intended use of the properties not being a shopping center, calling for major overhauls and renovations into the building automation for example. In one case, we decided to postpone seeking a certification until ensuring the utilization of the condensing heat from our retail tenants, in order to get a higher score. Also, we decided to renovate the rooftop prior to this, to set up solar planers which would also bring extra points in this regard."

R8: "Following the objectives of sustainable development, for example the waste management is optimized, minimizing the amount of mixed waste through user guidance. But also, that we unanimously take away such containers and replace them with plastic and energy waste bins so that any type of waste causing more stress on the environment is diminished and furthermore, that we may have reusable waste ready and sorted already on site. Then of course, regarding green areas which have been highlighted as well as the biodiversity aspect, we have planted beehives on the rooftops from which we could produce honey, also serving as a marketing trick apart from the local honey production available for the users, which is actually quite plentiful. So, a great marketing act for the property owner, but also a strong statement on their values, the eco-friendliness. Of course, in the background there is the desire for environmental certificate, BREEAM or LEED. From the green areas, and from sustainable development and circular economy in general, you reach a high score. And the better the score, the stronger the comparable portfolio for the owner once they overview their distribution of ownership in different countries for instance. In case things are done well in Finland, thus reaching high BREEAM scores, it increases the value of the Finnish portfolio in the eyes of the owning company. (--) in BREEAM the highest grade is outstanding, which is something that I believe not many properties in Finland has been granted. The owner, here in my case, aims for excellent gradings in all their assets which is very good result already. And even with completely new properties, the possibility of reaching excellent is not for certain, implying that this requires a lot of effort regardless of whether it is new construction in question."

Value from green transition

Regarding the customer value proposition, sustainable development and circular economy appear as core values that both property owners and users are increasingly embracing in their operations. Property owners seem to have an interest in reducing energy procurement costs by utilizing waste energy for heating purposes

for instance, while the users may also seek cost savings from more energy-efficient solutions such as LED lighting. Energy optimization was considered not only beneficial for the environment and the expedition of sustainable development, but it appears to save both the users' and the owner's money, based on the replies. At best, sustainable solutions thereby bring cost efficiency and effectiveness for the owner and helps with satisfying the given value propositon as a result, when the occupants experience less disruptions and disturbances.

Depending on the agreed lease terms, the users may also experience direct financial benefits through diminished maintenance charges. Also, for example the local power production of the building reduces the need to purchase energy, which often realizes financially for the tenants too. The participants implied that property owners today are more concerned about their image and the level of accountability that they show in their operations. Respectively, the tenants also pay more attention to sustainability, when considering potential occupancy for instance. Correspondingly, property owners today tend to expect the adoption of green values from their service providers and possibly, even compliance of the commonly agreed environmental targets. A certain level of sustainability reporting is therefore required from the entire stakeholder network, involved in real estate business today. According to the respondents, property owners today should be well-communicated in terms of the building sustainability. Respectively, the corporate responsibility of the tenant companies often actualizes in their physical business enviroments and location. To satisfy the value proposition or to develop it in Finnish commercial properties, some respondents emphasized the divesification of facilities with decoration elements such as green walls or other features that not only contribute to user satisfaction and comfort but also allow for the occupants to reflect and communicate green values in their own business.

> R5: ”Primarily, this comes down to certain type of engagement. If we as the property owner are committed to the regional carbon neutrality targets, we respectively expect our service providers and all the operators

> dealing with our property except for our tenants, to comply with these targets too. In case we buy REM services, for example property management or landlord services, we expect the managers to operate in accordance with our choices and values. Whether it is energy efficiency; they should observe, and act based on these values in case they find ways expedite things or report about them so we can together decide on the required investments or changes whatsoever through building automation. We don't specifically have a value proposition for our tenants in terms of the carbon neutrality targets, but instead we have expedited these things spontaneously according to our values, now strongly committing to these targets. And when we are proactive with this as the owner, surely it is a great asset and an advantage for us, that the end users receive tangible benefits within their maintenance charges from their occupancy in a green building. With current lease contracts the tenants are not really in the position of demanding these things from us, but as said, this is more based on co-operation and us being proactive for these things are common for everyone."

In summary, key benefits of green transition have to do with increasing the property values by adding to their reliability and reputation, to attract new tenants and increase the market value of the property. Furthermore, it can be argued that property owners shall save money by implementing sustainable solutions, but the owners and tenants both may upgrade their brand and image as responsible and considerate operators who embrace sustainability. Codes of conduct driven by green values, according to the respondents, bring about long-lasting and environmentally friendly practises, which result in cost savings in the long run. While the owners and tenants benefit from being "green" considering their business image, there are also positive impacts for the attractiveness of the buildings considering the visitors and end customers. At best, sustainability can even become the deciding factor in tenant's decision-making, as companies seek business environments to align with their coroporate sustainability targets. Based on the replies, it can be said that sustainability is a business driver for the property owners in this regard.

> R4: "The property owner in their strategy of course defines the operating models and for sustainable development and circular economy are such a big deal nowadays, the monitoring of ensuring and expediting these things is also strictly conducted by the owner. It is a image first type of thing, to be a forerunner in this regard. And oftentimes if the neighbor comes up

with something innovative regarding sustainability, it is duplicated by the masses quite rapidly if the solution turns out to be beneficial. Such accountability theme is something that all major property owners seem to have in the core of their operations. So it is present everywhere, especially in maintenance management, whereas in my profession I must acknowledge these things primarily for bringing them up in the lease negotiations. The users are also very aware of these things, as negotiations about available premises nowadays often involve sustainable development related questions alongside with the address, certain features of the building and the level of rent. So it is a big factor today, in case a customer selects the neighbor over your property, that the accountability perhaps wasn't taken into consideration well enough compared to the other location. Or that sustainable development wasn't conducted in a sufficient manner overall, and the lessor didn't have any follow up development initiatives planned for this anytime soon or in the near future, which drives the customers to look for better solutions."

R8: "This particular owner and the properties I am responsible of managing are representing very strong green values. So their object is to gain energy savings as well as reduce the CO2 emissions from their buildings that can also be reported to the public. And from my point of view, with digitalization and digital solutions such as the HVAC analytics or development of the building automation system, reaching these objectives is possible. So in this case, a year after the launch of the analytics service, a summarizing report was made from which we found that we had managed to diminish the energy consumption of the building by 24%, which measured in euros implied to a 75K of cost savings annually. The investment cost into this service is 5,6K a year, so it was immediately paid back for over the next ten years. For users, the value proposition of safe and secure premises actualizes with the conditions complying with the official indoor standards. In this particular building, the classification of indoor environment was examined to be S2 generally, some premises even reaching the S3 level. This observation was also purely discovered via the analytics service, that has sensors measuring the air content which could then be benchmarked with the standard values for identifying the deficits. According to the anomalies found, we took action regarding the premises that didn't reach the desired levels and managed to implement certain changes. (--) S3 being the minimum level that the Finnish Society of Indoor Air and Quality have set, in liters per second per person. And the highest grade, best level of conditions is S1, which from my understanding can only be reached in rare occasions. So the most common level is S2 which is already very good. Respectively, similar actions can be taken considering the optimal temperature levels. In the summer or in winter, based on the analytics we know whether the con-

ditions of certain premises aren't right which often implies that the building technology such as cooling, or heating may be insufficient or malfunctioning.“

R8: ”Cost savings of course within the maintenance charges in this case, which also realizes to the users via reduced rents in case of a maintenance fee type of lease agreement. But also the building emissions become reduced, for example CO2. Furthermore, a good building rating in the form of environmental certificates can be acquired which is an indirect added value again for the owner, for when applying an environmental certificate, the energy efficiency level of the building operations determines a higher score. For the users, the example of value added relates to the level of maintenance charges. So, in terms of property economics, via enhancing the energy efficiency, the consumption and the energy costs can be reduced for the users directly impacting their fixed costs through diminished maintenance charges. An indirect point of view could be, typical for bigger organizations at least, to reach the corporate level emissions targets that are supported naturally when occupying in a energy efficient property that has a low carbon footprint.”

Internal processes, development and learning

Based on the replies, the most significant benefits from sustainable development and circular economy can be achieved when these principles are applied in the management and operations throughout the entire building life cycle. This not only ensures all the technical information to become stored adequately, but also enables the exchange of relevant information and feedback also in the future. Especially for project management, and in case of a new property acquisiton, the saved information helps with the identification of the improvement areas drastically. Through more accurate project planning and execution as a result, the tangible benefits have to do with resource and cost efficiency as well as job satisfaction. Most respondents mentioned that sustainable development and circular economy principles frame a certain code of conduct to steer their work. Also, the external landscape today encourages the key operators towards more sustainable operating models, due to the positive financial and operational impacts found for every stakeholder in the value chain from sustainability. For some respondents, to

be able to express environmental accountability in one's daily work, had positive impacts on their personal job satisfaction.

> R3: "Basically everything begins by knowing that you are doing things the right way which is what really creates added value for the owner and the users at the end of the day. It gives you confidence in your work to feel you're on a right track and improves job satisfaction knowing you're doing the right things. And you may proudly announce that your company's actions are on point, exhibiting professionalism in whatever you do, allowing for to better sell those services as well. When you initially aim for the long-lasting solutions that are data driven, and the processes are systematic, it brings effectiveness not having to consider things case by case. Instead, the sustainability viewpoint becomes self-evident in everyday activities and this adds to the overall job satisfaction. Also, from the contractor's point of view, it becomes crystal clear for them to operate by complying with our policies, and I dare to argue that they are also pleased in making meaningful, sustainable work and not having to do things all over again in two years or so. The premises are kept in a good shape, the processes are standardized which satisfies the owner eventually, for things are taken good care of and the value of the property is maintainted making it easier to comercialize or sell them forward."

> R8: "There is a personal meaning to be found in sustainable development and eco-friendliness, for me to be able to have an impact on things. For example, with one customership, we made a transition of using only exhaustless electricity and district heating in the properties. And this contractual change alone of purchasing only CO2 free products, we were able to prevent 3,5million tons of CO2 emissions annually from emerging. And that, could be seen as my personal carbon footprint to be covered for many years."

It appears that data, digitalization, and new technologies are highly interconnected with the context of green transition, at least in terms of building maintenance and construction. Many participants emphasized the need to reduce the overflowing repair debts not only in singular buildings, but considering the entire Finnish building stock. Thus, the respondents emphasized the need for built environment to be developed with long-lasting sustainable solutions. Adopting sustainability, based on the replies, is clearly bound to also the modern digital solutions and technologies as the key amplifiers for energy efficiency as well as more sustainable property upkeep and development.

> R2: ”If you wish to look for a deeper meaning from REM, it can be quite meaningful what could be done in this field of practice at the end of the day. As climate change and environmental concerns are pretty discussed themes meanwhile buildings consume 40% of all the energy in Finland, we are in quite a relevant position here in this sector in terms of having a positive impact on things through your own work. To rationalize the energy consumption and prevent energy losses which is quite meaningful and probably is the most meaningful thing one could do in this regard.“
>
> R3: ”For certain Finland has a lot of repair debt. So when we execute repairs and projects in the buildings, the solutions have to be long lasting. So that we can decrease the debt of repair debt and maintenance backlog at some point. Through this we continuously create value, by doing things properly which creates value for both the owner and the tenants. This way the properties maintain their condition, and I dare to say that they are also more easily developed once the necessary repairs are done in time and with correct methods, creating space for property development too. The owners hardly find time for property development if there is continuous repairing going on. This might be doable, but probably becomes a lot easier once the repairing has been on point.“

From economic perspective and especially in the present times, an urgency for reducing operational costs in commercial properties was discussed. The costs of living are constantly increasing through i.e. rising utility prices, and the property upkeep must also become more sustainable and ecological for the rent levels to also stay reasonable. Aligning the service provision with green values is of essence in this regard, and may in fact turn into a business opportunity, emerging new operating methods and service solutions to the markets. Eco-friendliness and energy efficiency were repeatedly underlined as important objectives in the case companies, and is something that internal education within the case organizations primarily focuses on. As new trends arise from the world constantly, the participants agree that they should also be adjusted to, for the companies to stay competitive. All in all the participants agreed that there is still lot to be done in terms of sustainability in the real estate sector, despite massive actions regarding energy consumption for instance are already taken today. The key concepts of green tran-

sition, sustainable development and circular economy, altogether appear as something that customers today are expecting. This forces property owners to react and modernize their old habits.

4.4.3 Information and data

The structure of the last interview section, information and data, is shown in figure 42.

Theme: information and data

Focal areas	Aim	Questions	Location	Focus
Data collection Data utilization Data solutions	To understand about the collection and utilization of data and information in commercial properties, from the perspective of processes, people, and space. To discuss the benefits considering effectiveness, flexibility, and customer satisfaction. To identify data solutions that are impacting REM and being used in Finnish commercial properties, and how they connect to digital and green transition	**1-5**	✔ Chapter 4.4.3	Phenomenon
Value proposition Added Value Value added	To gain insight into the effects of data and information considering REM value chain and the value proposition for owners and users. To find out, what added value and value added, direct or indirect, can be obtained from information and data considering REM and the building operations	**6-7**	✔ Chapter 4.4.3	Economic perspective Customer perspective
REM activities Operations and services Future opportunities	To understand the role of data and information in REM activities and in Finnish commercial properties. To identify the areas of influence of information and data on operational, tactical and strategic levels. To address how data exploitation contributes to the internal processes in REM activities as well as the building operations. To discuss possible development areas and future trends	**8-10**	✔ Chapter 4.4.3	Internal Processes Learning Development

Figure 42. Theme 3 – information and data

<u>Data collection</u>

In commercial properties, data can be collected from many areas, but according to the respondents it primarily has to do with measuring the functionality of different building systems and their output quality. Data aggregation through building automation was highlighted in this regard, for various crucial indicators that arise from the automation systems fundamentally drive the necessary actions especially in property and project management. Information about system failures and repair needs, as well as the transmission of service requests in real time were described as the cornerstone for high quality REM by most respondents. Furthermore, energy consumption levels, or historic temperature data for instance, can all be stored into digital systems for observation. Monitoring this data that is

stored autonomously by the BAS, and transmitting it into digital service manuals, enables knowledge management in REM to some degree. Even more advanced methods, such as detection of CO2 concentrations from the indoor air for adjusting building conditions, were brought up in the interviews.

> R1: ”At least this has resulted in increased importance of the collected information and data and to the reliability of, which must be monitored and paid even more attention to for the data to be utilized correctly. Then of course, the developing digitalization and digitalizing has helped with data collection, analyzing, and management. And the developing technology, machinery, sensors and everything produce deviation reports more rapidly and in real time when reacting also becomes faster.“

According to the replies, the baseline for adequate data collection in commercial properties primarily relates to the BAS, most of which today embed smart sensor technology. In terms of more traditional type of data collection such as user feedback and occupancy experiences, some respondents estimated this as equally important for developing both the building operations and facility services. The likes of customer data, such as user frequencies, sales and information about the tenants’ business solvency, were especially addressed by respondents who specialized in leasing and ownership activities. Conclusively, the user data and feedback as well as measuring the building efficiency both operationally and economically, characterized as the capital data in REM. Overall, data collection in commercial properties seems diverse and the data is utilized in operational, tactical and strategic decision making. On top of that, the participants estimated that the use of data and information is only expected to significantly increase in the future, partially as a result of the industrial revolution, as well as new paradigms and technologies which emerge new innovations in this regard.

> R2: ”Through acquired information and data the property owner has a much better understanding about the actual use of the building regarding its space utilization rates and everything, displayed by the building automation. For example during the pandemic, when the premises became unused due to remote work, significant decreases in the use of water and other utility consumption was detected and thus some of the premise temperatures could be adjusted according to the low utilization rates at the

> time. (--) so with data picturing the status quo of the operational environments, also the conditions can be optimized to be more beneficial for the users, causing indirect added value for the occupants though this type of measuring and monitoring.“
>
> R3: ”In a way data and information form the baseline for doing the right things at the right time. And thereby, provide the users and the owners with cost-efficient and the best possible solutions at the time.”

Data utilization

Fundamentally, data utilization contributes to both the internal operations of the properties as well as their technical performance. In property management, data establishes the identification of issues, such as anomalous energy levels or water leaks, and therefore drives the renovations and modernization projects to follow. Finding flexibility and usability from the physical environment becomes easier with data utilization, according to some respondents. For every operator in the REM value chain, data-driven decisions often turn out as more reliable, and should be applied to the decision making together with the personal expertise of the REM experts, for best possible outcome. Data utilization should also be conducted both operationally, strategically and tactically, looking at the various examples given by respondents about daily issues in their work. The most advanced digital platforms today even allow for encasing all the essential information in one location, which can be considered added value for the work of REM experts. Therefore, sufficient data management tools help analyzing and understanding any technical failures and errors, but also allow for better business forecasting. Thus, information and data contribute to different business levels, bringing economic and operational efficiency. First and foremost, the respondents emphasize careful data management, for the data to turn into applicable information.

> R1: ”Simply, any failure and repair requirement information is utilized in the operational process for they always triggers the required, following repairing process. Not to mention the energy management data, which is utilized and forecasted in order to make rapid changes and repairs to avoid

> unnecessary energy consumption. So first and foremost, the information and data enables the property owner parties to prepare for massive renovations and modernizations or renewing of the machinery and equipment of the building in a data driven manner, or to be included in their long-term planning.“
>
> R2: ”For example, by monitoring and staying on track with the consumption data and identifying the factors with the biggest influence on this, data utilization enables reacting on time and planning the upcoming repairs to improve the circumstances. Or in terms of the operational activities, to be able to pinpoint and interfere with possible water leaks or something, with the help of certain energy meters and indicators.“
>
> R5: ”From operational point of view it is essential today to find space efficiency, flexibility and usability from the facilities so the consideration of data and information can be utilized for improving these things and finding more effectiveness and efficiency.“

Instead of relying on one’s gut feeling, the respondents underline the ability to make timely and accurate decisions by utilizing data. Regardless of the issue in question being short or long term in nature, digital platforms are of essence in processing and analyzing the given data, to extract it into valuable insights for final decision making. Especially during the past three years of global pandemic, which has caused changes in consumer volumes and sales, the respondets stated that information and data has eased the detection of these economic changes as well the identification of modern customer requirements. In leasing and ownership practises, the data acquired from BAS systems that digitally link to the service manuals, provides both owners, tenants or potential buyers all the relevant background information of the physical building conditions. From either financial or operational stance, the evaluation of the building performance today should be be data-driven and clearly visualized through modern digital tools.

> R6: ”In our business, a lot should be based on information and data rather than gut feeling, which is sometimes necessary too of course. In many sectors for example considering the user volumes becomes the driver for the investment decisions made by the owners. Does the property need more visitors which may call for investments for it to become more attractive to

> the customers. And considering new tenancies, different brands are interested in our customer types and volumes based on which they might decide the decision about potential occupancy. Also where to locate your business premise is evaluated with the information and data that we may provide as well as the general feedback from the commercial property which drives the decision making. And also steers our decision making, should there be more guidance in the building or anything negative that we should react to. So by following the customer path based on the collected data enables us to make decisions. (--) Through statistics by Finnish Council of Shopping Centers KKY, or RAKLI Ry, where all the Finnish shopping centers may report customer volumes and sales data, the owners can observe this things and even make acquisition decisions based on the information. That is probably how information and data are utilized at its highest. There can also be digital platforms to observe things from, and something that especially during the last three years has become important is to recognize how the data has changed during the pandemic regarding user volumes, sales etc. Another important area regarding these buildings may be the number of customers coming by car, the possibility for public transport and its importance to the business, average order values, and terms like that."
>
> R6: "Of course it eases the daily operations and enable arguing your decisions, which also increases the job satisfaction in general. To have your arguments based on data to the owner and the tenants and customers helps a lot in terms of handling feedback and complaints. To have 130 tenants overall to do business with, various opinions may arise from the crowd in which data helps the argumentation instead of emphasizing your gut feeling, and also provides backup and in some cases an exemption from liability. In terms of job satisfaction, to be able to rely on the graphs and statistics helps massively in case of a conflict."
>
> R8: "My personal point of view is that decisions should always be based on collected information. Generally, if a decision is made with gut feeling, it becomes hard to estimate the actual benefits of the action or investment which the owners also agree with. So, to be able to target the invested finances into the right objects."

Operationally and tactically, the respondents suggest data utilization to actualize in various systems for measuring the technical conditions and performance, enabling precise reacting. With the help of AI, data can be efficiently used in targeted marketing and customer acquisiton also, according to those dealing with especially leasing, shopping center management and property ownership. The ultimate

goal, stated by most, is to maintain and increase the value of the real estates through fact based and accurate decision making. From economic viewpoint, it appears that the importance of data collection and analysis are evident in finding competitive advantage. The responses imply that data should therefore be exploited first, to ensure the basics such as safety and security but furthermore, data solutions allow for reaching prime conditions and providing excellent customer service. Even basic corporate management processes today actualize in digital solutions such as access control, timecards, etc. which are bound to the physical building environment. From this viewpoint, the data solutions of real estates can also be seen as the facilitator for organizational working policies.

> R1: ”A lot of information is gathered. But on behalf of retail properties, I would emphasize the data aggregation of usage and maintenance, especially regarding the functioning and failures of the technical systems, the need for repair, life cycle information and real time maintenance and repair requirements entirely. And generally, the amount, quality and status of the service requests that emerge in terms of usage and maintenance.“

> R4: ”Data is utilized of course and once the data is collected, it is also mandatory to manage it, so to speak. Simply to go through the information in different corresponding task forces. In case of big, important things, the property owner often takes a stand on it and the identified improvements are proposed for example in the next year's budget and thus scheduled for execution for the future. So in terms of how the data is utilized and then implemented in practice eventually, the outcome is very much a reflection of the collaboration between REM decision makers and the owner. A core principle in real estate business and REM is at least to prevent the properties to decrease in value.“

> R9: ”From our operations within asset management, for example on how we contact our customers and make offers etc. And we have certain systems for closely monitoring and analyzing this. So in a company like us, there is a high emphasis on collecting all the data available regarding euros, different procedures, with advanced aggregation systems and approval methods overall. Perhaps we are less emphasized on monitoring basic functions such as the property management related activities and the actions of the managers. Those things can be monitored in other systems surely but is something we have less emphasis on."

Addressing the problem areas with information provided by digital tools creates the baseline for sustainability and expedition of circular economy also. Not only the data driven actions are more timely, but the accuracy adds to the profitability and longevity of the buildings, based on the replies. Operational data as well as collected customer feedback to this day, are actively contemplated in different taskforces, for constantly improving the service provision and staying competitive. In addition, the respondents state that property development in case of i.e. new occupancy can be tailored to meet the modern customer needs, based on the acquired knowledge. Information and data utilization therefore not only help closing out business deals regarding new leases, but establish improving the business by setting direction for the future.

> R5: ”Considering the big, strategic picture, first the information flow from the buildings is massive i.e., information of energy consumption and history of defects. Different acts and schemes drive certain projects with all the documents creating project banks. Unfortunately, all the information emerging typically falls under different portals from the owner's perspective. The owner usually hopes for the information to be accessible in one place which isn't often the case. So significant deficiencies can be identified regarding the integration and migration between the operating systems. And of course, how the information can be accessed, just like we have some of the information stored in the maintenance supplier's own systems which we cannot access fully. And this was strategically speaking but can be similarly applied to the operative standpoint where for example in case of an accident where a repairer needs certain structural diagrams, HVAC diagrams, so how this information doesn't always find this person although we know for sure it exists in various portals.“

The key for sufficient data utilization according to the replies is to synchronize the various data flows in order to produce feasible information. The respondents imply that with adequate data collection and interconnected data transmission, the entire data chain is in sync, establishing timely actions and accuracy. Via digital channels, the users may now make service requests without dependence to either time or location. Advanced solutions such as data studios for capturing all the relevant data were mentioned by some. These systems store the user data in multi-

faceted ways, allowing for the monitoring of the entire customer path. One thing that most respondents addressed in their replies, connects all the three themes of twin transition together. The respondents agreed that in today's business, information about sustainability and circular economy compliance should be communicated by organizations digitally. Simply put, companies should promote their environmental accountability digitally and online, and use data to support and validate the company image as a responsible operator.

> R1: ”Considering data solutions, how new is the building automation system in a retail property for example and how it is synchronized to the service manual is of relevance. Also, what type of data collection and data transmission are preset as default, so that the entire data chain is synchronized correctly and sufficiently for it to provide accurate information.“
>
> R5: ”Considering the big, strategic picture, first the information flow from the buildings is massive i.e., information of energy consumption and history of defects. Different acts and schemes drive certain projects with all the documents creating project banks. Unfortunately, all the information emerging typically falls under different portals from the owner's perspective. The owner usually hopes for the information to be accessible in one place which isn't often the case. So significant deficiencies can be identified regarding the integration and migration between the operating systems. And of course, how the information can be accessed, just like we have some of the information stored in the maintenance supplier's own systems which we cannot access fully. And this was strategically speaking but can be similarly applied to the operative standpoint where for example in case of an accident where a repairer needs certain structural diagrams, HVAC diagrams, so how this information doesn't always find this person although we know for sure it exists in various portals.“
>
> R9: ”On a upper management level, it enables observing where the markets are going, what is our position and what should be expected from our future operations. The first thing naturally regarding information and data is to ensure that it is correct and accurate which is something we must verify and make sure. After this we may analyze and derive actions for the operational levels to implement. But with so many different systems to be integrated in order to produce accurate information, it requires quite a lot of resources, analysts, to go through all this."

<u>Value from information and data</u>

Information and data were said to seal the value proposition from the owner to the tenants. The promised, safe and secure environment for the users, are best taken care of with data-driven optimization of the conditions. In case the customers are promised a modern and eco-friendly business location, yet the building data implies to high consumption levels, use of fossil fuels and so on, a contradiction in the customer value proposition emerges. Information and data help the owner to draw a clear picture about the actual state of the building, meanwhile the users also expect this to be communicated transparently, for considering all the pros and cons of the building. Thus, staying on track with the status quo of the properties and being able to adjust accordingly to changing environment comes from adequate data utilization. Property-specific knowledge management can make the entire chain of operations more streamlined and efficient. Through data-driven management, it also is more likely for the asset values to increase, most respondents claim. Information and data were also underlined by the respondents in a sense that they can make REM activities more convicing, by making the objects measurable. Some participants even highlighted rather revolutionary benefits from modern digital solutions in commercial properties today. For example, it is possible to create virtual counterpart of the building, and the manager is able to monitor all the conditional factors such as air flows, CO2 values, and temperatures both in retrospect and in real time. Moreover, this can be done completely remotely with the latest digital tools.

> R8: ”Information and data have a significant impact, as discussed. Knowledge management is always more convincing and can bring forth more measurable results. So the conditions measurement for instance, to observe the reality in case we get a complaint of the premises. For example, there is one property that I am managing, from which we have created a virtual twin. So that via the virtual twin, accessed from my own computer, I am able to monitor the conditions, the air flows, CO2 values, and temperatures. And in case of a complaint, I can click the premise in question and observe the conditions retrospectively from the past month for instance, from which I can also create a graph to be presented for the users about the conditional variations. (--) the digital twin is something we have implemented with one of our service providers in one of our properties in 2020.“

> R8:” In a sense I'd say that my own work will change in the future drastically. Virtual reality will definitely be highlighted and even virtual properties, instead of on-site visits. So that most of the work happens behind the screen, monitoring and addressing the concerns of the functionality and behavior of certain building parts. And even to the extent of having sensors in all premises for predictive maintenance and prevention of leakages for instance. So instead of having readable main meters for detecting possible leaks, or the level of surveillance based on leakage alerts, we could have complete sensorization for remotely monitoring any leaks and repair requirements from one user interface.

In terms of added value and value added, the economic and operational benefits of monitoring and analyzing consumptional and failure data of the buildings were emphasized the most. Data and information simply allows for strategically planning the long term, but also to accurately respond to customer needs on the spot. Businesswise, regarding commercial real estates, data-driven property upkeep helps with maintaining high occupancy rate, which is a key figure for property owners. Furthermore, to be able to track down, and draw conclusions from performance indicators such as occupancy rates, sales, revenues or rental incomes, the owners may forecast their business which makes data and information an evident business driver. The participants argue that even if it often requires patience for such investments to “pay back”, investing in data solutions should benefit the commercial properties through value increase and costs reduction in the long run.

> R6: ”We have a specific data studio, a place for data storing. Including the visitors, data from our users' business regarding their online popularity, and also if we have a campaign with multimedia advertising, there are a lot of data via different channels of the income levels and the ages stored in the data studio which enables the comparison between current and past campaigns for further decision making. The property owners are also provided with comparative tables providing graphs about annual sales and all that for supporting their actions. Also digitalizing the sustainable development and circular economy compliance has become more important, to be presented to our customers by displaying these things and our accountability measurements online for our customers. With a rather simple system that is currently in use, we also acquire visualized data graphs from our online visitors of the shopping centers. In marketing there are algorithms that may then forecast what improvements should be conducted in social media for example, very intelligently. So not only cookie policies and other

> simple marketing functions, but also very developed and AI driven actions such as re-marketing and re-targeting with certain tracking links in the websites to monitor the customers for predictive marketing and advertising. It also creates opportunities for the tenants' business operations which we have to consider, in spacing solutions for example. To try on clothes or have the possibility for measuring the sizes virtually or with specific applications, or whether there are QR codes to access such services and all that.“

The participants explained various added value attributes to be found from data exploitation. In terms of the technical potential, the way smart sensors for example already collect indoor data or determine the emptying points of waste containers automatically, can be seen as added value. Also AI can independently take care of digital marketing in some cases. Such things exemplify the impact of data and information, once they become mixed with modern technologies.

> R3: ”In a way data and information form the baseline for doing the right things at the right time. And thereby provide the users and the owners with cost-efficient and the best possible solutions.”

> R4: ”Property owners determine their values according to which they expect us to operate, and the operational sufficiency is thus validated with data and information in terms of how the value propositions of our properties are provided in practice for instance. In terms of accountability, something that is central for the owners is how to measure these things and how their corporate responsibility becomes realized. And for the users of course, what is promised to them and what type of values to expect all become actualized through our actions regarding the property.“

> R5: ”So one explicitly valuable factor has been the condition measurement based on which we can verify and ensure the safety and healthiness of the indoor conditions of the premises and present it to the end users and customers. So that is something that has been a direct upgrade to our service delivery as a property owner, over the past two years.”

> R6: ”What could be seen as the main priority for the owner and as the most important thing, is how and what kind of data we are collecting. For this also relates to not only the various impacts, but also solely to the value growth of the property.“

Internal processes, learning and development

Data and reliable information turn out to be the prerequisite for diligent and proactive REM and CREM in today's business. The respondents agreed that mistakes and incorrect solutions will always be made, yet they emphasized the role of information and data for preventing or replicating practises considered as counter productive. The participants imply that their expertise has become more and more measured in the ability of interpreting and utilizing data; for reinventing old methods as well as replicating the best practises. With correct REM systems in place, the respondents claimed that all the relevant information for executing REM professionally can be possible with one, single interface. Data solutions and data management systems that are user friendly, therefore appear to be highly advantageous in REM professions, by bringing forth more speed and productivity.

> R4: " Considering my work, the more we have digital systems i.e. for the leasing process, maintenance or management, those become extremely essential. As an example, which is kind of a quantum leap to the future is that we have a cloud-based system in the developing that is a direct tool for REM. With this the owner can operate with zero excel sheets, for it is a cloud-based platform where all the property specific data can be found comprehensively as well as the rent rolls. It encases the active operations of the building, the long-term planning, the lease administration and everything else in the same place that can be modified in real time and will be updated within the next 24 hours online. All the blueprints are also found there enabling space planning and development, having such tool in all our customer ships would be awesome. Although developing this system is time consuming and quite valuable. However, it brings forth effectiveness, decreases working hours with everything found in the same location and can be used for sending offers with all the required information for the receiver included. Strategically it is thoroughly planned process which to the operative side of things has been made as simple and useful as possible to do business and assist the daily operations."

In terms of financial planning, data and information in compiling the budget proposals and allocating finances between property assets is essential As modern data systems allow for reporting the operational and capital expenditures as well

as the year to date total spend, the whole organizational chain of command stays up to date with the data being shared on all corporate levels. Investment assessment regarding major renovations and calculating their payback periods and financial benefits, is by default a data-driven process today according to the respondents. In international companies especially, the organizational policies as well as strategy implementation for regional business units is possible with information and data. Thus, reliable information is of essence in setting the operational, strategical and tactical direction of the company.

> R9: ”Those are the basis for everything surely and in a company like us, where the headquarters are located abroad, meanwhile we are operating here in Finland, the policies as well as the operating systems must be very straightforward and transparent. And this way, in terms of measuring the business operations, also the regional operations can be monitored from our headquarters.”

Albeit pointing out its limitless potential, the participants collectively agreed on the underutilization of information and data in the real estate sector. The respondents expected the future to hold more advanced digital solutions in commercial properties, perhaps utilizing QR codes, augmented reality and virtual technologies. The readiness of customers to welcome such digital leaps should be estimated prior to implementation, according to some. Moreover, the return of investment should also be deliberated on before taking the initiative, preferrably with a data-driven approach.

> R8: ”In a sense I'd say that my own work will change in the future drastically. Virtual reality will definitely be highlighted and even virtual properties, instead of on-site visits. So that most of the work happens behind the screen, monitoring and addressing the concerns of the functionality and behavior of certain building parts. And even to the extent of having sensors in all premises for predictive maintenance and prevention of leakages for instance. So instead of having readable main meters for detecting possible leaks, or the level of surveillance based on leakage alerts, we could have complete sensorization for remotely monitoring any leaks and repair requirements from one user interface.“

5 DISCUSSION

The final report of the AI 4.0 programme was published on October 24 2022. Regarding the grand vision of making Finland a winner in the twin transition, three development areas were highlighted in the final report, courtesy of Finnish Government (2022):

> "Strengthening high-level research on key technologies as well as development activities and investments"
>
> "Increasing the adoption of digital capabilities and technologies that accelerate the dual transition in industrial SMEs"
>
> "Making Finland an international frontrunner in the twin transition" (Finnish Government 2022)

Regarding the development areas addressed by the Finnish Government (2022), they were observed in this study from the viewpoint of real estate management in Finnish commercial properties. In this chapter, summarized answers to the two main research questions are provided for solving the research problem. Using an integrative review, the theoretical contributions of the study are synthesized into a conceptual model, a knowledge synthesis. Furthermore, the external analysis frameworks introduced in the literature review, are elaborated for theory development and to provide managerial implications. Characteristic for case studies, recommendations for applying the research findings in practise are also presented. The reliability, validity and limitations of this research are critically evaluated and the compatibility between the theoretical and empirical parts of the study is estimated. Finally, how the study objectives were reached as well as potential directions for future research, are discussed at the end.

5.1 Value from twin transition

The research topic 'Value from Twin Transition' framed the research process from start to finish. As discussed, key themes of twin transition were examined in the

context of REM in Finnish commercial properties for acquiring an in-depth understanding of the phenomenon and to contribute to the field of research. In the following subchapters, the analyzed research findings are discussed and reflected with the study objectives.

5.1.1 Theoretical contributions

By categorizing the findings under the key concepts of twin transition, the research questions were answered to in an executive summary, shown in figure 43 . In addition, key insights from each thematic data set were highlighted based on the researcher's own judgement.

Research problem	Digital transition	Green transition	Information and data
RQ1: How does the twin transition impact the value proposition in real estate management? **RQ2:** What kind of added value or value added can be identified from twin transition in the real estate value chain?	**Digitalization** ❖ Digital platforms and services ❖ Electronic communication and reporting ❖ Virtual property administration and management	**Sustainable development** ❖ Energy efficient buildings ❖ Sustainable maintenance and repairing ❖ Accurate and timely maintenance and repairs ❖ Emissions reduction ❖ Consideration of the carbon footprint	**Data collection** ❖ Building operations and energy consumption ❖ Electronic and manual service requests ❖ User data ❖ Customer experience and feedback ❖ Technical failures and errors ❖ Utilization rates
	Digital solutions ❖ Digital monitoring and optimization tools ❖ Digital communication channels ❖ Building automation systems ❖ Process automation	**Circular economy** ❖ Waste management and recycling ❖ Materials recycling and reuse ❖ Eco-friendly waste disposal and processing ❖ Eco-friendly materials and methods ❖ Resource effiency	**Data utilization** ❖ Strategic, tactical and operational decision making ❖ Timely and accurate maintenance and repairing ❖ Life-cycle planning and budgeting ❖ Conditions assessment and optimization ❖ Property development ❖ Remote work and process monitoring
	Artificial Intelligence ❖ Automated conditions assessment and optimization ❖ Automated building and HVAC functions ❖ AI-driven adjustments (lighting, temperatures) ❖ AI-driven business processes (market assessments, targeted marketing)	**Sustainable solutions** ❖ Energy management systems ❖ Use of renewables ❖ Energy efficient technical solutions ❖ Advanced building automation systems ❖ Use of sustainable, low carbon materials ❖ Sustainable maintenance and construction methods	**Data solutions** ❖ Digitalized data collection systems ❖ Cloud based data analytics services ❖ Digital building service manuals ❖ Data management tools and BI ❖ Shared digital platforms ❖ Digital workflow systems
	Key insights ❖ Virtual building modelling ❖ Smart sensor technology ❖ HVAC analytics service ❖ Smart buildings ❖ Automated REM processes (reporting, customer contacting)	**Key insights** ❖ Environmental certificates ❖ On site power plants and energy production ❖ On site services and local production ❖ Communication of corporate responsibility ❖ Extending the building life cycle ❖ "Green code of conduct"	**Key insights** ❖ Knowledge management ❖ Predictive maintenance and repairs ❖ Fact based decision making ❖ "Data studios" ❖ Data-based anomaly detection

Figure 43. Executive summary of the research findings

5.2 Theory development

Morgan (2007) argues that in mixed method research, it is common for the researcher to adopt a pragmatic stance, in which the connection between theory and data is observed abductively. Also, the relationship to the research process is often intersubjective, instead of the theory development being fundamentally subjective or objective in nature. Moreover, the inferences from the research data

are neither bound to a specific context nor widely generalized, but instead, transferability is applied to the study outcomes (Morgan 2007, 71).

5.2.1 Intergrative review

Broome (1993) defines integrative review as a method for constructing a knowledge synthesis, in which the empirical and theoretical literature are typically summarized for providing an extensive understanding of a phenomenon. Thus, the method can be considered fitting especially in the contexts of informing research, practice, and policy initiatives. Through an integrative review, the researcher is able to present the "state of science", and contribute to the field of study often with "direct applicability to practice and policy" (Broome 1993). Integrative review is useful for defining concepts, reviewing theories, pointing out gaps in the literature as well as for analyzing methodological issues. Simply put, it is an inclusion of the empirical and theoretical reports and diverse methodologies, where the results are portrayed e.g. in the form of a table or model, a synthesis (Whittemore & Knafl 2005). According to Toracco (2005), the idea in integrative review is to generate new frameworks and perspectives on the topic and structurize the emerging themes to create a synthesis.

5.2.2 Synthesis

A knowledge synthesis is a summary of "all pertinent studies on a specific question or topic", according to Whittemore & Knafl (2005). The theory development process of the study resulted in constructing a knowledge synthesis through an intergrative review, to exhibit not only the solution to the research problem but also for contextualizing the scientific contributions of the study. In the knowledge synthesis, shown in figure 44, theories by Porter (1985), Lindholm (2006) and Leväinen (2013) as well as the external framework analyses such as the P5f and BSC models, are combined with the empirical evidence. Elaborating figure 16, courtesy of Lindholm, Gibler and Leväinen (2006), the synthesis presents twin

transition as the driver for value creation and competitive advantage, as displayed in figure 44.

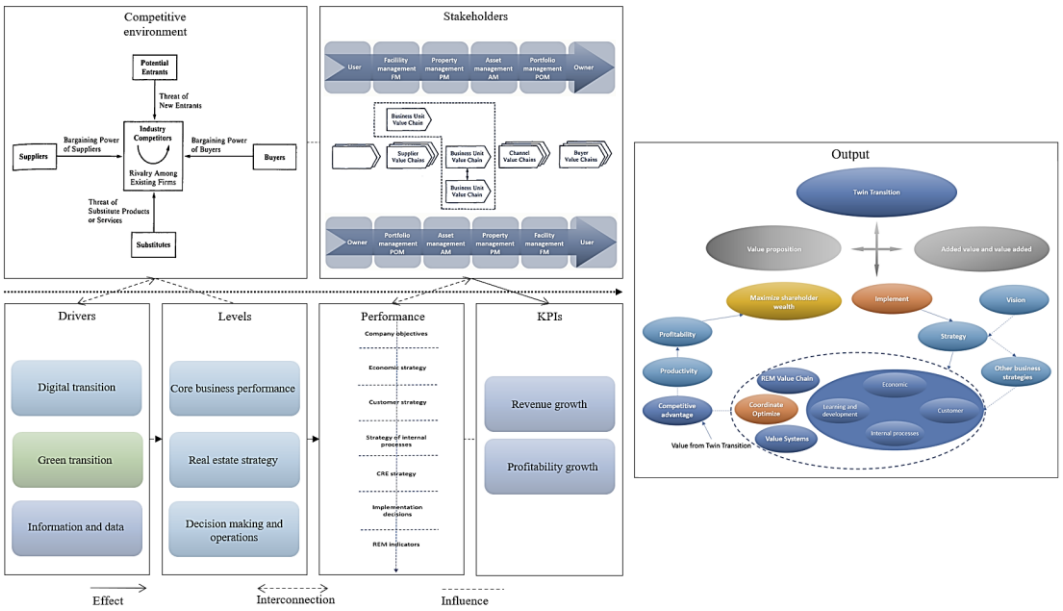

Figure 44. Knowledge synthesis

5.3 Recommendations and managerial implications

According to Porter (1985), identifying the generic value chain activities and dividing them into specific, discrete subactivities, are the first steps in diagnosing the company's sources of competitive advantage. Porter (1985) divided the organizational processes in the generic value chain, shown in figure 10, into primary and support activities. Respectively, Leväinen (2013) viewed REM activities fundamentally as support activities, meanwhile Porter (1985) described support activities to typically deal with business functions such as procurement, technology development, and firm infrastructure. Considering of the study objectives, to produce appilcable managerial implications, figure 44 demonstrates how for example the implementation of modern digital technologies may affect certain value chain activities and drive value creation, based on a singular response from the conducted interviews.

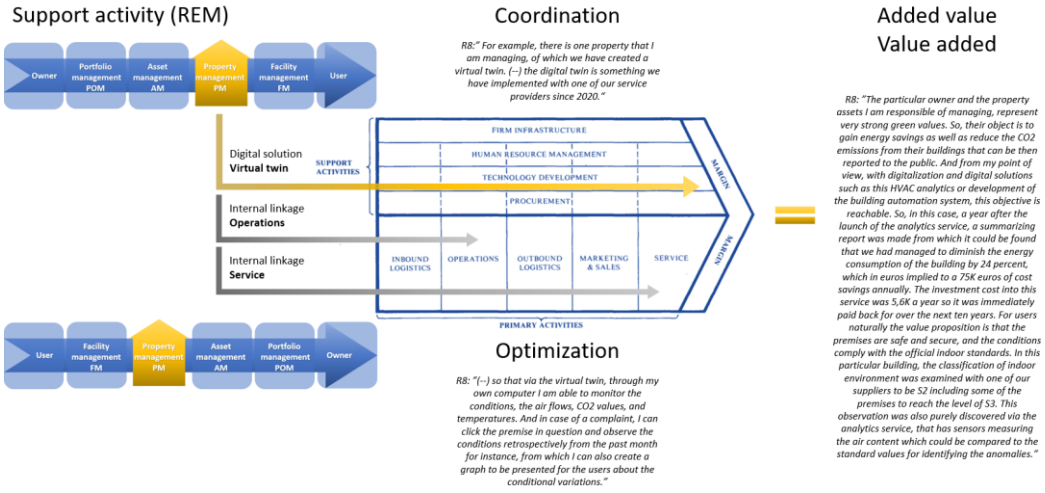

Figure 45. Digital solutions as value adding attributes

Porter (1985) emphasized the internal linkages between primary and support activities and also underlined the importance of optimization and coordination of the different value chain activities due to the emerging causalities. In reference to figure 44, a decision made in one area may thus directly affect another value chain activity, either positively or negatively. Porter (1985) claimed that the stronger the internal linkages, the more competitive the company should become, which should result in higher margins also. On the contrary, if the optimization and coordination of the value chain activities are weak or inefficient, the expected outcomes are negative, leading up to lower margins (Porter, 1985).

Porter (1985) viewed technology and development as an area that concerns each value chain activity, therefore describing it as support activity where true value is created for customers, suppliers, employees and shareholders (Porter, 1985). Figure 44 sheds light on how certain technological innovations may impact the primary activities of operations and service, especially in the REM of commercial properties. In figure 44, the value chain optimization and coordination is exemplified with consecutive actions desrcibed by one of the respondents, resulting in direct cost savings as well as satisfying the customer value proposition. Even Porter (1985) wrote that technology and development are key drivers of competitiveness (Porter 1985). It can be stated that the findings of this study not only support

Porter's view, but give even more emphasis to it. On top of that, another singular response from the interviews was selected to illustrate the influence of twin transition towards the customer value proposition, presented in figure 46.

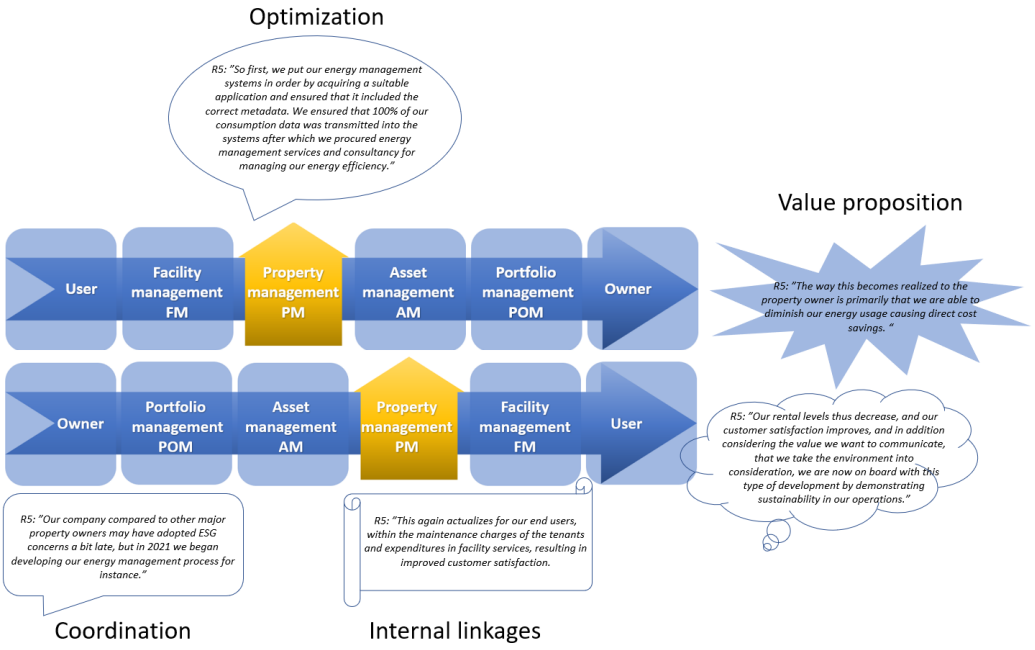

Figure 46. Twin transition shaping the customer value proposition

5.4 Evaluation

According to Morgan (2007), one of the great strengths of pragmatic research approach is the emphasis on the "connection between epistemological concerns about the nature of the knowledge that we produce and technical concerns about the methods that we use to generate that knowledge". Furthermore, when estimating the quality of a research, Saunders et al. (2019) state that the assessment of the reliability and validity are central.

The selected research strategy, philosophy and methods can be considered suitable in reaching the study objectives. However, it can be argued that the research scope could have been narrowed down, for the research to become more streamlined and concise for the audience. Respectively, the utilization of mixed methods

resulted in massive amounts of empirical research data, which turned out difficult and laborous for the author to summarize. For this reason, the paper also exceeded the desired thesis length set by the learning institution. On another note, the comprehensive data collection and sampling conducted in this study contributed to the validity and reliability of the research outcomes. In figure 47, the compatibility of the theoretical framework is reflected with the empirical data, to verify the relevance of the selected literature.

Statement from the theoretical framework	Location	Literature support	Corresponding statement from the research participants
➢ Increased value of assets (Lindholm, Leväinen & Gibler (2006) ➢ Increased property values (Falkenbach et al. 2010) ➢ Establish a company infrastructure with high quality conditions and minimized costs (Leväinen 2013, 37) ➢ Expertise of employees may partly explain the operational effectiveness, customer loyalty and even the number of sales of the company (Leväinen 2013, 113)	✓ Chapter 2.5.5 ✓ Chapter 2.3 ✓ Chapter 2.6 ✓ Chapter 2.9	✓ Figure 14 ✓ Figure 24	R1: "In short, I would say that it increases the value of the property. And towards the user it adds to the reliability and safety of occupancy, thereby engaging the tenants and users to stay in the location. I mean once these things are taken into account, the market value and interest as an investment grows, thereby providing the owner with more possibilities for the future. Whether it is to be traded or is an asset that can be used for warranty. Simply something with economic value that can be estimated and sold both of which in my opinion can be achieved by consumers and customers valuing the circular economy and energy solutions of the building and find it as reliable and safe to visit and use. This way the customer volumes will increase, and the use value in the market so to speak, also increases."
➢ Investments should be predetermined and targeted so that in the end, the estimated paybacks outweigh the required initial capital costs (Leväinen 2013, 101-102) ➢ Sustainability changes the taxation, calls for higher standards on material densities, and puts pressure on refurbishing the building stock, also having significant impacts on financing- and insurance policies (Falkenbach, Lindholm & Schleich, 2010) ➢ Reduce cost (Lindholm, Leväinen & Gibler, 2006) ➢ Decreased property costs (Falkenbach et al. 2010)	✓ Chapter 2.6.3 ✓ Chapter 2.9.2 ✓ Chapter 2.9.2 ✓ Chapter 2.5.5	✓ Figure 18 ✓ Figure 14 ✓ Figure 24	R5: "Considering the user, the direct added value comes from the financial benefits measured in euros. So, regarding the building stock in our possession, we are talking hundreds of thousands of euros per year. To exemplify, let's say that we have constructed 0,6 mega watts of solar power with 10 years payback period by the end of 2022, which in itself should cause 60K euros of savings annually that is directly cut from the total occupancy costs of the end user. So, with our solar energy investments solely, we save the customers money 60K a year. I believe the indirect added value highly relates to marketing and the image of being green, for both the owner and the users. So that together we can agree that the properties are functioning energy efficiently, which can be later verified to the public with different certificates for instance. That however is still in progress for us, although there has been familiarization to environmental certificates such as BREEAM and LEED already that we might be able to pursue in the future once we have our energy management system and energy consumption monitoring under control."
➢ Business potential for real estate owners in the compliance to local and global sustainability targets (Falkenbach et al. 2010) ➢ Customer satisfaction (Leväinen, 2013, 119) ➢ Expedite transition to low carbon energy usage, consider the conciseness of natural resources, and change the prevailing consumption behavior (Huttunen 2021, 12)	✓ Chapter 2.9.2 ✓ Chapter 2.6.1 ✓ Chapter 2.9.1	✓ Table 5 ✓ Figure 23	R9: "(--) we then have certain certificates of course which include certain demands regarding the facilities, things that we should take care of. And we do believe that once the basic operations are taken care of, it brings fort effectivity and customer satisfaction in the property. (--) BREEAM in-use in particular is something that we seek to certify to the level of Good or Very good. And also, regarding the BREEAM certificates during construction, we aim at Very Good or Excellent levels."

Figure 47. Theory compatibility

5.4.1 Validity and reliability

The selected case focused on Finnish commercial properties and aimed at discovering potential value from twin transition in this context. Considering the adequacy of the study sample, representation from all REM professions described in figure 5, were involved in the study. Furthermore, the companies that the research participants represented were relevant operators in the Finnish real estate business, which provides validation for the case. Moreover, clear saturation could be identified in the collected research data, which confirms the sufficiency of the data

collection. In terms of reliability, it should be noted that the research approach embraced a certain bias considering the research problem. As the standpoint was to primarily discover the positive impacts of twin transition in real estate management of Finnish commercial properties, the empirical questions also steered the research participants to this type of prejudice. Yet, opposing views to this preconception, set by the researcher, also arised in the conversations. This reflects the certain lack of objectivity as well as the researcher's own influence on the study.

> R2: "Commonly, sustainable development is viewed as cutting of and reducing something. So I cannot say for sure if there was anything for it to actually bring forth, regarding the operations of the building, or when things are done in accordance with the sustainability principles. Probably in terms of circular economy and all that, waste management has become easier in terms of sorting and disposal so that is something, surely. But I can't think of any other evident added value attributes from it towards the everyday operations in the property."

5.4.2 Limitations

Morgan (2007) believes that in pragmatic approach, the results shouldn't be viewed simply as neither context-bound nor generalizable. Instead, Morgan (2007) advocates the idea of transferability by rationalizing, whether the acquired knowledge can be generalized and transferred to other settings. This implies to, what can be done with the acquired knowledge, instead of arguing the possibility or impossibility of its generalizability (Morgan 2007).

Primarily, the findings of the research should be bound to only a specific context, the Finnish commercial properties. However, the knowledge synthesis in figure 44 implicates a certain degree of generalizability in the research output, which could be disapproved by certain schools of thought. Also, ways for applying the findings in practise were demonstrated in figures 45 and 46 with no theoretical back up in support. Thus, some might argue that the theory development and the managerial

implications are mostly based on the author's personal views and could be considered subjective and scientifically unproven. On the contrary, past theories are connected with the present on this study with an open minded attempt to emerge new knowledge.

5.4.3 Follow up research

Morgan (2007) emphasizes that the acquired knowledge and its transferability to other settings, can be assessed best with further investigation. As discussed in chapter 1, the role of built environment regarding the national wealth of Finland is significant. However, this study focused solely on observing commercial properties which only cover 17% of the entire Finnish built environment, as explained in figure 3. Therefore, for the research findings to be generalized to other settings, a logical follow up research in this case would be to replicate this study in Finnish residential buildings, as they cover 30% of the built environment in total according to figure 3.

Especially the insights collected from various REM professionals in the study, lay the groundwork for various directions considering a follow up research. For example, the results showed that the trends and themes of twin transition in fact shape the customer behavior today in real estate business, in terms of e.g. the selection business locations and occupancy. The following response was selected to elaborate this viewpoint, of twin transition to change the customer needs and preferences, which could be studied more for developing the real estate business.

> R9: ”(--) there are certain trends arising from the world to follow, to take part in, and perhaps these things may open up new opportunities as well to improve. So, whatever those possibilities are, I surely hope that things are done with more quality as a result, so that we develop from the adoption of these new operating models and solutions. (--) these things steer the entire strategy in a way, and also regarding the customer value proposition, green values especially have become something that our customers might even consider as self-evident. So that we, as the property owner, cannot just operate by the old habits, but instead compliance to these things are expected from us."

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APPENDICES

APPENDIX 1
QUESTIONNAIRE

Questionnaire for REM professionals

Value from Twin Transition - Case: Finnish commercial properties

*Pakollinen

Google Forms

Basic Information

Basic information are collected for presenting the sample overview

1. Gender *

Merkitse vain yksi soikio.

- ◯ Male
- ◯ Female

2. Group of age *

Merkitse vain yksi soikio.

- ◯ 25-35
- ◯ 36-49
- ◯ 50-65

3. Experience in REM *

Merkitse vain yksi soikio.

- ◯ 1-5 years
- ◯ 5-10 years
- ◯ 10-20 years
- ◯ Over 20 years

4. Employer (current) *

_____

5. Job title *

_____

6. Select alternatives relevant to your current profession *

Valitse kaikki sopivat vaihtoehdot.

- ☐ Portfolio management
- ☐ Asset management
- ☐ Property management
- ☐ Facility management
- ☐ Project management / Construction Contracting
- ☐ Shopping center management
- ☐ Environmental Social Governance (ESG)
- ☐ Lease management

7. Select the building types relevant to your profession *

Valitse kaikki sopivat vaihtoehdot.

- ☐ Commercial buildings
- ☐ Office buildings
- ☐ Transport and communication buildings (for example airport)
- ☐ Buildings for institutional care
- ☐ Assembly buildings
- ☐ Educational buildings
- ☐ Industrial buildings
- ☐ Public utility buildings (for example waste management)
- ☐ Warehouses
- ☐ Rescue service buildings (for example fire station)
- ☐ Energy supply buildings

8. Estimate the significance of real estate and construction industry in relation to reaching the objectives and key results of the twin transition

9. Evaluate the impact of twin transition in your profession currently *

Merkitse vain yksi soikio riviä kohden.

	No impact	Low	Medium	High
Digital transition				
Green transition				

10. Evaluate the impact of twin transition in your profession in the future *

Merkitse vain yksi soikio riviä kohden.

	No impact	Low	Medium	High
Digital transition				
Green transition				

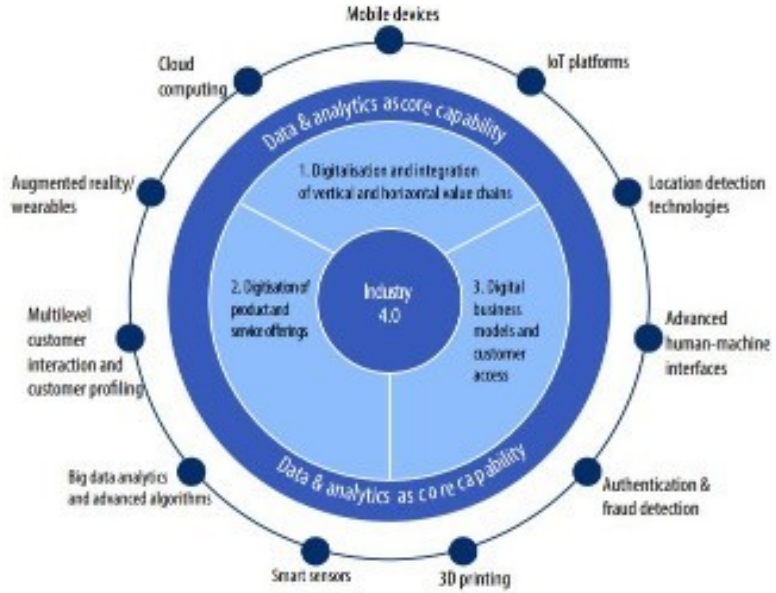
Digital transition

Digital transition

Industry 4.0

11. Select the alternative with the highest impact on REM value chain now and in the future *

Industry 4.0 framework and digital solutions and technologies that support it



Industry 4.0 framework inputs of digital technologies (Global Industry 4.0, Survey, 2016

Merkitse vain yksi soikio.

- Digitalization and integration of vertical and horizontal value chains
- Digitisation of product and service offerings
- Digital business models and customer access

12. If you wish to argue your opinion to the previous question, type here

13. Select the added value attributes now and in the future in commercial properties you are working with *

Industry 4.0 framework and digital technologies that support it

14. Regarding your own profession and REM, select the added value attributes now and in the future *

Valitse kaikki sopivat vaihtoehdot.

- [ ] Mobile devices
- [ ] IoT platforms
- [ ] Location detection technologies
- [ ] Advanced human-machine interfaces
- [ ] Authentication & fraud detection
- [ ] 3D printing
- [ ] Smart sensors
- [ ] Big data analytics and advanced algorithms
- [ ] Multilevel customer interaction and customer profiling
- [ ] Augmented reality/wearables
- [ ] Cloud computing

Enabling technologies and infrastructure	High-impact applied technologies
ARTIFICIAL INTELLIGENCE	**ADVANCED ROBOTICS**
Intelligent machines that work and react in a similar fashion to humans (incl. machine learning, natural language processing, computer vision, virtual assistants, AI robotics)	Advanced robots capable of complex, previously non-automatable, tasks
BIG DATA ANALYTICS	**AUTONOMOUS MOBILITY (CAVs)**
Use of large and varied data sets to uncover information incl. hidden patterns, unknown correlations, market trends and customer preferences	Autonomous and near-autonomous vehicles, incl. UAVs (drones)
QUANTUM AND HIGH-PERFORMANCE COMPUTING	**SMART CITIES**
Supercomputers with capacity to solve large scale, complex analytical tasks; use of quantum mechanics (via qbits) to increase computing power	Cities which incorporate ICT to enhance efficiency, quality of life, the economy and other performance metrics
INTERNET OF THINGS (INCL. EDGE COMPUTING)	**ADDITIVE MANUFACTURING**
Multi-layer technology that enables management, and automation of connected devices	Creating 3D, solid objects from a digital file by adding layer-upon-layer of material
NEXTGEN INTERNET AND INFRASTRUCTURE	**VIRTUAL AND AUGMENTED REALITY**
Infrastructure enabling next generation of technology: e.g. 5G and beyond, digital twin, highspeed WLAN	Software-created, fully artificial environments/ technology that superimposes a computer-generated image on a user's view of the real world
CLOUD COMPUTING	**DIGITAL ENERGY INNOVATIONS AND SUSTAINABILITY**
On-demand computing resources ran on distant computers, connected to users via the internet	New digital technologies enabling innovative energy applications: storage, smart grids, renewables
DIGITAL PLATFORMS	**DIGITALLY ENABLED BIOTECHNOLOGIES**
Digital platforms on which outside firms can develop their own activity or develop their own technologies	Group of technologies enabling new applications of biological innovation (e.g. biohacking, next-gen genomics)
DISTRIBUTED LEDGER TECHNOLOGY	**ADVANCED MATERIALS**
Peer-to-peer network with unique member digital signatures: all transactions are recorded by the entire network, notifying the network of a breach	New materials developed to obtain superior performance (e.g. graphene) power

15. Evaluate the impacts of the enabling technologies and infrastructure and high-impact applied technologies towards the real estate and construction industry *

Merkitse vain yksi soikio.

Insignificant

1 ○

2 ○

3 ○

4 ○

5 ○

Very significant

16. Regarding REM in the commercial properties you are working with, select the added value attributes *

Enabling technologies and infrastructure

Valitse kaikki sopivat vaihtoehdot.

- ☐ ARTIFICIAL INTELLIGENCE
- ☐ BIG DATA ANALYTICS
- ☐ QUANTUM AND HIGH-PERFORMANCE COMPUTING
- ☐ INTERNET OF THINGS
- ☐ NEXTGEN INTERNET AND INFRASTRUCTURE
- ☐ CLOUD COMPUTING
- ☐ DIGITAL PLATFORMS
- ☐ DISTRIBUTED LEDGER TECHNOLOGY

17. Select the alternatives of significance regarding the real estate and construction industry *

High-impact applied technologies

Valitse kaikki sopivat vaihtoehdot.

- [ ] ADVANCED ROBOTICS
- [ ] AUTONOMOUS MOBILITY (CAVs)
- [ ] SMART CITIES
- [ ] ADDITIVE MANUFACTURING
- [ ] VIRTUAL AND AUGMENTED REALITY
- [ ] DIGITAL ENERGY INNOVATIONS AND SUSTAINABILITY
- [ ] DIGITALLY ENABLED BIOTECHNOLOGIES
- [ ] ADVANCED MATERIALS

Green transition

Sustainable development and circular economy

18. Estimate the impacts of sustainable development and circular economy on the REM decision making *

Valitse kaikki sopivat vaihtoehdot.

	No impact	Low	Medium	Notable	High
Sustainable development	☐	☐	☐	☐	☐
Circular economy	☐	☐	☐	☐	☐

19. Regarding commercial properties you are working with, select the party with the highest influence in expediting sustainable development and circular economy *

Valitse kaikki sopivat vaihtoehdot.

	User	Owner	REM unit
Sustainable development	☐	☐	☐
Circular economy	☐	☐	☐

20. If you wish to argue your opinion, type here

21. Regarding commercial properties you are working with, are there any environmental certificates? *

Merkitse vain yksi soikio.

- ◯ Yes
- ◯ No
- ◯ I don't know

22. Regarding previous question, select the environmental certification or address other possible building rating systems

Valitse kaikki sopivat vaihtoehdot.

- [ ] LEED
- [ ] BREEAM
- [ ] Muu: _____

Information and data

Data utilization

23. Regarding commercial properties you are working with, select the applied data collection methods *

Valitse kaikki sopivat vaihtoehdot.

- [ ] Digitally
- [ ] Manually (written and spoken)
- [ ] With smart sensors
- [ ] Muu: _____

24. Regarding commercial properties you are working with, what type of data is collected? *

Valitse kaikki sopivat vaihtoehdot.

- [ ] Written and spoken feedback
- [ ] Electric feedback
- [ ] Customer and user data
- [ ] Customer and user experiences
- [ ] Maintenance and repair information
- [ ] Condition information
- [ ] Consumption data (energy)
- [ ] Safety and security
- [ ] Smart sensor data
- [ ] Muu: _____

25. Regarding commercial properties you are working with, select the applied data processing methods *

Valitse kaikki sopivat vaihtoehdot.

- [ ] Data aggregation
- [ ] Data architecture
- [ ] Data management
- [ ] Data analytics and automation
- [ ] Data visualization
- [ ] Business Intelligence (BI)
- [ ] Muu: _____

26. Regarding commercial properties you are working with, select the alternatives that require developing *

Valitse kaikki sopivat vaihtoehdot.

- [ ] Data aggregation
- [ ] Data architecture
- [ ] Data management
- [ ] Data analytics and automation
- [ ] Data visualization
- [ ] Business Intelligence (BI)
- [ ] Muu: _____

27. If you wish to argue your opinion, type here

_____

_____

_____

_____

_____

APPENDIX 2

THEMATIC INTERVIEWS & REPLIES

Digital Transition

1) How are digital solutions part of REM in commercial properties that you are working with?

2) How is AI utilized in the commercial properties you are working with?

3) In which areas do digital solutions and AI have impact on in commercial properties you are working with?

Perspective: *Process / Human / Space*

4) How does digitalization impact the operations and services in the commercial properties you are working with?

Perspective: *Effectiveness / Flexibility / Customer satisfaction*

5) How does digitalization impact REM in commercial properties you are working with?

Perspective: *Strategic / Tactical / Operational*

Impacts on the REM value chain

Value proposition *= the unique mix of product and service attributes, customer relations, and corporate image that a company offers*

Customer Perspective

6) How can digitalization, AI, and digital solutions in REM activities impact the value proposition for the:

Owner

User

Added value/value added

7) What kind of added value/value added can be found from digitalization, AI, and digital solutions in commercial properties you are working with

Directly for the owner/user?

Indirectly for the owner/user?

Internal processes, learning and development perspective

8) What kind of added value/value added can be found from digitalization, digital solutions and AI regarding

The operations of commercial properties?

The real estate management of commercial properties?

9) What kind of added value/value added can be found from digitalization, digital solutions and AI regarding your own work?

Operations: *Efficiency / Flexibility / Customer satisfaction*

Orientation: *Process / Human / Space*

Level: *Strategic / Tactical / Operational*

10) What opportunities do you see in digitalization, digital solutions and AI in terms of developing the

REM in commercial properties?

Operations of commercial properties?

Value proposition in REM?

1	R1: "The first thing that comes in mind is the planning of real estates based on data. This has of course been used in architectural planning for a long time and that way the facilities can be turned to a virtual based model (--). Second, utilizing digitalization in the usage and maintenance of commercial properties requires exceptionally high amount and reliable data and therefore the data aggregation, saving and storaging all the available data and so forth kind of lay the groundwork for the utilization of digitalization in property usage and management." R2: "(--) for example an electric building service manual, through which basically all the daily processes are run. That is pretty much the cornerstone for procuring the maintenance services and repairs as well as saving the important information, and also overall in terms of management in general (--). Then, considering for example the communication and contacting the users of the facilities, digital monitors in staircases as well as info screens in the hallways are growing in popularity and thus diminish the old fashioned "paper" communication so that the information gets exchanged in real time" R3: "(--) perhaps an automation system renovation that I have came across in which additional sensors are placed all around the building, that primarily relates to data usage of course. But as far as I see these things go hand in hand with digital solutuons, to have these sensors placed, thus acquiring more accurate information i.e. from carbon dioxide levels in the indoor air which is transmitted to the subdistribution board of the building automation system (BAS) and perhaps, and more specifically regarding the automation, when suppliers also offer these cloud based solutions via which they can remotely monitor the property level systems operations and steer those operations so that the caretaker doesnt't necessarily have to be that proactive anymore in this regard." R4: "(--) at least from the perspective of leasing and ownership, digitalization highly relates to different systems, how and what kind of data is collected from various sources and how it is utilized. Therefore, and especially in commercial real estates, a lot of data is collected from the users, i.e. experiences from occupancy, that in my own profession at least is strongly present. And digitalization in general has such a huge role in this job in general, that it is hard to separate to whatever digitalization may imply to since it is happening around you in silence continously. (--) As major share of the work is done via computer anyway, and the rest is about interacting with a customer face to face, negotiating and so forth. So thereby digitalization for me personally means the easiness these applications and systems provide that are used in daily work to help with handling and closing out i.e. the negotiation processes." R5: "The building automation system itself both stores and produces digital data that can be then utilized in REM. Surely that is the most evident tool for real estate management. But particularly from the standpoint of green transition, during the years of 2021-2022 we have had an enormous emphasis on both constructing renewable energy and energy management overall and lookinng at the issue from the perspective of digital solutions we have built 0,6MW of solar power, connected via inverters to our energy management system and cloud service in real time, with personalised access. Furthermore, these inverters are transmitting data to the info TVs of our educational buildings about the energy production, which again can be used for not only marketing purposes but also the users may simply monitor the energy consumption of the building as well as the generation capacity of the renewable energy themselves." R6: "In many commercial properties or shopping centres specifically that I work with, most solutions are digital whether it is about REM, customer, or internal, team related activities that they concern so there is like three different aspects to it. Thus, digital solutions enable working with multiple shopping centres simultaneously, for the processes are basically the same between these buildings. Of course, they are all physical, individual assets that are separately located somewhere in the area, but most solutions within them are digital." R7: "In every property we have its own building automation system surely which manages for example the temperatures, moisture content, and lights. In fact, we have a service delivered by one company, that takes place in their energy control room in which they remotely monitor our properties and handle the required optimization. Also, I dont know whether a service manual is considered as digital solution but however it is used, and the maintenance documents are filled in and saved there for keeping track of the maintenance and repairs of the buildings." R8: "From REM standpoint, the digital solutions relate more heavily to the maintenance side of things so that energy efficient, both operations and circumstances, are thus monitored." R9: "There are quite a few systems to be used daily in asset management (--). If AI for example refers to robotics and automatized building technologies, there are certain functions of course, which are pretty basic to begin with, but where AI has been in fact added into the processes, such as in handling invoices and observing anomalies for instance. However, it can be concluded that there is yet alot to be done in this regard implying that not too of a complex systems have yet been developed considering my own work."

2	R1: "Artificial intelligence has over the years slided into different systems. For example in today's automatic door systems there are intelligence boxes measuring the use frequency, thereby predicting the need for future maintenance or repair, and providing this information to the property management unit. Also, the AC and automation and the entire HVAC system follows the spatial tempteratrures, carbon oxides, humidity and so forth via programmed automation, and according to the user volumes and frequencies it can steer the building automation system to intelligently produce enough heat, air exchange etc." R2: "For example in energy issues, AI is indeed utilized (--). It can interpret the upcoming weather conditions and optimize heating predictively, for instance in accordance with so called consumption peaks (--). And in regard of these consumption peaks, to not heat on for example full power when the heating has been managed to start predictively already beforehand. Or then i.e. the AC may, through the building automation, smell the CO2 concentration in the air etc and thus optimize ventilation to be more effective and so on." R3: "A tangible example can be the measuring of the CO2 rates from the indoor air to determine the status of the operating environments as well as identifying how the machinery is functioning; whether the blowers are running as they should (--). Also, lighting is something that we even had an expert informing us about recently on how it is growing in popularity all the time to exchange current lamps with LED solutions but also how they are also increasingly equipped with motion detection mechanisms." R4: "(--) the role now and in the future is growing all the time, so that we have independent, modern AI based devices that are sustainable. Surely we already have applications and softwares provided by partners, one of which in fact gathers data from companies in the market that exhibit certain economic movement. For instance, a company's revenue may have increased massively during the year or their number of employees has increased or vice versa decreased heavily, and the idea of the service is to capture the details of the contact person, i.e. CEO, from a customer register to whom we then have already in cooperation with the service supplier tailored a property-specific message for possible contact. What's in it for me in this service practically, is the predetermined message to my cell phone from the AI and all I have to do is to overview and confirm the content and press send after which it is forwarded to this contact person with a caption telling i.e. how their revenue has doubled over the year and whether they would be interested in finding new premises for which we would have solutions to offer etc. Then, the customer or respondent may reply with an email, if interested" R5: "In this moment of time the magnitude in which AI is utilized in commercial properties or in REM is very little, but for sure if we start from building automation, there is AI to some extent. Like, all types of measuring, steering, optimization processes are working in accordance with some AI. But then again in terms of REM, there is not alot that comes in mind so maybe that is for the future then." R6:" "From the standpoint of a shopping centre or the customer, AI is utilized alot in for example marketing solutions." (--) for customer recognition for instance, to whom targeted marketing can be pointed at in social media or something for example, but also in the facilities it can be identified i.e. what kind of registration numbers in terms of region are driving into the shopping centre. Thus I will acquire information where the customers are coming from, according to which I can deliberate on the economic target area of the property and prepare targeted marketing for acquiring those customers in specific who frequently visit us and thereby bring more money to the owner." During the COVID time we had certain dicsussions about the two most important indicators regarding our business which were the visitors and sales, for which we had measurements at each entrance which I monitor daily. (--) it felt odd, since in a way my job was to bring more customers in meanwhile the status quo was to avoid gathering and crowds in the same place. So with our supplier that provided the systems for calculating the visitors we had different ideas with AI involved to for instance estimate the number of concurrent customers. Somewhere abroad there were even solutions to diagnose the disease via measuring temperatures. Furthermore, and outside of corona, these applications could even create 3D modelling providing me with data of whether it was adults or children and men or women from different groups of age that are visiting us. This however we have not been using partly due to certain GDPR regulations that exist in Finland, yet it has been on the table." R7: "(--) there are for example AI involved in twilight switches, like in terms of indoor and outdoor lighting, it constantly detects the level of daylight as in the amount of lux units and once this drops under a certain ratio, it switches on the lights. And it is supported with a back up system, in this case an astronomical clock so if in any case the twilight switch was dysfunctional, it will automatically follow the astronomical clock preset with the standard lux levels of the region or the nation." Also, in every property we have a building automation systems through which everything is run: cooling, AC, temperatures. Everything that is connected to the automation, hence why it is the highest form of AI that we currently have supporting our operations." R8: "The service that I referred to earlier, the HVAC analytics, is heavily based on AI. It follows the building automation functions and more specifically the energy consumption which is what the AI relates to for example in terms of identifying anomalies to which the AI calculates according to a certain formula, a potential consumption increase or decrease, according to the anomaly. (--) It is a cloud-based service. And also diving deeper into AI, building automation systems surely utilize AI to some extent. (--) in a way they are pre-programmed systems but at least in the modern ones AI comes in play i.e., in terms of detecting daylight and motion detectors, so that the lighting and AC for example may function autonomously based on the space usage and external stimulus, for example." R9: "Managing the big picture and the contractual side of things as well as the property development, capital expenditures etc. are the primary tasks of an asset manager. So, in a sense and in our world, a very basic type of reporting and constructing building management proposals are executed for which any automated solution has not been developed or at least is yet to be seen. So a lot of things are still conducted manually."

3	R1: "Regarding retail properties, the role of digitalization is visible in all degrees so to say: in the planning phase, exploitation of the planning documents further in the construction and usage phase, and finally the utilization of this virtual information during the occupancy and in the maintenance of the building. So, in every stage of the life cycle, the constantly developing digitalization has a more important meaning." R2: "From the process' viewpoint, say, running the daily operations and all that, is conducted with electronic tools such as electronic service manuals for enterprise resource planning and also considering the users, they are also provided with electronic platforms for service requests for instance. So that with a cell phone one can rapidly send a service advice without a call to the maintenance switch, and regarding the premises also the building automation solutions come in play that include intelligence and electronic processes administering the circumstances in the building. R3: "So one example of being more efficient could be that the lights are only switched on when there are people are moving in certain premises. This also relates to green values and electricity usage which is highly valued especially today, to minimize the unnecessary consumption. And this way, AI is involved within the optimization of lighting." R4: "(--) we have one system that has been launched frequently and used for about a year now, that especially in properties of high vacancy and low utilization rate, is a great tool." R5: "In terms of premises, if we had digital solutions with which we could model the space and its usage during a certain period of time so that e.g. remote workers could check if a workspace is available, and there would be sensors for measuring any human presence either based on CO2 rates or motion (--). In such case, the role of a human of course is someone who is present, but also as a remote viewer. All this can then be linked to the word process which pretty much is what the aforementioned reflects. (--) completely outsourcing processes to AI is something which has been discussed surely. For example, when building automation systems utilize the weather forecasts steering whether the buildings are i.e. heated or not, that would be a process of AI involved in it, yet it is something that is only still under discussion. (--) our company might have been a bit late within participating in the high-end development, the energy saving campaigns and all that ESG related stuff, as our work in this regard only actually started in the beginning of 2021." R6: "(--) I assume processes in this regard imply that for example, from Tampere, I am able to manage multiple issues on behalf of the owner, for the buildings, or the customers completely digitally and remotely, whatever it might be. (--) Surely it is thought of how to target certain customers or manage to provide the customers with memorable experiences and added value in the shopping centres via AI and bring more aspects to the facilities with the help of it. For instance, there has been a lot of talks in utilizing augmented reality (AR) and virtual reality (VR) i.e. in marketing or guiding. Something we aren't using too much yet, but what would be a possibility." R7: "Regarding the human perspective, as in how to access our workplace in the first place, we have electric locking everywhere. So, a person must use access control for clocking oneself into the building via employee time tracking device that reflects the digital solutions. In the production it even goes as far as that this is the basis of the employee salaries and working hours, which makes mandatory in a sense that if they don't clock in and clock out, they won't get paid." R8: "The processes of building service technology are of course affected by AI through building automation systems. And on top of that, also this analytics service that monitors the operations of the building. Whereas on the other hand, all this also affects the user as many digital HVAC solutions aim for making the space usage of the user as comfortable and effortless as possible. In fact this also refers to the facility perspective too, in a sense that it would not necessarily depend on the user how the systems of the facilities are functioning due to the systems being relatively independent in terms of operating." R9: "(--) we have an organization here in Finland while our headquarters is located abroad, from where the systems and the operating models are given to us. Whether it is about human resources, systems, and whatnot, to some extent there is always some manual work to be done. However, it could be said that digitalization, digital solutions and AI are involved in the entire chain of operations. (--) the human interaction and people is something that could never be fully replaced with digitalization though, for it always has its own nature. (--) in terms of space, there has been many types of visualizations or even 3D models and stuff like that in my own work that has been deliberated on, but not on a regular basis but perhaps those are something for the future, instead."

4	R1: "This is of course the most important role or element that the benefits from the developing digitalization should be exploited to. In short, if a good amount of acquired data for laying the groundwork for digitalization is available, it can be used for predicting maintenance tasks and solutions as well as repairs for buildings so that safe occupancy for users is ensured, the circumstances are as stable as possible and correct so to say. The temperatures, airmasses, draught and so on." R2: "Exactly all these services, so that i.e. service requests can be made through an electronic channel without time restrictions but instead a free, 24/7 availability within the services which of course affects the customer satisfaction by saving time and with no need for contacting anyone in person specifically." R3: "The customer satisfaction aspect here is easy to grab. For example, considering the building automation through which via certain cloud service it is possible to remotely control the prevailing temperatures and ventilation of the building, and thus optimize the best circumstances and standard values for different times of the day e.g. for the working hours or when people are present in the facilities. Say, the temperature is set to 22 degrees and the air exchange enhances during working hours but once the premises become vacant the machinery automatically adjust themselves to lower the temperatures for instance. And optimizing the ventilation this way makes an efficient solution too, also bringing forth certain flexibility due to the easiness of controlling the system digitally which AI is then able to support according to the acquired real time data of the circumstances which can be quickly reacted to." R4: "In terms of commercial properties the role of digitalization is important, especially in properties like business parks where there are services around the premises. And why not also in terms of office buildings with no facility services in specific, but digitalization is clearly a part of measuring and planning our operations. First and foremost, this is about capturing a lot of data from the users of what kind of services there should be for better customer satisfaction such as electric info screens and monitors as well as applications and websites including the contact details and help for different kinds of questions. (--) for the users of the facilities are the ones often coming across with all kinds of problems within the building and thus end up looking for a contact person in case of any problems which is relevant in my profession, but the efficiency that digitalization brings in terms of reduced number of contacts is essential as the information is provided in the form of this type of better customer service from the property owner to the clients. As the role of the property owner within the properties are often experienced lacking in general, yet there is no consensus on what should be done specifically for us to make ourselves more present in the property. One of the biggest things in leasing is that we must keep our customers satisfied and develop in it according to their needs continuously, capture the data and feedback, in order to survive and maintain satisfied customers." R5: "Considering our processes as the property owner at first, we are leasing the properties to our customers including the plots, implying that all the processes that the tenants have going are basically their concern. But in terms of REM, it could be cleared up a little bit that digitalization is involved in all use of the premises regarding the booking systems, as the educational premises, working halls, negotiation rooms are all "run" through the same system. (--) this brings effectiveness but may also diminish the flexibility in case a room has been reserved but isn't however occupied, it will stay unused. This particularly could be improved with smart sensors and indicators for CO2 or motion, whether there are in fact spaces available with automatic signal to the booking system which would be a clear improvement. We as the property owner and the lessor naturally take care of the maintenance and the quality of it. For example, in terms of providing cozy and safe outdoor areas for the end user, the service chain operates so that the user evaluates the service output in real time and reports the anomalies via agreed channels. This type of electric service request channel is nothing new, however can be seen as a traditional form of utilizing digitalization as the requirements are forwarded to the designated service supplier directly." R6: "In shopping center business, it has been deliberated on how digitalization is first and foremost a good thing but can also be seen as a competitor. Surely, as we represent a tangible building asset, we want our customers to visit as this is what makes core business. Whereas digitalization, e-commerce for example, is in fact our biggest rival and obstructs this idea and our business. Therefore, it may affect in good or bad in a sense that we kind of compete against it meanwhile it also enables many things for us." R7: "Regarding our core operations and services which are about package delivery and cargo. (--) so, for example, we provide parcel lockers where our customers shipments are delivered that digitally inform of the arrivals of the deliveries with a code for then accessing the locker. (--) and in terms of efficiency, when we have the access control for clocking yourself in, the system is programmed with the terms and conditions of the collective agreement. This of course prevents employees from having a 2 hours break for example." R8: "In case of this particular example property that I am now referring to in many of my replies, let's say all the building automation systems and monitoring were all ripped off. And doing so would simply result in the building to be both "dumb" and ineffective. Surely the building automation systems and monitoring also influence customer satisfaction through the optimization of circumstances. For example, occupancy sensors and twilight switches steer the lighting, but also the ventilation through CO2 sensors so that before it gets uncomfortable the ventilation will be boosted according to the CO2 rate. In my opinion the BMS itself provides flexibility in a sense that the building operations can be adjusted very well. Considering the emerging energy crisis for instance, at least in the properties that I am managing we have been decreasing the set values of some premises significantly already and this is all done via building automation. Right now, the control room is in the building, yet everything can be done via a computer so that there is no need for a caretaker to calibrate the control subcenter physically, but all this can be done remotely instead." R9: "(--) for sure in all operations, not just real estate business, but also in the customers' operations. Of course, a company such as us has customers and tenants with industrial and productional operations, which hasn't required massive changes in the recent years, however there are things that can hopefully be automated and replicated more efficiently than before. (--) certain reliefs to daily operations are hopefully acquired via digitalization, to have better communication systems and the feedbacks are directed more sufficiently without too much interruptions. The information would be more accessible, which in our firm is also a bit of an issue with so many assets to look after, that the information is sought manually from multiple sources. And solely the data storing in our company has its own challenges just like in any firm probably. Not to mention projects, renovations which produce a lot of data, where this data is saved and stored is something that are very typical problems to solve for us still. Then the needs of the users regarding the properties differ slightly from one another, but the most important factors are enough light and heat. And the snow removal must be done efficiently to keep the goods moving, so it is often about the very the basics when it comes to the properties that we possess."

5	R1: "Considering management, and from the perspective of financial management especially, the more, and more reliably any information is acquired about the building usage in terms of i.e. energy consumption or what was addressed earlier how through digitalization and developing information management the conditions can be optimized, this obviously has an impact on getting specified knowledge of the most cost-efficient operating model regarding the real estate. Then of course, with all these sensors which have been advancing into so called smart sensors as of late, the conditions and changes of the buildings can be measured in real time for example in case a change occurs in the external weather conditions. R2: "Through digitalization a lot of data is acquired from the real estate surely, so that for example energy consumption trends etc. can be followed once there are a lot of information according to which also strategic decisions regarding the building maintenance can be made and also modify the operations accordingly" R3: "In some of the real estates these solutions are implemented already whereas in some it is still in its infancy with ancient technology. So, this is something that drives me personally to replicate the best practices, regarding the building automation for instance, into other properties to follow as well. So that we have had good experiences of something which definitely drives us to the direction of digitalizing and utilizing AI in other properties too. In a way and through my own experience the owners can be provided with valid information better, to recommend certain investments and why they should be beneficial. Hence, with data to support the arguments, they are easily justified to the client as in the property owner. (--) Take lighting for instance in a premise with low occupancy rate, it is rather reasonable to equip such premise with a lighting solution with motion detection for the return of investment becomes realized in short payback period. It is important for the owners to always ponder these issues from the financial standpoint which is probably one of the highest priorities alongside with safety and security." R4: "Through strategy, it actualizes to the operative side of things what the objectives are, i.e., the highest possible occupancy rate, and what are the various things affecting this. Digitalization itself won't erase the fact of a property being sort of overdue, has a bad location or so forth despite the fact a lot can be done with modern development." R5: "Considering the big, strategic picture, first the information flow from the buildings is massive i.e., information of energy consumption and history of defects. Different acts and schemes drive certain projects with all the documents creating project banks. Unfortunately, all the information emerging typically falls under different portals from the owner's perspective. The owner usually hopes for the information to be accessible in one place which isn't often the case. So significant deficiencies can be identified regarding the integration and migration between the operating systems. And of course, how the information can be accessed, just like we have some of the information stored in the maintenance supplier's own systems which we cannot access fully. And this was strategically speaking but can be similarly applied to the operative standpoint where for example in case of an accident where a repairer needs certain structural diagrams, HVAC diagrams, so how this information doesn't always find this person although we know for sure it exists in various portals." R6: "Whether it is safe to say that e-commerce relates to digitalization in terms of people consuming and buying services through it, if surely affects the planning of a shopping center, the layouts or projects for instance, in which the development of digitalization must be taken into account more and more. For example, in terms of the common perception of a shopping center with certain type of premises and business locations, the strong digitalization of today is pushing towards i.e. more collection points and automatons for online customers from which all the purchases can be made which calls for better space management and from real estate management point of view the ability to forecast what is to come. So the ability to expedite certain plans through a digital leap quite rapidly in a flexible manner regarding both the property and the needs of the tenants has become essential." R7: "Well I am responsible of budgeting for example, and all our budgets are in digital form as we prepare separate budgets for each property asset including i.e. the repairs, big or small, and the budget is, let's say 1M in Finland in total which is divided to each asset equally. And the budgets are then monitored monthly from which I get a digital report whether we are on budget or not and whether we meet our budget by the end of the year as planned. So the money is transferred digitally between the asset once we identify a financial surplus, for we will always have a repair debt of some sort, but we also don't want to exceed the overall budget and the digital reporting is mandatory in managing these things. Without this I could never be on budget and be aware of my total spend, a good guess maybe yes, but impossible to know for certain. Nowadays we have this system in which all the invoices are handled as well as every major procurement is done via this system. So the acquisition proposals which then are passed forward for approval depending on the company precedence and the magnitude in euros which brings transparency so that not everyone can just purchase anything without an approval of a superior. As we are a support organization to our core operations who lack the expertise in maintenance and repairs and cost management, we become the ones to sort out, procure and monitor the contracts and maintenance agreements and of course hold meetings regarding how much money these things have cost for our production unit in the first quarter for instance for them to see, for they are the one paying it eventually." R8: "(--) at least the possibility to monitor the HVAC provides me with a view on how, and whether the building and its machinery are functioning as they should. With no analyzation at all in this regard there would be no information or reports provided on how things are functioning in the first place. (--) a good example of this could be if we detected anomalies in the efficiency rates of the heat recovery of the AC implying to a possible malfunction in the system, and we wouldn't' be able to locate the issue to any machine in specific, the building energy consumption would increase significantly. Generally, once the issues can be detected before any significant anomalies within the consumption, we can prevent them and avoid the costs getting out of hand." R9: " (--) digitalization is one area in the entirety which is how it should be, that for all of us in this profession here should have their digital skillset up to date to be able to use the systems and hopefully to learn to use new ones as well. A donkey bridge to digitalization here would be that the usability must be on a good level, so that there shouldn't be too complex and difficult systems among on top of everything else but instead something that supports and serves the operations."

6	R1: "I believe that by following correct data and information it can be pointed out if the building in terms of energy efficiency for example is on such a good level that in comparison to corresponding, other properties it is lower and thereby a valuable investment object. (--) from the user's viewpoint I would emphasize the reliability, predictability and safety regarding the occupancy and of course for it to be environmentally friendly. The idea that with factual information we can ensure the users that the building meets all the quality requirements which can be supported with reliable data, and through the data as well as real time monitoring these conditions can be maintained in the right course creates credibility among the users regarding where they have selected to place their operations, that it is the right choice from the building perspective too." R2: "With these solutions of course, digital services and all that, the owner can be provided with easement within the daily operations and maintenance issues for instance. This brings forth cost savings once there are automated processes reducing the required manpower in the property maintenance thus resulting in savings for the owner, plus of course a lot of data is acquired about the property via digitalization and AI regarding how it is used and what the energy consumption and the condition of the building overall are, to name a few." R3: "Pure cost savings can be acquired immediately. And in the long term the entire functioning of the building becomes more efficient with digitalization altogether if we discuss the i.e. heating and the electricity consumption. Surely the owner is also provided with more information and better knowledge on how the property asset in fact operates, as with the help of digitalization especially this type of data can be accessed. For me personally digitalization expands the perception on what the background systems are and what are the things that they eventually have an effect on. I dare to argue that similar information comes in handy for the owner, to realize what the building consists of, thus driving decisions regarding the development and maintenance of the property. (--) primarily, perhaps the customer satisfaction to find the appropriate conditions for each tenant, that we are able to optimize the conditions in the premises and provide good working conditions for the people." R4: "In REM, say we have a certain asset or premise that we are desperately trying to sell. So the property owner draws the big picture regarding management, coordination and strategy, while the duty of the managers is to then implement and expedite these things in practice. The value proposition, how a customer benefits from our service or product, is that in our attempts to lease the properties, certain types of values and pledges determine the actions taken in this regard and to reach this objective. Also, as we represent the owner, we are the one creating the environment and the community alongside with our service providers, within the property. So that you always start of with something and then keep developing according to the received feedback and plans that have been made. This relates to the idea that the users are free to focus on their own core business whereas we take care of the digitalization to live up to the standards of today." R5: "The end user is equally dependent on the data gathered in the building technology as well as REM systems. So generally, the end users of the property for their part also want to communicate in what type of facilities they are located in, to the outside world. What is the energy consumption rate for instance and how they can utilize this in their own marketing, which then requires access to the data stored in the systems of the owner and service suppliers of course." R6: "Like for property owners for instance, as they hope for the property to grow in financial value or that the property develops which can be addressed by digitalization but more importantly it has more potential to bring forth various experiences for the users. As the whole idea of a shopping center is to have everything available under the same roof, digitalization and AI can even bring more to the table for the customers in this regard. As in, easiness, less effort and what is trending right now is to have these vending machines and lockers and collection points but also the fact that the time spent in the mall would be as short as possible. You can get food and clothes from one spot, or they are even delivered to you for instance so things are made effortless and quick for the customers. And this is the change that digitalization has emerged that usually when considering our strategy, we deliberate on how to get the customer to spend as much time as possible in the building, but the controversy now is that these digital solutions in a change the prevailing habits towards a faster phased visit and tempo. It has been proved that the more time the visit takes like, in terms of the tangible lead time, the more the overall spend which is a good thing for the owner. But in today's world it is necessarily not guaranteed that the lead time is linked to the amount of income. Instead, the digital solutions have resulted in same amount of euros being spent in the property but now with a shorter lead time, implying that perhaps these strategies should also be reconsidered." R7: "We have determined the optimal temperatures in the premises for our users, that in terminals we maintain x temperature levels and in package sorting the optimal temperature is y, of which the production is responsible of covering the costs of course. And once a situation occurs for decreasing the temperature, say, by 1 degree, the users firstly wish to know what the temperature of the space is in the first place by default. So retroactively, by viewing the trend curves from the past we are able to look at the past temperatures through AI and digitalization solutions, for example during last winter and thus we can also present the previous level of cost. So, in case they wish to decrease the temperatures, we can provide them with information in this regard as well as the potential cost savings denominated in euros." R8: "The particular owner and the property assets I am responsible of managing, represent very strong green values. So their object is to gain energy savings as well as reduce the CO2 emissions from their buildings that can be reported to the public. And from my point of view, with digitalization and digital solutions such as this HVAC analytics or development of the building automation system, this objective is reachable. So in this case, a year after the launch of the analytics service, a summarizing report was made from which it could be found that we had managed to diminish the energy consumption of the building by 24 percent, which in euros implied to a 75K euros of cost savings annually. The investment cost into this service was 5,6K a year so it was immediately paid back for over the next ten years. For users naturally the value proposition is that the premises are safe and secure, and the conditions comply with the official indoor standards. In this particular building, the classification of indoor environment was examined with one of our suppliers to be S2 including some of the premises to reach the level of S3. This observation was also purely discovered via the analytics service, that has sensors measuring the air content which could be compared to the standard values for identifying the anomalies. According to these anomalies we took action with the premises that didn't reach the desired levels and managed to implement certain commitments. In terms of conditions, similar actions can be taken towards the temperatures regarding anomalies. In the summer or in winter regarding either increase or decrease, we know whether the conditions of a premise aren't right implying that the building technology such as cooling, or heating may be insufficient or malfunctioning. (--) So S3 is the minimum level, that the Finnish Society of Indoor Air and Quality have set, as in liters per second per person. And the best value, the level of conditions, is S1, which from my understanding can only be reached in rare occasions. So the most common level is S2 which is already very good." R9: "The customers are very interested in the consumption data of the facilities, also relating to the green transition, for they comply with various reporting regarding their electricity, heating and water consumption. Also regarding green electricity, that we are able to provide them with such information for providing this type of added value that has become important for the customers. (--) Surely as we want to be best in class, implying that whatever the customer needs may be, our company already from the upper management level has a high emphasis on the ESG matters. But as far as digitalization, I'm not sure whether we have yet put enough effort on AI and other solutions. So I assume there is yet a lot to be done in this regard, in case we wanted to differentiate and improve for better. For us it has been a priority that the invoicing is on time which is probably the most essential for every business, but there are definitely more to add to it. From my previous profession I recall certain suppliers that promoted the model of knowledge management, providing data analytics in all their operations. But it is a good question whether this is necessary in terms of current partnerships and supplier co-operation to call for such endeavor, as right now we have been acting based on the contractual agreements primarily. So, digitalization specifically hasn't really been a focal point and on the agenda in any internal meetings, excluding our internal operating systems and so forth of course."

7	R1: "The more we can acquire reliable data from the energy usage and technical solutions of the property in terms of having correct, efficient components and energy saving solutions with a timely point of renewal, all this adds to the reliability of how the property is being used and managed in general." R2: "For instance, AI provides direct surplus value through the building automation system optimization as we make direct cost savings through energy savings in heating, air exchange and lighting, that can be very distinct actions with significant financial impacts. Solely, in terms of the money that is being put into the buildings, it costs less once the usage is optimized by AI." R3: "The costs and especially the knowledge, understanding of what the building embodies in terms of systems and what the interrelated impacts are, so the general understanding in this regard. (--) probably in the future we will also reach the level of identifying impurities and emerging microbes, that with future digitalization can address and predict exposures. So surely this is yet a new thing at least on behalf of the prevailing technology which might turn out fragile and still in the development so that first there may be additional costs required and a long-term view by the owner. But the development is evident and there is a high probability that the benefits in the long run are higher regardless of the momentary repairing investments." R4: "Digitalization can add to the value of the building. It is a direct added value whether the value of the real estate grows as a result of digital solutions. Then for the user specifically, for today the properties must follow a certain standards and environmental certificates, or the waste management must comply with sustainable manners. So for many users, what kind of features the properties are embedding, how they are used and maintained, brings forth added value and easiness to the daily operations. Somehow, I find this inconspicuous sometimes, that you don't even see the effects around you although there are things happening all the time. Surely the property owners today are practically competing on who handles these things the best in the big picture, for it is such a question of image." R5: "(--) If we look at a very typical version of a lease agreement where all the maintenance costs are allocated into the rent paid by the end user, we use the term maintenance charges, and the savings that the owner is able to achieve through investments contributes to these maintenance costs which then become realized for the tenants via diminished maintenance charges as in direct value added. And brings forth direct added value to the property owner through PR so to say. With digitalization it is possible for us to optimize a major share of our service procurement overall so that we can outsource services more effectively. We may also determine the extent of the maintenance, i.e. cleaning much more efficiently by utilizing certain systems which adds to the maintenance effectiveness, but again this is part of the property maintenance charges that eventually is concretized for the tenants." R6: "Nowadays, considering the users, the customers want certain rapidity and agility to buy everything from the spot so these digital solutions especially are helpful in this regard and bring fort direct added value also. This also implies to, for example, when a shopping center holds a certain capacity for customers, that the customer now spend the same amount of euros as before but with a shorter lead time. Perhaps in some parking areas with not too many parking slots this is also beneficial. The customers today might deliberate on whether to visit a shopping center over the e-commerce anymore which we are thus competing with, considering the indirect added value there could be solutions or something that could only be experienced on the spot. (--) not only the certain experience related services, but when looking to provide a "wow" effect for the customers, there could be something different arranged inside the property that help with engaging the customers into that mall in particular, for instance." R7: "20 years back our company practically owned all the property assets, thus being very little on hire, say, with 90-95% of ownership. Nowadays the trend has clearly shifted into selling out and instead letting on the assets with long tenancies and currently we only possess around 5-10% of our building mass and these business premises are primarily located in the metropolitan area. (--) currently, nearly all our property assets in my area of responsibility are rental properties. Mainly, as the user, we take care of everything except for major overhauls that belong to the owner and have likely been documented in the lease agreements but even such complete renovations could sometimes be settled with a reduction in rent, and thus made our responsibility." R8: "Cost savings of course and towards the maintenance charges in this case, which also realizes to the users in a sense that the rent is reduced in case of a maintenance fee type of lease agreement. But also the emissions of the building are reduced, CO_2 for example. Furthermore, good environmental certificates can be acquired which is an indirect added value again towards the owner. When pursuing an environmental certificate, the energy efficiency within the building operations brings forth a higher score. For the users the example of an indirect value added related to the level of maintenance charges. So, in terms of property economics, via enhancing the energy efficiency the consumption and the energy costs can be reduced for the users directly impacting their economy via the diminished maintenance charges. An indirect point of view could be, typical for bigger organizations at least, the emission reduction targets that of course benefit from being on hire in a energy efficient property with CO_2 emissions being as low as possible." R9: "For the user the property asset is a supporting element to their core operations, in a sense. But in many places or regarding certain customers, the circumstances must be carefully determined in accordance with the user's operations, in terms of mechanization for instance, the temperature must remain between certain degrees for the entire process to run sufficiently. So it is very important on our behalf to help the user to succeed in their own processes. That way, a good relationship of trust can emerge and at its best the customer may become so engaged of the added value and the level of service which hopefully results into long tenancies. (--) so the automation controls the conditions and especially from the cost perspective, considering the energy crisis we are in right now with electricity prices fluctuating constantly, with digitality we can easily respond to this need of maintaining certain space temperatures much more effectively compared to buildings that have to be optimized manually. And also that we can communicate the actions made and thus bring forth facts to the users via certain digital systems, for instance."

8	R1: "First and foremost, regarding the use and maintenance, digitalization enhances the property administration every step of the way for certain. The more this type of manual information management, capturing and all that can be cut, the operations become enhanced through which it becomes more economically cost efficient." R2: "Via digital services and solutions we get closer to the premises functioning in an optimal way, so that we can react to changing circumstances and conditions more effectively with AI tirelessly monitoring the building. We get all the automation alerts and other critical signals that are possibly ongoing, so it is essential and would feel strange not to exploit such services or possibilities in today's professional building management" R3: "Especially having reliable data already today and even more so in the future for support, and to ensure that the systems will notify once something breaks down in the machinery or within a singular device, so that we get the information in a detailed manner much better and more effectively about the cause, or we can specifically point out the need for repair to the caretaker. So definitely the functioning of the systems will enhance and vice versa, they can be shutdown when not needed. (--) so, reacting more quickly to all the flaws and failures in the operations and with more understanding the actions taken and the future investments will be more accurate. In a way I see a reduction in the repair debt once we have the data illustrating the need for repair for the devices and into what extent." R4: "In terms of operations, again the building lifecycle is impacted positively with modern systems and applications. Then again from management perspective, to have the modernity, new digital environments, brings forth easiness." R5: "My response here involves digitalization, digital solutions, and AI all at once and utilizing them through i.e. building automation systems is essential regarding the functionality of the commercial property. This ensures healthy and safe, optimal conditions for the end user with the word optimal implying to energy efficiency as well as temperatures, air exchange etc. (--) first of all we can provide our tenants with a healthy and safe environment as well as righteous circumstances regarding the maintenance costs. From the commercial property management standpoint, the accessibility of the existing information available in the right place and the migration and integration between our property management tools and systems are emphasized here." R6: "In a sense this enables managing larger entities in case the processes become easier in nature, automized, and can be remotely controlled. For example, considering marketing management heavily relevant to my profession, a lot can be automatized releasing my time from doing much on the social media for instance. Not necessarily the principal task in my profession, but with the AI being so intelligent in the socials that it can read the algorithm and provide the right people with targeted marketing. So the only thing I am responsible of is to enter certain values according to which it can already start operating, versus 10 years ago for example when I had to segment the customers a a lot. Whereas now, the AI is autonomous in developing the target segments requiring only a few clicks for the advertising to proceed. This brings forth added value by also increasing the willingness to buy via more advertising and attracting the customers on-site which is a big help especially in marketing and in terms of my daily work, to get the campaigns going with only a few clicks." R7: "Unfortunately the users often tend to demand more cleaning, repair and all that. In a way there is a lack of general understanding of the building technology and costs related to it, and instead and oftentimes all kinds of improvements, such as a 100K renovations, are asked for with no realization about who is going to pay it and what the investment costs would be in the first place. So if our CREM unit didn't exists here and in-between for managing these things, the users would likely end up with plus a 100 million euros in maintenance costs." R8: "The operational reliability of the property increases significantly when there are less factors that rely on the human. Not to belittle the position of a human in this regard, but the fact that whatever the building automation can control independently according to the signals from sensors, it is much more capable in processing massive amounts of information compared to a person trying to manage such entirety. (--) so reliability, but also the traceability will improve as often the digital building solutions usually embed a way of monitoring the expected impact areas, whether it is the ligthing or the AC in question." R9: "The circumstances must be maintained on a sufficient level and at best digitalization supports these internal processes in a wayy that they provide certain indications automatically and in a sorted manner preventing the need for searching these things manually. (--) furthermore, it helps us to develop, the information is found in the right place and can be reacted more quickly than without digitalization and AI solutions."

9	R1: "it calls for commitment from the stakeholders to have a positive attitude towards implementing the developing digitalization. It all starts from the data aggregation to be sufficient and precise enough as well as committing to it. To go along with the digital solutions and not be afraid of them. The solutions must thus be piloted and the users dealing with them must have the persistence in the beginning to examine and analyze the acquired data correctly that calls for willigness to first of all harness and the expertise to utilize this information, for digitalization alone doesn't necessarily improve a thing." R2: "As an example, through these things REM is geographically possible to be conducted from anywhere of which I am a good example being 150km away from the properties I am responsible of managing yet I gain all the data to my home office in real time regarding i.e. the occurrences in the building automation systems. Or with the electric platforms and channels I am able to alert the corresponding caretaker or the repairmen depending on the situation, so conducting this job today has become really flexible and location-independent, to be able to run things in your own way improving the job satisfaction as well." R3: "Easiness in project launching, as the properties exchange in terms of ownership over time and oftentimes like now we have a situation where our client has acquired a new asset with certain HVAC renovation requirements. In rare occasions we get all the information and documents of the building, and the investigation to start of with the projects are insane in terms of what has been done in the past and what should be done. The technical due diligence may be there to help but is rarely perfect. And once there is no photos and blueprints up to date, launching new projects becomes difficult. Somehow, I see that such need for documentation diminishes through digitalization, but instead you can find all the information from the digital platforms regarding the life cycles and what should be renewed in the near future. And also the job satisfaction improves once this becomes more effective to launch projects and execute them more efficiently. Processes thus improve in speed and in terms of lead times which again calls for less resources from the owner bringing forth cost efficiency. The spaces are maintained in a better condition in general due to technology and AI operating in the background and illustrating the status quo and prevailing circumstances. This for sure affects on how the properties are traded in the future and from the owner's point of view the buildings with effort put into digitalization and technology are more intriguing than something with 50 years old technics which is a risky investment for the understanding of the costs are difficult to identify." R4: "Considering my work, the more we have digital systems i.e. for the leasing process, maintenance or management, those become extremely essential. As an example, which is kind of a quantum leap to the future is that we have a cloud-based system in the developing that is a direct tool for REM. With this the owner can operate with zero excel sheets, for it is a cloud-based platform where all the property specific data can be found comprehensively as well as the rent rolls. It encases the active operations of the building, the long-term planning, the lease administration and everything else in the same place that can be modified in real time and will be updated within the next 24 hours online. All the blueprints are also found there enabling space planning and development, having such tool in all our customer ships would be awesome. Although developing this system is time consuming and quite valuable. However, it brings forth effectiveness, decreases working hours with everything found in the same location and can be used for sending offers with all the required information for the receiver included. Strategically it is thoroughly planned process which to the operative side of things has been made as simple and useful as possible to do business and assist the daily operations." R5: "At best, when discussing knowledge management, to find the information in the right place and effectively, it can be seen as a donkey bridge to job satisfaction when a simple task requires less time but instead things proceed effortlessly and in a desired manner. (--) strategically, the property owner is responsible of guiding the suppliers to provide maintenance services in a certain way. And once we have the costs data for example from the maintenance costs per cost centre, we can manage the work of our suppliers better. I personally like to use the term levels of maintenance that we follow. We might have assets in which we are willing to provide the services fully, so that the technical conditions and circumstances exceed a certain level, or we want to improve them. And then we possess properties that we strategically see having a life cycle of no more than 1-5 years left, to which we naturally want a level of maintenance that supports our real estate strategy in this regard, so that the asset remains feasible for the next five years and it is maintained so that the conditions remain healthy and safe but aren't necessarily being improved. This way the cost level we are pursuing also remains reasonable considering the future of the assets." R6: "it is perhaps a little scary how AI for example in advertising on social media is so intelligent so that you can almost count on it without having to think about the strategy to whom it should be targeted in the first place. It releases you from thinking this through yourself and instead it can autonomously steer and propose such things which may call for verification in an occasion for things to be correct, to make sure the advertising is directed to the right place." R7: "(--) "Surely digital solutions ease my work drastically by bringing forth effectiveness. So that I can see the digital processes, get the reports, instead of walking around with temperature meter on site but the through different applications I can monitor things and make the required changes. That is definitely something that brings effectiveness in our process." R8: "It is much easier to run the technical maintenance of the property with a system observing the functionality and alerting the possible anomalies within the operations. According to the anomaly reports the technical maintenance can thus be managed with the focus on the right things that create significant added value regarding the building functionality. The efficiency of your own work becomes emphasized, to be able to conduct multiple tasks in short period of time, once the external service running on the background provides you with relevant information to focus on. The modern systems that we use today provide automatic workflows too. (--) so there are less to remember once the system workflow notifies you with whatever should be underway. The fundamental intend of use is to be a information management system, but it has been launched to become an ERP system also so basically everything that we do regarding the building data whether it is about projects or maintenance most of which include some sort of workflow, we then manage via this system we have. Take a project with 2-year defects liability period approaching, the workflow highlights the project in question reminding me of the builder's warranty inspection." R9: "if we are able refine all the information to create a situation where singular things don't require separate contacting but instead there is a systematic operating method, it enhances the process by only including the intended parties regarding the issue. We often find ourselves in a role of dealing with users and tenants personally, for the customers want to contact us for some reason which we then delegate forward to our suppliers. Which isn't exactly efficient, but what can you do if a customer wants to call you in person or email you specifically. On the other hand, emails are more easily forwarded than summarizing discussions where you may forget a lot of things."

10	R1: " With reliable data, and data-driven and correct strategic choices the property owner achieves a more cost-efficient property unit. (--) the acquired information from service manuals and the correct and sufficient analyzation of it results into timely and better maintenance and repair solutions compared to a scheduled, manual inspection and decisions made by people's own perceptions. (--) if a customer is promised a fluent, pleasant, fast, and easy visit, such promise isn't fulfilled, or the customer becomes disappointed if during the critical hours the corridors of the store are stuffed with repair equipment and repairers. In the worst case, a store may have to be temporarily closed due to i.e. smoke or something. So in order to avoid the customers from experiencing unexpected occurrences like that, the mandatory repairs and testing should take place with no customers inside the building in a predictive manner." R2: " "As the potential is almost limitless regarding what can be achieved with AI and digital solutions, I would say many management and maintenance related job will go down in history once it becomes possible to conduct these tasks with different sensors and electric solutions. And things like conditions in the premises, albeit being relatively developed already today, will develop even further for there is a lot of energy saving potential from optimizing the heating or lighting according to what is necessary instead of doing this in vain. That is the future plus from the user perspective increasing the comfortability by optimizing the spaces better according to the user's needs. There can be many different types of operators occupied in a commercial real estate for example with varying needs, which can be addressed with AI solutions so that the conditions can be optimized and even more so in the future." R3: "I believe the development work will improve on a broad scale due to better understanding of what the buildings consist of regarding technology and systems. And with this, timely investments and repairs can be made through which the owner is surely satisfied, for the property is being taken good care of as well as the users due to systems being up to date and functioning accordingly most of the time." R4: " To have specified systems for REM is everything in this profession. Those times, of taking photos from the facilities to be displayed on the internet on manually waiting for customers to take contact. In relation to my own profession, the REM digitalization plays a huge role, that you have systems that are easy to use from which you can find almost all the data required for doing the job with only a few clicks. Furthermore, you'll find all the information about the lease that should be included in the lease offers, with the objectives being determined by the owner: what are the operational costs and thus the maintenance charges and with what kind of specs and budget the property may be developed. Basically, everything can be found under the same system plus it it also enables reporting, document both your on-going and upcoming prospects and report the status of those prospects: conducting a walk-through for potential client, sending the offer, drafting a contract etc. So in this particular customership we have completely let go of excel sheets and other reporting, so that everything takes place digitally with the same program. Also the objectives have been determined in the same platform, from which their expedition can be monitored." R5:" My emphasis is on the AI here, for it is surely something for the near future. It will be interesting to see its full potential in terms of what it may provide to the property owners or how we can via exploiting AI develop our REM or operating models. Also in terms of upgrading the properties or improving our customer satisfaction with AI is worth considering. Right now I cant say what kind of development and the actions taken should be exactly, but I'm looking forward to finding out." R6:" Once all the technical devices become smarter through digitalization and automation, whenever there is a risk of i.e. heating or electricity sensors to reach alarming levels, we get the alerts immediately. So that no presence is required on site, for example regarding waste containers or other machinery that include sensors, which notify the need for emptying effectively in real time. So velocity and rapidity, plus obviating the need for humans to be present all the time monitoring the conditions. (--) a viewpoint which came to my mind regarding the prevailing labor shortages, that with AI and robots this need could be responded to at least in shopping centres by replacing the employees in many industries. That is something that could bring added value and cost efficiency considering i.e. cleaning robots or automated outdoor maintenance solutions. And we even have our first tenant to consider this type of solutions in a restaurant, to pick up the dishes and bring food to customers. Furthermore, the robots can be programmed with simple greetings such as enjoy and thank you, which is something that could help the restaurant entrepreneurs with their problems quite rapidly if the option is to close out the restaurants due to lack of employees." R7: Considering maintenance, one of the biggest cost areas we have comes down to cleaning. Together with the cleaning supplier we have now discussed and wanted to develop the process to perhaps cleaning our premises with robots. As our cleaning costs per year are several millions, releasing at least some of the staff to other tasks that robots cannot do, and utilizing the robots for cleaning the terminal floors for instance. I assume this solution goes both ways in the eyes of the users for they always see threats in such scenarios, e.g. the robots causing a collision course in the production facilities but on the other hand they are interested in reducing their costs and developing the processes. So I believe a good discussion will arise in this regard, with certain compromises required from both parties in order to find a common ground." R8: " Together with one of our suppliers we are about to start an intelligent process regarding one property starting with a smart readiness index analysis, identifying the current smart readiness of the building. Depending on the results, we will propose these development targets into our long-term planning to make the property more intelligent so to speak. There are various things to be changed, adding sensors or something, through which the property can be made more intelligent and independent in terms of functioning. In this particular asset I assume that the development tasks relate to utilizing daylight more efficiently and in terms of managing it. For the property is broadly glass faceted on both sides with high thermal stress both in spring and summer that calls for a lot of cooling. So to build sunshades controlled by the amount of daylight or something could help remarkably to not only the comfortability of the users but also towards the energy consumption of the property through decreased need for cooling. (--) the more we load smart activity within the building, the better the traceability. So a sunshade system for example would be integrated with the building automation for monitoring bringing forth one more dimension to the traceability, and the same goes with measuring the need for cooling with sensors. This would likely be the following step after the sunshade system to be able to separately observe the actual benefits from all this and report it to the owner, that the investments turned out to be beneficial and profitable. And from the ratio of the saved cooling energy, we are also able to estimate the payback period of the investment more accurately, than the pre-evaluations made prior to investments. Going further to an even smarter buildings, the amount of sensors will increase in the future and the external systems such as the HVAC analytics should be able to gather the data from pretty much every process. This, compared to the status quo, provides us with massive amounts of information and you could say that in this case the properties can be managed with knowledge. At this point knowledge management comes to fruition to some extent, but this is only a fraction of the unveiled potential." R9: " In a way, the operating systems should be simple enough for all the operators to use. Analyzing the information should of course emerge innovativeness and bring forth new business opportunities. So that we could i.e. detect an increased demand on certain things according to which we then steer our current operations or discover new businesses entirely. (--) then, better understanding our customers and what is important and matters to the them at the end, but also according to which we may meet the customer needs by following how their businesses develop and how this should be prepared for and reacted to. So things like this, at its best"

Green transition

1) How do the principles of sustainable development impact REM in the commercial properties you are working with?

Perspective: *Facility services, Maintenance and repair, Constructing, Leasing, Ownership, Sales and marketing*

Perspective: *Strategic / Tactical / Operational*

2) In what ways is circular economy visible in the operations of commercial properties you are working with?

Perspective: *Recycling / Reuse / Eco-friendly solutions*

3) In which areas are sustainable development and circular economy impacting in the commercial properties you are working with?

Perspective: *Process / Human / Space*

4) How do sustainable development and circular economy impact the operations and services in commercial properties you are working with?

Perspective: *Effectiveness / Flexibility / Customer satisfaction*

Impacts on the REM value chain

Value proposition *= the unique mix of product and service attributes, customer relations, and corporate image that a company offers*

Customer perspective

5) How can sustainable development and circular economy impact the value proposition for the

Owner

Users

Added value/value added

6) What kind of added value/value added can be found from sustainable development and circular economy in commercial properties you are working with

Directly for the owner/users?

Indirectly for the owner/users?

Internal processes, learning and development perspective

7) What kind of added value/value added can be found from sustainable development and circular economy regarding

The operations of commercial properties?

The real estate management of commercial properties?

8) What kind of added value/value added can be found from sustainable development and circular economy regarding your own work?

Operations: *Efficiency / Flexibility / Customer satisfaction*

Orientation: *Process / Human / Space*

Level: *Strategic / Tactical / Operational*

9) What opportunities do you see in sustainable development and circular economy in terms of developing the

REM in commercial properties

Operations of commercial properties

Value proposition in REM

1	R1: "From the standpoint of retail properties, I would say that in planning and construction phase energy efficiency solutions should be taken into account whereas in the usage phase respectively, the building should be harnessed with environmentally friendly energy solutions. More so, during occupancy and regarding the building maintenance, the technical devices, components and solutions are selected according to their life cycle duration and from the energy efficiency perspective. And of course, regarding occupancy, the building should be aligned with opening hours of the store in terms of its solutions to perfect the desired energy efficiency and effectiveness." R2: "For example, starting from maintenance and repair, a lot of this is considered that i.e. the selection of materials is conducted with sustainable solutions with less load on the environment once these long-lasting, long-term solutions can be made. Considering what the construction industry was and how constructing in general approached 50 years ago, the mindset might have been to build the properties to last for the next 50 years before demolition and new construction. And now, the trend is to extend the life cycle for as long as possible with the selected solutions." R3: "There must be rather big differences between and depending on the owners, as in the clients. But regarding the properties that are taken better care of, the upkeep is systematic and regular, and the property manager works as a great partner from my point of view to actively procuring the required repairs and observing the status quo of the building systems regarding their condition and what should be paid attention to further in long term planning and for us project managers to possibly take care of. So all the defects, what should be renovated in the upcoming years, from which lays the groundwork for us do launch the right projects at the right time within the property. And furthermore, that we focus on the critical areas that call for repair, thereby prolonging the building lifespan by taking actions based on such information. With the right actions the building remains in good condition and as a result also the operating profit from diminished vacancy rate is achieved for the properties are more intriguing, and also easier for the owners to sell if they wish to do so in the future. So by taking care of the property with these projects and renovations, if a tenant leaves for some reason it is easier to find new ones with the premises not being completely messed up." R4: "Sustainable development surely is on the table considering REM today, so strongly in fact that it cannot be avoided. Not implying that it should be avoided, but for example considering institutional investors, it is such a massive question of image for them meaning that the annual objects regarding the maintenance of a real estate especially, heavily relate to this topic. So it is a big part of what we are doing, and one must constantly keep in mind that the decisions made are sustainable in character and the construction materials, the systems etc. that we provide are sustainable. For the people responsible of maintenance that is more of a daily concern whereas from my perspective where the responsibility is to manage the leasing processes the important thing is to maintain the customer satisfaction and find tenants for vacant premises. And today, a question that is often asked is how the sustainable development is taken into consideration in the property for the tenants also have certain goals in this regard. So that their business premises are located in a property, in which these things are considered. So in my profession it is a hot topic, but the ways of conducting this oftentimes come from the side of property management." R5: "Our company compared to other major property owners may have adopted ESG concerns a bit late, but in 2021 we began developing our energy management process for instance. So first, we put our energy management systems in order by acquiring a suitable application and ensured that it included the correct metadata. We ensured that 100% of our consumption data was transmitted into the systems after which we procured energy management services and consultancy for managing our energy efficiency. The way this becomes realized to the property owner is primarily that we are able to diminish our energy usage causing direct cost savings. This again actualizes for our end users, within the maintenance charges of the tenants and expenditures in facility services, resulting in improved customer satisfaction. Our rental levels thus decrease, and our customer satisfaction improves, and in addition considering the value we want to communicate, that we take the environment into consideration, we are now on board with this type of development by demonstrating sustainability our operations." R6: "If you look at property owners, the kind of compete in terms of who is the most capable expediting the green values, for the built environment infamously are considered to load the environment heavily. So sustainable development surely is a part of our everyday work in various ways. Considering both the supply and demand in tenancy, there is a competition between property owners to be able to provide the greenest possible outcome and services. And some brands are very strict in terms of occupying just any property, but instead they tender out the available business premises based on these green values. And in construction this is considered a lot of course, which can be seen in decisions made by the owners. It is important to have environmental certificates today and be able to communicate this, but also something more visible that is done for the customers lately at least in shopping centers is that we i.e. have a beehive on the rooftop for local honey production for our cafeterias to utilize as for one example out of many. LEED and BREEAM have been the desired certificates which are pursued to both achieve and maintain within all our properties. Today however it isn't enough to have any certificate, but it has to reach certain level as well. So, thinking back 5 years, this might have been enough, but now the baseline is to apply for the certification once it is guaranteed to achieve a certain level. (--) the level good is pretty much a prerequisite in each of our properties, but even with this there might be challenges due to the original intended use of the properties not being a shopping center, calling for major overhauls and renovations into the building automation for example. In one case, we decided to postpone seeking a certification before ensuring the utilization of the condensing heat from our retail tenants, in order to get a higher score. Also, we decided to renovate the rooftop prior to this, to set up solar planers which would also bring extra points in this regard." R7: "For we are a state-owned company and operate in full compliance with national policies in terms of emissions reduction, circular economy and waste management, all the recommendations received from our national leaderboard basically turn out as commandments for us. And we want to be the forerunner in the green transition, that can be seen in for example our property specific waste reporting that we monitor closely. Not to mix carboard and plastics with energy waste for example, or even worse, to mixed waste which is the costliest option. So, we try to sort and process all the emerging waste as good as possible and into the right place that we produce in our operations." R8: "Regarding the customership I am involved with, sustainable development is heavily emphasized by the owner with high standards on having as environmentally friendly building assets as possible. This prerequisite results in me, as the property manager, to actively bring forth proposals on developing the energy efficiency of the building, and oftentimes these proposals are approved and proceed into implementation. Right now, we have two energy efficiency projects in a state where the planning has been done and we are about to tender out the suppliers. And we are talking projects, investments that are worth millions for the owner, yet they have been evaluated profitable within 8 years considering their payback periods. Surely, the property manager's own interest has an impact on expediting sustainability, at least I am personally interested in energy efficiency specifically. And being in a position where I can positively affect the environmental emissions, this motivates to investigate all the possibilities in this regard, so that the pressure is not only created by the owner but also the manager's own interest becomes important, depending on the person of course." R9: "Sustainable development, and more specifically ESG that is a term used in our department, as well corporate responsibility in general strongly relate to our business and that is what customers want also. Thus, it is something we want to expedite for it is such a hot topic and a huge driver for everyone's operations. And if not directly, it is at least affecting in the background. As much as economic things are business priority, today the corporate responsibility matters are equally so."

2	R1: ”In the retail sector circular economy has been highly emphasized in terms of waste management and recycling at least. For example bottle recycling regarding the required technical solutions is something that comes to mind first, utilizing the high-end technology at the time. Also, for the retail sector identifies as the forerunner in refrigeration systems and solutions and efficiency in this regard. Another important thing is to of course set the reuse of the condensation heat, so that the excessive heat is recycled in the buildings. So once the refrigeration systems produce condensation heat, it is stored and recycled to support the heating systems. And thereby the retail property may have a self-sustaining heat production for major part of the year." R2: ”Merely it can be seen in the provision of different recycling and waste management alternatives, and in case there is a specific business operation going on in the facilities that produces certain type of hazardous waste, that this could be effectively processed and sorted. But on the other hand, the operators are often the ones responsible for this, instead of the property management having to deal with these concerns.“ R3: ”I often try to guide the contractors already in the tendering stage with the query list that underline the reuse of materials if practicable and also products with CE marking that are classified as environmentally friendly by default. Nowadays considering the properties that I deal with the recycling is pretty advanced, having separate containers for paper, metal, glass, mixed waste and biowaste for instance. (--) the pressure in this regard is pretty much internal, to align our operating methods in terms of the query lists and documentation. And once someone notices a development area, it is actively brought up into the table. We also have a person that keeps the documentation up to date. Moreover regarding the environmental solutions and reuse, there is a responsible code of conduct being used with one of our clients that specifically emphasizes in the tendering stage. Practically, it aims for getting the contractors to address multiple areas regarding sustainable development and the construction materials, recycling of wood and metal and so forth. This pushes the contractors to pay even more attention to their service solutions, and this way the suppliers with the most sustainable endeavor may be selected for the job at least in this customership.“ R4: ”There is a waste disposal point for every property and the more it includes containers for different waste, the more satisfied the users are. We have put a lot effort into this during the last years and especially property management representatives have developed these services. Regarding reuse which is often relevant in modifications, lets say a wall should be moved by 1 metre to one way or another, to be able to reuse the old wall but instead reuse it is something at is emphasized surely, so that anything feasible is either stored or somehow exploited. Cardboard and the regular office waste surely has been collected for a long time, but for example what we have done this year based on our user feed back, is arranging containers for plastic waste for our users a lot.“ R5: ”We like to use the term service network, so as the property owner and regarding our properties, the construction is steered by the service network of our end users. In case a property is excluded from the service network, the existing furniture is primarily recycled or reused. And once the property is excluded and becomes vacant, it becomes a development property for us, implying to possible realisation, development in land use planning, or subleasing. So principally we avoid the demolition of the properties and regarding major renovations, new construction, and some of the smaller projects we bring along the carbon foorprint calculations, comparing the carbon footprint of different construction methods. Say, we have a property approaching the end of its technical life cycle that calls for overhaul or demolition prior to new construction, we consider the options from the carbon footprint perspective and include it in our final decision making.“ R6: ”Considering the mix of tenants we have, more and more the customers want operators that emphasize reuse and recycling such as thrift shops that have been unorthodox for shopping centers, but operators with a green emphasis in general. In Helsinki we have a facility that is occupied by several operators with a shop-in-shop type of concept, all embracing green values heavily. Also reuse in terms of renovations, looking for environmentally friendly materials from vacant premises to be utilized in case of new occupancy. Also our customer newspaper has been made from renewables communicated with approval stamps accordingly. We also have giveaways for sharing leather bags etc for promoting sustainability. In the past it used to be, that if you wanted a more sustainable product, it often came with a certain premium that didn't eventually fit our budget, but now it has been delightful acknowledging that the prices are actually becoming lower in case of selecting the environmentally friendly products. This brings forth great marketing value to select products like this, but this has only been shifting frequently probably due to the increase in volumes that customers now prefer the environmentally friendly products, which is definitely a change for the better.“ R7: ”We have separate places for waste that are then disposed to larger containers located in the waste dock. We also have suppliers for emptying these containers, and we have energy reporting systems to specify how many tons of waste each emptying has included in order to use them on full capacity to reduce the need for emptying them. Simply because this also disadvantageous financially and for the environment to empty half a waste press.“ R8: ”A good example is a development property located in Vallila, where a large operator recently decided to end the leasehold leaving half of the property now vacant. And the property owner saw this as a good opportunity to develop the property from the circular economy perspective by attempting to reuse all the feasible materials. Also with high rate of vacancy, an opportunity arised to set up the facilities with more smart solutions in terms of lighting and air exchange for instance. And now that it is mostly vacant, it is like an empty canvas to draw on, with the fundamental idea of reusing everything we can.“ R9: ”Waste management, in terms of complying with legislation and all that, has been a topic for quite some time. The level of reuse is more difficult to evaluate at least in our profession, for it is highly dependent on the operator and ofc this regulatory landscape, what can be recycled and reused from the emerging waste. On the other hand, also steered by legislation but more importantly the customer needs of today, create pressure on selecting more environmentally friendly solutions. We of course hope that in this case the costs also remain reasonable for all parties. For example, constructing green buildings with i.e. roof coatings that neutralize nitrogen oxides in the indoor air or so, the overall benefits of such solutions should always be considered in relation to the investment cost. Something that the customers address and what is also steered by legislation nowadays would be the recharging points for electrical vehicles. Then there is solar panels and green energy in various forms, which we have to consider and surely link to the operational side of things in a tangible way."

3	R1: ”Sustainable development and circular economy can be seen in all the areas as in the property planning, constructing execution, in the selection of machinery and equipment, and simply in the correct way of communication and guidance of the user.“ R2: ”First of all the topic is very trending and can be seen in everything that we do, in repair planning, in the maintenance strategy etc. And also in the service level agreements when for example maintenance contracts might involve clauses to avoid meaningless energy usage and considering maintenance tasks, whether they are necessary. Like in outdoor maintenance, upkeeping the green areas in a reasonable way and thereby be able to reduce emissions and energy consumption in such processes.“ R3: ”For example in real estates with operators producing various types of waste, there might be other operators who provide services for recycling it accordingly so that everything goes to recycling and possibly even gets reused through them. Considering the process aspect, at least we have discussed and developed a streamlined operating model for everyone together in our unit and may proudly say that we are up to date in taking these things into consideration. Once these practices are repeated in several projects through the query lists and in the tendering documentation, the idea becomes included in every renovation and renewal project as a result.“ R4: ”A building might be constructed in the year x with certain intended use, living up to this expectation and considering the limitations. In older buildings especially, for example the waste disposal facilities can be very small in relation to recycling requirements and circular economy mind set of today which is often solved by at least securing the basics in this regard. These are things, that are often approached through environmental certifications, implying that once a certification is seeked for certain property, certain requirements must be met in order to achieve one.“ R5: ”The question could be turned around, in which area do not sustainable development and circular economy impact the commercial properties in my profession, for they surely affect everything. Even the simplest of things, such as outdoor maintenance, where in the query list the energy efficiency and emission standards of the suppliers' machinery and equipment might be determined for instance. So it has been taken extremely far in so many areas, for taking as much things as possibly into consideration.“ R6: ”For example the way how we communicate this to our customers in all our communication and marketing, how we build the premises, or what is displayed in our website. Whether it is the everyday user of the building or the tenant, this aspect is always included. For example, in our website we have a compliance section for our customers to read regarding every property asset, for displaying our corporate responsibility and actions taken in this regard, explaining what sustainable development means in our work, possible environmental certification grades, or presenting the practical solutions such as solar panels or partnerships that we have. For example, if we have clothing recycling in the shopping center, or whether our restaurants have services for avoiding food waste in which we are socially on board. So it is strongly involved within all kind of planning already, and naturally the owners and the customers both expect this. On top of marketing, we also offer recycling bins on our hallways and larger recycling spots for customers and residents from the neighborhood to access, so it is a highly important value certainly.“ R7: ”Considering environmentally friendly solutions which of course we are using, for example in construction. The best example has to be the fact that we have so much vehicles running on both diesel and gasoline, with which we are in the middle of a transition towards more environmentally friendly solutions, as in electric vehicles. So alot of recharging points have already been constructed, and we have more and more electric bikes and scooters for commuting, for logistics and travel is such a massive part of our core operations. As a company we follow certain recommendations in this regard, whereas also my superior is interested in my actions and so on. So the monitoring goes all the way to the board of directors including a minister of some sort, due to us being a government owned company.“ R8: ”Through the objectives of sustainable development for example the waste management is optimized, to minimize the amount of mixed waste through user guidance. But also that we unanimously take of such containers and replace them with plastic and energy waste bins so that any kind of waste with more stress on the environment is diminished and furthermore that we may have reusable waste ready and sorted in the property already. Then of course, regarding green areas which have been highlighted as well as the biodiversity aspect, we have planted beehives on the rooftops from which we could produce honey, also serving as a marketing trick apart from the local honey production available for the users, which is actually quite plentiful. So a great marketing act for the property owner, but also a strong statement on their values, the eco-friendliness. Of course, in the background there is the desire for environmental certificate, BREEAM or LEED. From the green areas, and from sustainable development and circular economy in general, you get a high score. And the better the score the stronger the comparable portfolio for the owner as they overview their ownership in different countries for instance. In case things are done well in Finland, to reach high BREEAM scores, it increases the value of the Finnish portfolio in the eyes of the owning company. (--) in BREEAM the highest grade is outstanding, which is something that I believe not many properties in Finland has been granted with. The owner here in my case, aims for excellent grading in all their assets which is very good result already. So even with completely new properties, the possibility of reaching excellent is not for certain, implying it requires a lot of effort regardless of whether it is new construction in question.“ R9: ”From the space perspective, the most tangible thing that comes in mind is to implement certain technical solutions into them overall. From the human perspective, the pressure from users partly impacts to which direction things are going and what should be done and developed. What is interesting here, is that whether the pressure, the indications should come from our tenants to our direction, or should we be more of a forerunner in the expedition, communicating our users with the best practices that we are planning to execute. Probably it would be for the best for us to be ahead of our tenants in this regard."

4	R1: ”You could say that making the right decisions regarding sustainable development are the key here. Whether it is the selection of machinery and equipment or reliable partners as the service providers. (--) so making the right choices in selecting the solutions from service providers with similar values and principles within their operation, as well as right type of informing.” R2: ”Regarding logistics halls and big warehouses, you dont really have a lot of facility services. The maintenance company may provide services such as ploughing the yard and so on. (--) these are rather difficult types of property to relate the question to, but in a nutshell the sustainable development is visible in these properties strongly from the energy consumption viewpoint, that this would be optimized with smart solutions to find a reasonable level of energy usage. And the renovation solutions should favour materials and methods that contribute to the building lifecycle to become as long as possible.“ R3: ”When all this is integrated as a part of our basic operations, it is not only paid attention to but also becomes effective due to regularity and as a part of normal behavior. In terms of customer satisfaction, taking good care of the premises first and foremost, the right choices we make throughout a project is the key. And once we repair something, it is conducted profoundly from the beginning for it to last the next 10 years or as long as possible hopefully. To make the repair solutions long lasting, through which all the disturbances for the customers, the tenants would have to deal with otherwise in case something is broken all the time. This also adds to efficiency, since even if the investments would appear a little larger at once, in the long term it may still turn out as the most cost efficient solution preventing the constant need for repair.“ R4: ”(--) If it is possible to reuse something, doing so should have a positive impact on the financial side of things, the costs.“ R5: ”What I am emphasizing here is that when discussing the responsibilities between the lessor and the tenant, the things we must take care of are thus limited to the owner's responsibilities whereas if the tenant wants specific type of furniture for instance, they shall do so according to their interests and operating methods. In our process we procure the maintenance services fully from company X who may simultaneously be our tenant, now responsible of handling the procurement of the required service supply. In case there is a tenant in the building that for some reason wouldn't be able to procure some of the required services, company X has the resources for filling this gap although the service level agreements and everything would follow the procurement policies of company X too. However, of course we as the property owner have been expressing our opinion on the facility services and operating methods over the years for example in terms of what kind of substances and materials are being used, for example in cleaning.“ R6: ”Indeed the fact, considering what facility services the shopping centers include, it could be even seen shocking for the public in case we didn't emphasize sustainable development and circular economy strongly in our operations. Like, it is bad image not to have this considered or whether they are downsized due to some other brand. So you have to be careful with taking actions that are counterproductive in terms of expediting sustainability in a sense. (--) even the service suppliers nowadays almost automatically propose a more sustainable option, whether it is about the construction methods or marketing materials that are in question.“ R7: ”There is a lot of variation in this, I would say. For everyone thinks their own way, and we are the one trying to communicate this circular economy and sustainable development and provide the opportunity for everyone to expedite it by sorting the waste to the intended places. Also by educating our production units about this and providing them with information about their recycling rate or waste levels during the past months or so. And of course, via guidance on the recycling bins and containers with the correct marks on them for there are many of us that would sort the waste wrong otherwise, from my experience.“ R8: ”Bicycle parking makes a good example. So if possible, we aim at providing this opportunity for the users of the properties, to encourage them to commute by bicycle instead of a car during summer especially. Also sharing economy, a bicycle-sharing system is something that has been proposed by the marketing section as well as carsharing. So we have a large parking hall in this one development property, that one of our suppliers would provide the service of carsharing with two electric cars for the tenants to utilize for current matters.“ R9: ”(--) we then have certain certificates of course which include certain demands regarding the facilities, things that we should take care of. And we do believe that once the basic operations are taken care of, it brings fort effectivity and customer satisfaction in the property. (--) BREEAM Use in particular is something that we seek to certify to the level of Good or Very good. And also, regarding the BREEAM certificates during construction, we aim at Very Good or Excellent levels."

5	R1: ”Sustainable development and circular economy are such meaningful values today that both the owners and users are calling for reliable knowledge and information about them. So everything must be well documented and presented in a fact-based manner. (--) Every retail or a commercial property has a service manual system that serves as a data bank. And by developing it is possible to harness a real time data base that also the owner or user is able to monitor full time and understand how things are operating in the building. I would say the owner is primarily interested in how much of the energy procurement can be cut in case the so-called waste energy could be utilized for heating purposes for instance. Simply, if the emerging waste energy is not utilized and reused for the basic operations of the building, what is the cost for purchasing the same amount of energy from the outside. From tenant's perspective as the user it is crucial to understand what the benefits might be from having a led-based lighting system or what is the potential savings from the energy optimization in premises with only temporary use or during closed hours.“ R2: ”Energy optimization becomes realized in euros for the owner at least. So it is not only reasonable from environmental and the sustainable development aspect, but also for the owner's wallet. So taking the environment into consideration can be argued easily. And many of the users today have their own objectives in this regard, to do sustainable business which oftentimes highly relates to their business premises also running with green energy etc. For some companies this is very important, to be able to communicate being on the crest of the wave regarding sustainable development and adopting it in their business.“ R3: ”To make decisions that are long lasting and sustainable brings forth cost efficiency for the owner but also effectiveness into their work and time management by doing closing things out at once. So that things are settled for the distant future, allowing them to focus on other issues regarding the property and use their time effectively. For the user, to make sustainable solutions at once should minimize the interruptions in use and disturbances that they otherwise might have to deal with.“ R4: ”The property owner in their strategy of course defines the operating models and for sustainable development and circular economy are such a big deal nowadays, the monitoring of ensuring and expediting these things is also strictly conducted by the owner. It is a image first type of thing, to be a forerunner in this regard. And oftentimes if the neighbor comes up with something innovative regarding sustainability, it is duplicated by the masses quite rapidly if the solution turns out to be beneficial. Such accountability theme is something that all major property owners seem to have in the core of their operations. So it is present everywhere, especially in maintenance management, whereas in my profession I must acknowledge these things primarily for bringing them up in the lease negotiations. The users are also very aware of these things, as negotiations about available premises nowadays often involve sustainable development related questions alongside with the address, certain features of the building and the level of rent. So it is a big factor today, in case a customer selects the neighbor over your property, that the accountability perhaps wasn't taken into consideration well enough compared to the other location. Or that sustainable development wasn't conducted in a sufficient manner overall, and the lessor didn't have any follow up development initiatives planned for this anytime soon or in the near future, which drives the customers to look for better solutions.“ R5: ”Primarily, this comes down to certain type of engagement. If we as the property owner are committed to the regional carbon neutrality targets, we respectively expect our service providers and all the operators dealing with our property except for our tenants, to comply with these targets too. In case we buy REM services, for example property management or landlord services, we expect the managers to operate in accordance with our choices and values. Whether it is energy efficiency; they should observe, and act based on these values in case they find ways expedite things or report about them so we can together decide on the required investments or changes whatsoever through building automation. We don't specifically have a value proposition for our tenants in terms of the carbon neutrality targets, but instead we have expedited these things spontaneously according to our values, now strongly committing to these targets. And when we are proactive with this as the owner, surely it is a great asset and an advantage for us, that the end users receive tangible benefits within their maintenance charges from their occupancy in a green building. With current lease contracts the tenants are not really in the position of demanding these things from us, but as said, this is more based on co-operation and us being proactive for these things are common for everyone.” R6: ”It is a number one trend for property owners right now and as we approach the energy crisis of the upcoming winter, property owners at least online are actively sharing the energy saving measurements and actions that the company has taken in this regard. And also, on how they are actively involved in different sustainable development projects or support them financially, which is a certain type of image contest and bring added value to their properties and the users of it. (--) In case there are two properties that a potential tenant should choose from, the values on how sustainable development has been considered may become emphasized and thus drive the decision making, at least from my experience during the last couple of years.“ R7: ”(--) there has been conversations with the owner about constructing a recharging point for electric cars on our behalf has the tenant. This would of course increase the value of the property as the owner reclaims the systems once our tenancy comes to an end, but since the property is not in our possession, we don't have the interest in investing into them alone but instead take care of the project and maybe pay half of it. So that it would be a win-win situation and we wouldn't have to rent them or find a solution from somewhere else. (--) and our duty is to offer our users the opportunity to sort the waste albeit they are the one eventually deciding to do so. Therefore, it is more about informing as well as providing our users with sustainable solutions for them to adopt and use.“ R8: ”For property owner especially in this case the eco-friendliness and sustainable development are ranked high in the value hierarchy. On the fund level, it is guaranteed that the person responsible for the fund performance is happy with reaching more and more of these targets. On the other hand, the more these targets are reached, the more the interest to invest in Finland increases if you think about this even further. Towards the users then, as eco-friendliness belongs to everyone these days and is becoming a highly important thing, what better way is there to expedite it than via occupancy in a property that enables sustainable operations by solely being environmentally friendly in nature." R9: ”That is certainly something that we pursue, for example through certain green lease principles where we include certain requirements in our lease agreements about sustainable development and eco-friendliness, so that the tenants would also commit to our objectives which has never been an issue in the first place. Surely these commandments aren't very strict, but to comply with the principals that we represent is important for us and we try to engage the customers to it just like we commit to it ourselves. For we believe these are important issues for our customers too."

6	R1: ”In short, I would say that it increases the value of the property. And towards the user it adds to the reliability and safety of occupancy, thereby engaging the tenants and users to stay in the location. I mean once these things are taken into account, the market value and interest as an investment grows, thereby providing the owner with more possibilities for the future. Whether it is to be traded or it is an asset that can be used for warranty. Simply something with economic value that can be estimated and sold both of which in my opinion can be achieved by consumers and customers valuing the circular economy and energy solutions of the building and find it as reliable and safe visit and use. This way the customer volumes will increase, and the use value in the market so to speak, also increases. R2: "Here, the owner achieves costs savings in euros of course, and for both the owner and the user are positively affected regarding their brand and image, added value for responsibility and taking the future of the globe into consideration and so on.“ R3: ”First and foremost regarding sustainable solutions, once you decide on executing something, you conduct a condition assessment, or an investigation by specialists what is there to fix in the building and how it should be conducted. Then you include the project planning team to go through the existing data based on which profound project plans and the bidding for contractors may follow. This way the bids should be quite cost effective once the initial information is on a good level and the problems have been identified prior to the launch of the project. Moreover, the implementation with correct constructing methods should result in structures with long life span. Thus, I would say this affects directly and indirectly in a sense that directly the renovations can be conducted successfully at once which should make both the users and the owner satisfied. Indirectly, the property including its machinery and equipment should last longer and also in the long term there should be a repayment for such investments. Considering our value proposition to our customer, as we wish to be a reliable partner by doing things the right way from the beginning and be able to manage the projects as well as the properties in general, also in the future. (--) We want to be the selected partner in project management also in the future by doing things right, instead of doing a half-ass job that would instead overload the property and its functionality.“ R4: ”For the owner, the indirect added value arises from the improved attractiveness and image. (--) say, there is a property with electricity provided by the lessor which is produced with solar panels or other renewables, of course it has an impact on the electricity bills of the tenants. Today, for example in Tampere the majority of the building stock is quite old, with no possibility to have an individual electricity meter in each premise. And considering the options for measuring the electricity consumption of each tenant, the most reasonable outcome often is to divide the electricity bill of the property company based on squares or have a fixed price for it or something which inevitably drives the property owner to seek for more sustainable alternatives. In such case, the solution is oftentimes to try producing the electricity in the most effective way possible.“ R5: ”Considering the user, the direct added value comes from the financial benefits measured in euros. So regarding the building stock in our possession, we are talking hundreds of thousands of euros per year. To exemplify, let's say that we have constructed 0,6 mega watts of solar power with 10 years payback period by the end of 2022, which in itself should cause 60K euros of savings annually that is directly cut from the total occupancy costs of the end user. So with our solar energy investments solely, we save the customers money 60K a year. I believe the indirect added value highly relates to marketing and the image of being green, for both the owner and the users. So that together we can agree that the properties are functioning energy efficiently, which can be later verified to the public with different certificates for instance. That however is still in progress for us, although there has been familiarization to environmental certificates such as BREEAM and LEED already that we might be able to pursue in the future once we have our energy management system and energy consumption monitoring under control.“ R6: ”Directly, considering the owner and the user, there are benefits to be found in euros regarding renovations where materials reuse and recycling could be utilized to achieve cost savings. Or at least it would be beneficial for the owner's wallet. And for the users too, to be able to find such solutions where they could save some money. Indirectly it is more about the image that comes in mind, that unless you participate in these things or take them seriously in your operations, it can affect your reputation in a bad way or respectively in a positive way to be able to attract certain customers for instance.“ R7: ”The property grows in value, for example through installing recharging spots for electric cars. (--) there are also benefits for the user from these things, as for the mixed waste is the costliest option whereas energy waste comes next, so once you sort the waste properly, they become a lot cheaper to dispose plus you may even get financial compensation, as in, repayments allocated directly to bank balance of the commercial property or to the operator for doing so. (--) furthermore, we have a property that is equipped with manual roll-up doors which is open all the time also during the winter. So procuring an automatic door that closes, if necessary, also brings forth indirect added value for the users preventing heat losses which eventually also results in surplus value within their operational costs, too.“ R8: ”Sustainable development and circular economy sometimes require big investments for the energy efficiency systems. And for sustainable development to be the guiding theme for emissions reduction, it is a driver for taking action. Surely, there are other ways to improve the effectiveness of the building, but these themes also innovate investments in our homeland through all kinds of projects and investments. Considering the fact that around 40% of all the emissions in Europe are caused by real estate and construction industry, the potential is massive. Even from the viewpoint of national economy and reaching economic growth, to focus on energy efficiency and eco-friendliness via investments embeds a huge potential.“ R9: ”Every now and then we are obliged to invest into something new, but the investments also provide us decrease in operational costs regarding use and maintenance which is positive, and direct added value for us. And the indirect must have to do with communication or something that cannot directly be measured in euros or with no actual price tag. However, there will be more goodwill and things like that for sure. (--) and both are good things, to save money but also that we can communicate further about the positives. A good example could be solar power stations which decrease the maintenance charges of the users through local energy production which is added value for them also."

7	R1: ”If the building functionality and things regarding circular economy are monitored from the beginning of the life cycle as precisely as possible, that way the success and right solutions can be found, but also the areas of development. And once the monitoring is reliable with enough data, the planning and execution team may be provided with constructive feedback for not replicating the mistakes but instead to improve the operations towards a better direction.“ R2: ”Commonly, sustainable development is viewed as cutting of and reducing something. So I cannot say for sure if there was anything for it to bring forth instead regarding the operations of the building, or when things are done in accordance with the sustainability principles. Probably in terms of circular economy and all that, waste management has become easier in terms of sorting and disposal so that is something, surely. But I can't think of any other evident added value attributes from it towards the everyday operations in the property.“ R3: ”Basically everything begins by knowing that you are doing things the right way what really creates added value for the owner and the users at the end of the day. It gives you confidence in your work to feel you're on a right track and provides job satisfaction knowing you're doing the right things. And may proudly announce to be on point and professionals in whatever you do, for better selling the services as well. (--) when you aim for the long-lasting solutions that are data driven, and the processes are systematic, it brings effectiveness not having to consider things case by case. It is self-evident, the viewpoint of sustainability, in everyday activities and this emerges job satisfaction. Also, from the contractor’s point of view, it is crystal clear for them to operate by complying with our policies and I dare to argue that they are also pleased in making meaningful, sustainable work and not having to do things all over again in 2 years or so. The premises are kept in good shape, the processes are standardized, the owner is satisfied for things are taken good care of and the value of the property maintains making them easier to sell forward or commercialize.“ R4: ”Currently there is a realization for property owners to put a lot of effort and invest massively on sustainable development and circular economy issues. Also, the fact that we as managers must react to the customer feedback actively in this regard as well as proactively interfere with things that require developing.“ R5: ”The first thing that comes to mind from the principals of sustainable development or circular economy, is that they create certain boundaries and code of conduct for how the commercial properties should operate and how they should be managed in order to comply with these principles. So in a way these frameworks steer the actions as well as the REM.“ R6: ”Time and money can be saved once we can utilize and reuse certain materials from inside the building. One example from more of a commercial perspective could be that often the tangible value may be found in i.e. reusable waste which we can utilize for certain campaigns to make shopping bags for instance. And direct added value is to avoid the waste disposal that comes with a cost but recycle it instead. And more of an indirect added value could be that we can advertise such eco-friendly activities such as products made from recycled materials and local production, which is something we utilize quite a lot these days. (--) although this is something that actualizes in property management mostly, the more things can be reused and recycled. In euros of course but also longevity through i.e. recycling, hence cost savings and easiness. So that there is no need to replicate processes once we can find long lasting solutions.“ R7: ”All our decisions are based on consuming as little energy as possible and to effectively comply with circular economy in our properties. And regarding my own position, these things actualize in these energy efficiency measurements and being able to move on from a consumptive heating production method towards more eco-friendly methods. These are type of things here in real estate management unit that we constantly deliberate on, to install solar panels or small wind turbines on the roof perhaps or whether we should move from oil heating to district heating. Or in case we have electric heating, would it be reasonable to support the heating with air heat pumps or air-water heat pumps, for instance.“ R8: ”Sustainable development is also considered already in our service level agreements so that once we make contracts whether it is about property maintenance or the building technology systems, they always come with a directive to our suppliers that we expect them to comply with, so that the work around our property would be as eco-friendly as possible. Considering the added value towards the users, of course in sustainable and eco-friendly buildings there is a lot of emphasis on the diversity of the premises which usually results in better usability and comfortability. As sustainable development highlights naturalness, there might be green walls built to the premises also improving the comfortability and even the quality of the indoor air.“ R9: ”Regarding our internal processes, we are provided with certain feedback and development areas to focus on and think about even further that brings certain guidelines to our operations. And also different audits take place, based on which we may plan our actions. From REM point of view, a framework of how we should operate, how do we collaborate with our partners, what is our reporting like and how do we react to it. (--) for example, there are different assessments regarding ESG which first of all requires certain measurement tools for capturing the initial data to start off with, after which we may start developing things. In some of the areas regarding corporate responsibility and accountability, we may still be at the starting point and not very far ahead in my opinion."

8	R1: ”At least this has led to increased importance of the collected information and data and to the reliability of it must be monitored and paid even more attention to, so that the data that is utilized is correct. Then of course, the developing digitalization and digitalizing has helped with data collection, analyzing, and management. And the developing technology, machinery, sensors and everything produce deviation reports more rapidly and in real time when reacting also becomes faster.“ R2: ”If you wish to look for a deeper meaning from REM, it can be quite meaningful what could be done in this field of practice at the end of the day. As climate change and environmental concerns are pretty discussed themes meanwhile buildings consume 40% of all the energy in Finland, we are in quite a relevant position here in this sector in terms of having a positive impact on things through your own work. To rationalize the energy consumption and prevent energy losses which is quite meaningful and probably is the most meaningful thing one could do in this regard.“ R3: ”For certain Finland has a lot of repair debt. So when we execute repairs and projects in the buildings, the solutions have to be long lasting. So that we can decrease the debt of repair debt and maintenance backlog at some point. Through this we continuously create value, by doing things properly which creates value for both the owner and the tenants. This way the properties maintain their condition, and I dare to say that they are also more easily developed once the necessary repairs are done in time and with correct methods, creating space for property development too. The owners hardly find time for property development if there is continuous repairing going on. This might be doable, but probably becomes a lot easier once the repairing has been on point.“ R4: ”For lease negotiations and customer satisfaction surveys which are close to my profession, these things are vital for they are so of the essence that once not taken into consideration, it may result into vacant properties with no new tenancies to be found, at worst. So these accountability themes in general have become highly emphasized today, and are something that the owners are very much competing in.“ R5: ”In my profession I see no added value from these things necessarily, but in terms of market economy and major property owners, it is surely a market edge to have your processes and functions straight, for differentiating in the competition and ensuring high utilization and occupancy rates for your assets.“ R6: ”Efficiency is one thing but also the strategic level, to be able to communicate that your company has embraced these things. For example the beehives we have on the roof is an eco-act itself, but the fact that our cafeterias and restaurants may use the honey instead of getting it from a distance supports the idea of favouring local production and effectively too. Also the tenants are increasingly interested in utilizing the rooftop area for growing herbs and salad as well as other possibilities you hadn't even thought of before. But on top of enabling the use of more local products, such request create potential for additional rental income for more rental squares are in use. And the users can benefit and may advertise being ecological by avoiding transportation and using local products instead produced on the spot at the rooftop. We already have a tenant, a restaurant that very much embraces this, so it is an example of a win-win situation.“ R7: ”In my profession, together with experts I'm responsible of planning and making certain investment decisions, and also calculating the possible payback periods. And of course in every decision we end up making, we strive for this green transition and avoid the use of any contaminant elements.” R8: ”There is a personal meaning to be found in sustainable development and eco-friendliness, for me to be able to have an impact on things. For example, with one customership, we made a transition of using only exhaustless electricity and district heating in the properties. And this contractual change alone of purchasing only CO2 free products, we were able to prevent 3,5million tons of CO2 emissions annually from emerging. And that, could be seen as my personal carbon footprint to be covered for many years.” R9: ”I feel like this should already be inherent, so there should be no need to bring up these things. So they are a part of all the operations, but I can't say what the tangible effects are, whether it improves job satisfaction or effectiveness, but it always exists in the background, however. So it requires no extra attention when you know you have a separate ESG director in the company to expedite certain things for implementation, but in general it affects the operations on every level."

9	R1: ”I guess the possibilities are limitless, but I couldn't predict what they are exactly. And I would assume that nobody does, however it is commonly acknowledged that if the data from the operations is not collected continuously and reliably, the data as well as AI utilization and thus finding new business solutions will be hard.“ R2: ”The potential for saving energy is massive albeit a lot is already being done in this regard. So if a property still lacks a heat recovery system, or the waste energy is not harnessed from the production of domestic hot water etc., there is still much to be done to reach the level that these things should be on today. (--) for there is a lot of commercial properties still lacking this type of upgrades within the technology that could be there, and in the future, probably should.“ R3: ”Generally speaking, many kinds of materials at least. Wood for example can be reused effectively, as well as asphalt at least to some extent. Also metal can be reused pretty much completely via melting it at least, although I'm not sure if it follow some kind of standard procedure in terms of percentages, how much of the old materials are allowed to be mixed with pure, new metal products. In terms of plastic the convention is probably similar, so at least the overall material consumption diminishes via reuse and doing things right at once.“ R4: ”Depends on the prevailing trends, but I suppose sky is the limit here. Right now we are desperately trying to find ways from maintenance to reduce cost levels because inevitably, if our operational costs only keep on increasing, it will eventually affect the rental levels also. In case you missed the development of the cost-of-living index from the past year, there has been quite a wild increase of 8% and there is nothing we can do about that. So there will be a price increase accordingly for lease agreements that are bound to the index. Which is of course due to many factors, but the fact how big of an impact the operational expenses have, what is the price of electricity, water and other utilities and so on is massive. For in my opinion, if the prices go up, it is unlikely that they would go down or return to the level they used to be. (--) Then there are heating systems and the ecological aspect to be considered, whether it should be geothermal heating or something else. Also in terms of electricity which is a huge cost factor in commercial properties, the property owners are clearly striving for buying green electricity from the markets. right now property owners definitely strive for buying green electricity from the market, whether it is wind or hydropower or other renewables. R5: ”I assume this has more to do with how we contractually steer our service provision to align with our values, if you may call that an opportunity in this regard.“ R6: ”It feels like even though something is being done, there is much more to do with little bit of effort. Regarding my previous example about the additional rental squares in shopping centers, it should be considered more how they could be utilized and offered to our customers, the local production being one example of this. Moreover, all the condensation heat from retail stores etc. should be utilized better. (--) In one shopping center, right after the acquisition, we conducted a brand investigation showing exceptionally strong emphasis on sustainable development and circular economy. And that ended up being the baseline for our brand renewal, something that is quite new and unique considering how many competing shopping centers there are in the area. So these value propositions we provide our customers with, about the building, services and materials, eventually turned out to be the reason for visiting us or staying on hire on in the property in this case, based on the investigation.“ R7: ”Green transition, circular economy and monitoring our energy consumption are surely important areas regarding our properties. Solutions of being eco-friendly and to diminish energy usage, are continuously both explored and implemented. For example, we have replaced metal halide lamps with led lights, or in the AC we have heat recovery systems to store the waste energy that is reused for heating the facilities. So with all this kind of solutions, which is part of my work to examine, tender out and eventually implement. (--) Let's say its summer and plus 30 degrees Celsius for instance, and we are cooling with full power on the previous day for reaching the desired temperature levels. And the next day, the outdoor temperature drops to plus 10 degrees only, while our doors are open for loading cargo and suddenly there is a need for heating. So the temperature variations can be massive, and that is something we have deliberated on if there was an AI that detects and predicts such variation as well as the indoor conditions for alignment. So that once there is 30 degrees Celsius and 10 the next day, we could avoid heating or cooling the premises knowing that the AI is smart enough to utilize the prevailing heat and optimize the conditions.“ R8: ”Right now eco-friendliness and energy efficiency steer a lot of REM operations. And the development is something that really touches both these areas. Also in our company the internal education is focused on these concerns, as well as other accountability issues. And in terms of developing the commercial real estates, this relates to making the facilities more diversified with green walls and other elements. Which then contributes to the user satisfaction and enables the users to operate sustainably in the building, for example if sorting the waste has been made as simple as possible. Or via bicycle sharing systems or carsharing.“ R9: ”(--) we are in the making but there is a lot to be done in this regard. There are certain trends arising from the world that should be followed, what to participate in, and perhaps these things open up new opportunities to improve as well. What those possibilities are, I surely hope things are done with quality so that we develop through these observations, operating models and solutions. (--) these things steer the entire strategy in a way, and also regarding the value proposition, green values have become something that our customers might even consider as self-evident. So that we, as an owner, cannot just operate in the old habits, but instead compliance to these things are expected from us."

Information and data

1) How and what kind of data and information is collected in the commercial properties you are working with?

Perspective: *Process / Human / Space*

2) How are data and information utilized in the decision making in commercial properties you are working with?

Perspective: *Strategic / Tactical / Operational*

3) In which areas are data and information utilized in commercial properties you are working with?

Perspective: *Facility services, Maintenance and repair, Constructing, Leasing, Ownership, Sales and marketing*

4) What are the benefits of data and information for the operations and services in the commercial properties you are working with?

Perspective: *Effectiveness / Flexibility / Customer satisfaction*

5) What kind of data solutions are impacting REM in the commercial properties you are working with?

Perspective: *Digitalization / Digital solutions / AI / Sustainable development / Circular economy*

Impacts on the REM Value Chain

Value proposition *= the unique mix of product and service attributes, customer relations, and corporate image that a company offers*

Customer perspective

6) How can data and information in REM impact the value proposition for the

Owner

Users

Added value/value added

7) What kind of added value/value added can be found from data and information in commercial properties you are working with

Directly for the owner/user?

Indirectly for the owner/user?

Internal processes, learning and development perspective

8) What kind of added value/value added can be found from data and information regarding

The operations of commercial properties

The real estate management of commercial properties

9) What kind of added value/value added can be found from data and information regarding your own work?

Operations: *Efficiency / Flexibility / Customer satisfaction*

Orientation: *Process / Human / Space*

Level: *Strategic / Tactical / Operational*

10) What opportunities do you see in data and information in developing the

REM of commercial properties

Operations of commercial properties

Value proposition in REM

1	R1: ”A lot of information is gathered. But on behalf of retail properties, I would emphasize the data aggregation of usage and maintenance, especially regarding the functioning and failures of the technical systems, the need for repair, life cycle information and real time maintenance and repair requirements entirely. And generally, the amount, quality and status of the service requests that emerge in terms of usage and maintenance.“ R2: ”For example the energy consumption data which is gathered through meters measuring the consumption, and respectively the historic temperature data via sensors through which the indoor temperatures can be optimized. And also there might be measurement systems for detecting the CO2 concentration in the indoor air, according to which the air exchange can be affected.“ R3: ”Building automation renewals are done a lot these days. And the modern technological systems supported by automation include a lot of sensors for measuring CO2 and the indoor air quality inside the property. To acquire information about the indoor temperatures and whether the ventilation is in balance, and also regarding the lighting optimization according to the actual utilization rate of the premises with motion detection. This way, re-arranging certain premises can also be considered in case of tenant exchange, to make the building even more efficient.“ R4: ”In short, we capture a lot of data from specifically the users of the properties for they are present daily in the property. If they are dissatisfied of something, it is very important to let us know about it for us to develop the operations since we often miss out on the things that our tenants and users deal with on a daily basis. This heavily relates to my own profession of course and via maintenance the consumption data and all that unveil the systems that are costly for us and what we should develop to make things more sustainable.“ R5: ”Information and data is collected very extensively. Starting from i.e. access control, camera surveillance, or sensors measuring either the indoor conditions from carbon dioxide or motion or whatnot, this produces data that is then stored in specific, secured locations.“ R6: ”Enormously, but as mentioned the most important data for us are the user frequencies and sales. So the number of visitors and of course other types of data are from the customers, i.e. gender etc. which is something that hasn't really been done yet, but whatever is possible with these counters that we have. So right now, it is mainly quantitative, and focuses on sales in terms of how the businesses of the users are going, so those are the important areas currently. Say, we have a marketing campaign where a lot of data is collected. So if you browse a newspaper and see an advertise from shopping center x and click it, we can acquire a lot of data from you in terms of the group of age, probably your gender, level of income, location and how often you may visit the mall, so we may in fact collect and analyze a lot of information. Especially the level of income is a factor that in marketing that is emphasized a lot.“ R7: ”From the real estate perspective, we collect data from temperatures and humidity, and everything related to the property: what is the outdoor and indoor temperature, are the building processes functioning as expected, is the heat recovery system working and storing the heat loss, etc. Then again regarding people, we monitor their arrival to the workplace as well as their breaks, which is the basis for the payment of wages. From process perspective, we follow the life cycle of our package delivery from the point of receiving and handling it to delivering it to its destination for the customers to pick it up.“ R8: ”Currently in many ways. Of course, the energy consumption as well as conditional and operational data is collected for now, but this will definitely develop in the future.“ R9: ”From our operations within asset management, for example on how we contact our customers and make offers etc. And we have certain systems for closely monitoring and analyzing this. So in a company like us, there is a high emphasis on collecting all the data available regarding euros, different procedures, with advanced aggregation systems and approval methods overall. Perhaps we are less emphasized on monitoring basic functions such as the property management related activities and the actions of the managers. Those things can be monitored in other systems surely but is something we have less emphasis on."

2	R1: ”Simply, any failure and repair requirement information is utilized in the operational process for they always triggers the mandatory repairing process. Then of course the energy monitoring data, which is utilized and forecasted in order to make rapid changes and repairs to avoid unnecessary energy consumption. (--) First and foremost, the information and data enables the property owner parties to prepare for massive renovations and modernizations or exchanging of the machinery and equipment of the building, in a data driven manner in their long-term planning.“ R2: ”For example, by monitoring and staying on track with the consumption data about the biggest influencing factors in this regard, thus enables reacting and planning the upcoming repairs to improve things. Or in terms of the operational activities, to be able to pinpoint and interfere with possible water leaks or something with certain energy meters and indicators.“ R3: ”What is for certain regarding this question, again has to do with building automation. (--) so these things are utilized so that the building systems are maintained correctly for them to signal any need for maintenance. And if the air supply or exhaust are insufficient, these can be enhanced accordingly.“ R4: ”It is utilized of course and once the data is collected, it is also managed, so to speak. To go through the information in different corresponding task forces. In case of big, important things, the property owner often takes a stand on it and they are proposed for example in the next year's budget and scheduled for execution for the future. So in terms of how the data is utilized and then implemented in practice eventually, the outcome is very much a reflection of the collaboration between REM decision makers and the owner. A core principle in real estate business and REM is at least to prevent the properties to decrease in value.“ R5: ”From operational point of view it is essential today to find space efficiency, flexibility and usability from the facilities so the consideration of data and information can be utilized to improving these things and finding more effectiveness and efficiency.“ R6: ”In our business, a lot should be based on information and data rather than gut feeling, which is sometimes necessary too of course. In many sectors for example considering the user volumes become the driver for the investment decisions made by the owners. Does the property need more visitors which may require investments for it to become more attractive to the customers. And considering new tenancies, different brands are interested in our customer types and volumes based on which they might decide the decision about potential occupancy. Also where to locate your business premise is evaluated with the information and data that we may provide as well as the general feedback from the commercial property which drives the decision making. And also steers our decision making, should there be more guidance in the building or anything negative that we should react to. So by following the customer path based on the collected data enables us to make decisions. (--) Through statistics by Finnish Council of Shopping Centers KKY or RAKLI Ry, where all the Finnish shopping centers may report customer volumes and sales data, the owners can observe this things and even make acquisition decisions based on the information. That is probably how information and data are utilized at its highest. There can also be digital platforms to observe things from, and something that especially during the last three years has become important is to recognize how the data has changed during the pandemic regarding user volumes, sales etc. Another important area regarding these buildings may be the number of customers coming by car, the possibility for public transport and its importance to the business, average order values, and terms like that.“ R7: ”In our properties, again information and data about the temperatures and humidity are needed for making decisions to invest on the machinery and equipment for better controlling the circumstances. So for this we need data to even detect the problems, since we can't count on everyone's individual opinion in these matters. One may think its cold meanwhile the next person complains about the heat, and so on. The data must exist for us to first of all set the standard values and communicate the threshold values to our production units. Then of course in our operational activities, the lead times for our services are analyzed constantly for improving the processes and thus avoid losing customers.“ R8: ”My personal point of view is that decisions should always be based on collected information. Generally, if a decision is made with gut feeling, it becomes hard to estimate the actual benefits of the action or investment which the owners also agree with. So, to be able to target the invested finances into the right objects.“ R9: ”On a higher level, it enables observing where the markets are going, what is our position and what should be expected regarding our operations. The first thing naturally regarding information and data is to ensure that it is correct and accurate which is something we must verify and make sure. After this we may analyze and derive actions for the operational levels to implement. But with so many different systems to be integrated in order to produce accurate information, it requires quite a lot of resources, analysts, to go through all this."

3	R1: ”In retail properties, data is utilized a lot from the user perspective, for example regarding technical functionality or failures in the refrigeration systems and so on. Above all, so that the failure notification gets forwarded directly to the service provider assigned by the user to react immediately to the alert.“ R2: ”In maintenance and repairing definitely, with indicators that enable observation and taking actions and also long-term planning based on the data. So if there is a property that consumes exceptional amounts of water or other form of utility for instance, it can be taken into account in strategic planning and project planning.“ R3: ”Very comprehensively in all technical systems. (--) that is where data and information are acquired and considering leasing, it becomes easier when you have data to be presented for potential tenants in terms of water and electricity consumption levels. To better inform the potential customers about their expenses during occupancy and thus support their decision making. In terms of ownership, it is also much easier to advertise your property with precise numbers for the customers to see. So whether it is about new leases or re-evaluating the asset for transaction purposes, everything is simpler with technical systems on point and operational data to be presented, thus making the asset to increase in value. I have also heard about a water consumption reporting system that displays the water consumption of the property in real time.“ R4: ”Surely this aims for maintaining the value of the real estate and preferably making it grow. The means for this on the other hand closely deal with the discussed themes, so that whoever is able to innovate and develop and provide the real estate industry with such tools has a key role in this. We get tons of contact requests from all kinds of start ups and other operators about their solutions. And in case we find them feasible in any sense, we are often interested in hearing about them and even deploying them. For example, the application which sends automated messages on our behalf came from a start up company.” R5: ”With camera surveillance and access control, certain misuse, vandalism, thefts and so on can be prevented naturally which is an easy example for this question. And of course, the authorities are involved in this kind of occurrences and ultimately handle this type of scenarios. But we also have facility services, including space usage, space efficiency which relate to this. And regarding ownership and leasing, the new thing is to have sensors to measure temperatures, humidity, CO2 and even pressure drops within the building envelope. So we can verify any suspicions arising from our users about the conditions of the property. Also with certain cloud services in which the users also have access to, the actual conditions can be observed and compared to the suspicions that they might have.“ R6: ”In many aspects, whether it is about facilities and their energy efficiency data in different graphs. Or if a premise has the qualifications for certain type of use and how it should be developed. And in maintenance, repair and constructing whatever data has been collected. For example, to construct a residential property alongside to a shopping center should be a data driven decision based on the feedback from the area and on a larger scale. Maintenance and repairs decisions of course also call for supportive data, whereas the owner is interested in the profitability, and make massive decisions based on the acquired information. In marketing, to target customers from certain area for instance and to evaluating the level of income between separate urban areas is data driven and supports our decision making in terms of advertising. So they are used also to characterize and identify customers for responding to their needs accordingly, in terms of adding parking slots etc. So the operational chains so to speak can be very long in these cases.” R7: ”For example in maintenance and repair, should the humidity percentages or temperatures be increased or decreased. So in general, we need data and information in order to analyze what the needs for repair are, and where. Because when people imply that something is broken or malfunctioning, it is too hot or cold, or there is draught in the premises for instance, it always comes down to personal preferences. And usually there is no reasonable conclusion to be drawn from individual opinions of thousands of employees simultaneously, despite some of the observations being very realistic. So we need information and data from different indicators that measure the indoor air, the possible pollutants and particles, and temperature changes for example. So for example, I am told that it is cold in the premises but once I visit them the temperature is 24 degrees Celsius. But for some reason the heaters are shutdown during the night which I am not aware of, and since we operate 24/7, the employee with the feedback might be working nights only when the temperatures decrease to 16 degrees Celsius only. So for us to be able to detect these problems, we need the data.“ R8: ”In controlling the conditions of course, so that they would be as good and stable and optimized as possible. The most pivotal area however are maintenance and repair, to collect data from the operations to the find weak spots to be developed or renewed, to improve efficiency. Also leasing the department benefits from knowing that this is how the maintenance process proceeds in the background. To be able to inform the tenants and have the leverage to promise the tenants that the conditions will remain stabile, and the property will be more energy efficient with data collection and utilization.“ R9: ”For sure in all areas, and regarding my profession focusing on ownership and leasing mostly, there are information provided to all the activities in the background enabling the right decisions to be made. And the information is provided to us by different consultants and also from multiple sources, that we go through from time to time. From which we may create a view on where the markets are heading. And usually, the biggest data acquisition operators are the ones who are marketing these services and which we also tend to exploit."

4	R1: ”Concerning operations and services, first and foremost to maintain the retail property safe, secure and in operation with data that is rapid enough. Thereby the service that is provided in the building isn't interrupted.“ R2: ”Once again, the customer satisfaction can be affected with the acquired data through optimization of the conditions. Also in terms of operational efficiency, by knowing the so-called weak points that require improving, more energy savings or something like that, the data often provides the answers.“ R3: ”To be able to direct the accurate data and information correctly. From my point of view, to be able to conduct sufficient repairs into the specific problem areas. At least I want to believe that the growing amount of data tells us precisely what causes the problems and how it should be approached and fixed, relating to sustainable development in terms of longevity and cost effectiveness. If the disturbances for customers, the tenants are temporary and short and also fixed at once, the operations are effective, and the customer satisfaction stays on a high level. It is also flexible receiving the information quickly about building systems that are approaching the end of their life cycle. So if a lease agreement is coming to and end for instance, the required repairs can be scheduled with the right timing before the new occupants. And the premises stay in flawless condition right from the beginning of the occupancy and there are no pipe repairs going on or other things to cause disturbances for the new tenants“ R4: ”Every year, all the data and information that is collected from the operations and then discussed, always bring forth new insights on improving our efficiency, flexibility, customer satisfaction. Naturally, we want the facility services to be effective, to serve our users and the owner in a modern, flexible way as well as possible. And according to the feedback we may quickly refine them for better, too. So data from the user needs, for example if the property should have a carsharing system, massage services or anything that the customers come up with, is important for us. The spectrum can be massive and surely it is not possible for us to arrange everything. But for example, this year we have got feedback from our guidance, bicycle parks, comfortability of common areas, electric information boards, etc. of which at least two or three have already been addressed, ordered and hopefully even become delivered by the end of the year. So the collected feedback about the services, and from the corresponding people, surely steers our actions. For if we would embrace a passive type of property ownership and only focus on observing the cash flow instead of developing things, it would cause problems for us in the long run.“ R5: ”(--) as I am also getting new ideas now, in many properties we have had condition measurement systems from different service providers for over a year now which have definitely proved their value, as we possess 150 thousand rental squares in total that include various types of spaces and people. “ R6: ”First and foremost to avoid loss, and to be able to utilize and control the decisions and actions to the right direction. To gain information whether something is worth or not. Whether it is about business, that according to data we have enough restaurant operators in the property considering our customer volumes. So it is utilized to support decision making big time and brings fort effectiveness instead of always replicating the same thinking processes. But the data forms the basis for pointing out the good and bad solutions. From commercial and marketing perspective and looking at the entire customer path, we often follow a 70 20 10 rule in our decisions regarding the selection of suitable marketing channels and the right brands for potential tenancy. So that 70% of the decisions should be proven successful, tested, and perhaps verified by data, while 20% are more experimental yet somewhat familiar. And the last 10% is something completely new with no previous experiences from the past but which we choose to try out and collect data from. So that maybe in the future these things may be moved into the other categories.“ R7: ”We had a situation where there was a lot of feedback about bad indoor air. And every time I visited the facilities, there was no issues in this regard. So I asked about this from our energy management supplier, and they said all the machinery are running correctly. But as we looked into this together with the caretaker, we found a manual setting in the building automation system that wasn't displayed in the energy management remote control systems, that one AC machine was shut down in the nighttime. And those who came to work early in the morning experienced bad indoor air due to the machine being switched off for the last 8 hours, whereas during my visits it had already been running for some time already.“ R8: ”The energy efficiency and conditions of the building remain stable of course and can be easily adjusted to one way or another via the building automation system. I would also emphasize the monitoring of the service network. In case we find there is a pending failure that is unfixed for quite some time already. And even if this would have been reported many times for the maintenance partner with no reaction, thereby we may also detect poor service quality and leaving things untreated.“ R9: ”At best, once we can take the right actions and make decisions based on data, this would always be more efficient with more automated and less manual work required. So unfortunately there is oftentimes a lot of manual hassle in one way or another, in excel or other systems. But once the information has been acquired and processed for expediting things more quickly, this increases the customer satisfaction and effectiveness. Information and data may also provide us with recommendations that can be considered counterproductive and not so flexible. (--) we have an ERP system that produces certain workflow but isn't something that affects the everyday work too much. It hasn't been automated enough but instead the manual work is always required, whereas our invoicing systems are more automated in some areas."

5	R1: ”Considering data solutions, how new is the building automation systems in the retail property and how it is synchronized to the service manual is of relevance. Also, what type of data collection and data transmission are preset as default, so that the entire data chain is synchronized correctly and sufficiently to provide accurate information.“ R2: ”Communications through electric channels for example plays a huge role in today's business. It must have been a while since we delivered handouts on paper due to having digital screens in the buildings from which the users receive the latest news or may even reserve premises. So that is one thing and of course we have the already discussed electric service manuals. So these things definitely help by enabling the users to make service requests via electric channels and make contact through time-invariant systems. (--) perhaps a good example could also be sensors installed within the waste disposal spot sending alerts according to the utilization rate for optimizing the emptying. So that is an example of how effective maintenance, and how to avoid unnecessary logistics and emptying with the help of data and smart solutions.“ R3: ”For sure, considering a HVAC related area for example which hasn't been touched yet, the sewerage. (--) so the water flows can be monitored and controlled to some extent and in case the water flows deviate from normal due to the pipes including deposits and blockages for instance, they can be detected and fixed more effectively before the surfaces wear away or corrodes. And also to prevent any depressions or breakages within the pipelines in a worst-case scenario.“ R4: ”There is such a strong potential in digitalization today with AI being the most interesting area of it. For due to AI there are things happening around you that you don't necessarily even realize. Many machinery and equipment are utilizing AI already having a huge role but even more so in the future operations, the more intelligence is applied into the properties. Whether they are AC related stuff or whatever is being invented, to be able to detect bad indoor air and respond to it with different solutions. So the property owners get feedback of i.e., two contiguous premises, one being cold and one being hot, or the other with no air exchange and the other with excessive ventilation. And this is an exciting field to be developed with the help of AI for there is always a linkage to things like customer satisfaction as well.“ R5: ”(--) as I am now also coming up with new ideas, in many properties we have had condition measurement systems from different service providers for over a year now which have definitely proved their value, as we possess 150 thousand rental squares in total that include various types of spaces and people. “ R6: ”We have a specific data studio, a place for data storing. Including the visitors, data from our users' business regarding their online popularity, and also if we have a campaign with multimedia advertising, there are a lot of data via different channels of the income levels and the ages stored in the data studio which enables the comparison between current and past campaigns for further decision making. The property owners are also provided with comparative tables providing graphs about annual sales and all that for supporting their actions. Also digitalizing the sustainable development and circular economy compliance has become more important, to be presented to our customers by displaying these things and our accountability measurements online for our customers. With a rather simple system that is currently in use, we also acquire visualized data graphs from our online visitors of the shopping centers. In marketing there are algorithms that may then forecast what improvements should be conducted in social media for example, very intelligently. So not only cookie policies and other simple marketing functions, but also very developed and AI driven actions such as re-marketing and re-targeting with certain tracking links in the websites to monitor the customers for predictive marketing and advertising. It also creates opportunities for the tenants' business operations which we have to consider, in spacing solutions for example. To try on clothes or have the possibility for measuring the sizes virtually or with specific applications, or whether there are QR codes to access such services and all that.“ R7: ”We aim at developing the real estate side continuously for the best of our business and our clients, too. And try to be open for a change and avoid sticking to the old habits, but instead be encouraged to try out new solutions and become a forerunner. Considering we're a state-owned company with certain recommendations from the state which we have to comply with. (--) we have certain certificates including our production units having their own too. And considering what type of building certifications we have achieved, since they aren't on the table in the everyday operations, I can't say at a glance. But I believe there are certifications we've acquired and are complying with." R8: ”In the future I would say this relates more to AI utilization. So that is the direction we are heading, towards self-steering building systems with more intelligence. That is the trending pathway to be monitored, from my perspective. For example, adding more sensors to the premises and increasing the information flows within the building automation systems, i.e. connecting it with weather forecasting. So the building automation could detect changes in the upcoming weather and temperatures in advance for preparing the optimal conditions of the property accordingly which is something I know is already being used and will also be applied to the properties I am managing, as well.“ R9: ”I think there is nothing more to add to this on top of what we've already discussed. Some things may also be so self-evident, such as service manuals and the arrangements in that regard. But then again, there are still customers, tenants, who in accordance with their lease agreement are responsible of taking care of the facilities and premises by themselves during the occupancy, yet with no service manual being used at all."

6	R1: ”Of course there is a contradiction if the property owner claims the commercial property or the retail property to function energy efficiently and according to the principles of sustainable development, while the property systems and the data indicate otherwise. Or on the other hand, if the users promise their customers that the property is eco-friendly and safe, but the data implies to increasing energy consumption levels and utilization of fossil fuels instead of using renewables and recycled energy for heating the premises for instance, that is a huge contradiction.“ R2: ”Through acquired data the property owner has a much better understanding about the actual use of the building regarding its space utilization rates and everything, through building automation data. For example, during the pandemic, when the premises became unused due to remote work, significant decreases in the use of water and other energy consumption was detected and thus some of the premise temperatures could be adjusted according to the low utilization rates at the time. (--) so with data collection picturing the operational environments, also the conditions can be optimized to be more beneficial for the users, causing indirect added value for the occupants though measuring and monitoring.“ R3: ”In a way data and information form the baseline for doing the right things at the right time. And thereby provide the users and the owners with cost-efficient and the best possible solutions.” R4: ”Property owners determine their values according to which they expect us to operate, and the operational sufficiency is thus validated with data and information in terms of how the value propositions of our properties are provided in practice for instance. In terms of accountability, something that is central for the owners is how to measure these things and how their corporate responsibility becomes realized. And for the users of course, what is promised to them and what type of values to expect all become actualized through our actions regarding the property.“ R5: ”So one explicitly valuable factor has been the condition measurement based on which we can verify and ensure the safety and healthiness of the indoor conditions of the premises and present it to the end users and customers. So that is something that has been a direct upgrade to our service delivery as a property owner, over the past two years.” R6: ”This could be seen as the main priority for the owner and as the most important thing, how and what kind of data we are collecting. For this also relates to not only the various impacts, but also solely to the value growth of the property.“ R7: ”Our values are to be reliable, appreciative and advanced. Considering REM and our value proposition, to be advanced, we strive for developing our properties continuously for our users and also for our business operations and the end customers. So all the data that we can collect, for example about the electricity consumption that appears to be excessive in relation to the squares we possess, such observations trigger the investigations and further inspection. Realizing that with a property of this size we shouldn't have such consumption rates, and we are able to examine the issue and make changes. Whether it means adding motion detection for the lighting, installing a heat recovery system or automatic roll-up doors, or blocking the heat loss with a vestibule or additional roll doors, so what ever it might be, based on the needs.“ R8: ”They have significant impact as discussed. Knowledge management is always more convincing and can bring forth more measurable results. So the condition measurement for instance, in case we get a complaint of the premises. For example, there is one property that I am managing, of which we have created a virtual twin. So that via the virtual twin, through my own computer I am able to monitor the conditions, the air flows, CO2 values, and temperatures. And in case of a complaint, I can click the premise in question and observe the conditions retrospectively from the past month for instance, from which I can also create a graph to be presented for the users about the conditional variations. (--) the digital twin is something we have implemented with one of our service providers in one of our properties in 2020.“ R9: ”More and more our users and customers of certain type especially are interested in the information about the energy pricing and the latest production trends etc. So the electricity concerns being one thing, but also connecting to the accountability overall in terms of possible green production methods, and the development of the cost-levels for them to forecast the future better. So, in things like this, the users are very curious and are expecting to be informed better."

7	R1: ”For the owner, something that has been discussed and emphasized already is the energy consumption data as well as the failure information. Then on the other hand, if the building technology appears unreliable and easily faulty from the user's perspective, it may result increased probability of risks in the tenant's operations. For instance, if the property data indicates increasing leakages and issues within the water proofing of the roof of the building over the years, there is a danger and high risks for the structures to fail during heavy raining in the autumn which may cause significant damages to the tenant's end product.“ R2: ”It has significance for the owner to be able to make strategic lines regarding the future of the building. To be able to observe the space utilization and thus respond to the user and tenant needs, so it goes both ways.“ R3: ”Personally for me there is a strong impact on creating value for the operations as well as bringing forth added value attributes at the same time. It makes the marketing easier and once the property is taken care of properly with timely repairs based on data and information, the easier it becomes to also maintain the occupancy and find new tenants. So the occupancy rate is maintained on a high level, and the right type of tenants, suitable for the intended property use, may be found.“ R4: ”Doing the things that require attention and focus are derived from the data and information and the better we are able to measure it, refine things, the better also the cash flow, in the long run. Since my profession isn't about drawing the strategic lines but more the implementation and the operative side of things, somehow it feels like all the data and information shape the overall value proposition, making it greater than the sum of its parts. Real estate business in general isn't exactly rocket science but very much an economy-based business, but as discussed, the accountability theme today is strongly present today that financial investments to the data side of things are required. And the results, the profitability is not immediately realized but instead in the long run. So the property owners today are all looking to compete on who is the most developing, innovative property owner offering the best service delivery for tenants. For the competitive stance in real estate business in this regard is very tough, resting on those laurels will eventually result in increased vacancy so to attract the tenants the role of property development and REM has become very important.“ R5: ”I’ve got nothing more to add.” R6: ”One tangible thing could be the monitoring of the most important data values such as sales. So we constantly monitor the OCR rates, how much the sales are in relation to the rental levels in order to keep track of the solvency of the tenants. So we may identify challenges among certain businesses to better forecast the rental income and cash flow for the owner which can be turned into forecasts and predictive graphs. Also, the predictability in terms of what data can be collected regarding certain area to predict decisions and actions regarding that area. Also, to whom we should target our advertising is evaluated through the acquired data of our potential customers and visitors, to reach the right clients so to speak, the residents from the neighborhood or customers that have visited us in the past. So with data we are able to directly contact and intrigue these people on site, bringing forth more revenue to the end user with better accuracy.“ R7: ”Whatever the ways may be for us to develop our properties and invest money into them, they will benefits both the owner and the users through value growth as well as modernization. And as we are a support organization for our users, we are looking after both their electricity consumptions levels as well as the spend and everything related to the maintenance. So we manage their costs and possibly may even increase the employee satisfaction levels through our actions.“ R8: “For the owner the direct added value of course is the value growth of the real estates through reasonable investments. So that of course causes increase in value due to the properties becoming more intelligent and energy efficient. Indirectly, and with these data driven investments, the carbon footprint of the building may also decrease which again may support the value proposition of the owner regarding the intended image of the property asset.” R9: ”The type of situation as discussed earlier, that the user may be informed and assisted with their operations with information and data. And the direct benefits can often be calculated also in euros, to be able to conduct certain things in a more simple, inexpensive and efficient manner. On the other hand, the indirect benefits may deal with communication and something immeasurable and qualitative, instead of direct financial benefits.”

8	R1: "The collected data and the reliable information should be the basis for diligent and proactive REM entirely. You get what you measure, so to speak, which is true in my opinion. This also means that the data and the measurements must be on point, sufficient, and conducted in real time to prevent false and incorrect decisions in the future." R2: "Overall, having a lot of data from the property enables the steering and optimization of the everyday operations, realizing the things that may require attention. Same goes to the management, being able to see the actual conditions and occurrences of the building through data which steers the following, required actions." R3: "Unfortunately, not always everything goes as expected. Mistakes, as well as incorrect solutions will be made in project management, but they may also provide valuable insight on how to not conduct things in the long run. And the acquired data and information thus in a way always steers for better, more effective practices to be applied." R4: "Easiness for everyday operations, and especially with this one REM system that we have. Simply being able to access all the data required in your work, by just a few clicks. And to be able to demonstrate your expertise and professionalism in REM via using a system that is very user friendly and easy to use feels great." R5: - R6: "It is an important part of the job in many ways and many aspects. Considering the users and what is competed within shopping centers, are differentiation and memorability. So one value perspective that comes from data, is to be able to produce different types of experiences. This also relates to AI, in case of a shopping center for example has a lot of digital screens and audio advertising which have been combined in this case. So that once you see an advertise by a movie theater for instance from the screens, simultaneously and courtesy of AI, a theme song of a movie for example starts playing on the background which increases the probability of the customers to pay attention to it and go to the movies for instance. So that is an example of exploiting this type of technology and combine these two solutions that may result in improved customer volumes and cash flow. But the overall added value is to be able to find such combined solutions effectively." R7: "For example in terms of budgeting, as everything in our operations is about moving the finances around. So I am responsible of reporting my spend to my superior for observing the benefits, so that we would invest into things such as major overhauls and repairs which benefit us in the long run. Say, I've decided to invest 230K into replacing fluorescent lamps with LED lights, naturally my superiors and the financial department of our company are interested in the impacts of the investment regarding the electricity costs for example within the next 6 months. And we can directly point out the cost benefits from such decisions according to the reports based on certain timelines, in case no other major changes has been implemented. Our financial department also compare the properties on a national scale, the energy savings between different cities for example in case the properties are similar in character. At least I believe that this is something that my superior and the upper management are analyzing." R8: "For the sole purpose of making the operations easy to monitor and steer. Surely, for management it enables better monitoring and easiness in terms of supporting the decision making and making it data-driven." R9: "Those are the basis for everything surely and in a company like us, where the headquarters are located abroad, meanwhile we are operating here in Finland, the policies as well as the operating systems must be very straightforward and transparent. And this way, in terms of measuring the business operations, also the regional operations can be monitored from our headquarters."

9	R1: ”Having the right type of data and information releases time for the right things. For if the data and information can be trusted and there are no anomalies to be detected, this enables focusing on other important things. Or respectively, if the data and information turns out to be alarming, the main focus can be shifted to prioritizing those areas. (--) this can be seen in many levels, but primarily it lays the groundwork for economic planning and supports it. But also it supports all kind of resource planning as well as timetable planning and the guiding principle of time management. Furthermore, data and information are the triggering factor for timely and correct corporate communication and so on, so all in all there are many roles to it.“ R2: ”This job entirely is about handling different types of data and information and forwarding it. So it is hard for me to say what the added value in specific may be, for without data and information of the properties this job wouldn't barely even exist in a sense. So to acknowledge what is happening in the properties, what maintenance related activities are in progress and also what should be conducted, is the core of everything. When planning the future of the building and so on, everything begins with assessing the overall technical shape and conditions, based on data and information.“ R3: ”The better the initial data and information you have about an upcoming project, the more effective the process execution too, because you know what you should be doing and where, and also in what kind of time frame. In my opinion this is the starting point and has a massive impact on every step of the way and to the final output, to achieve high quality level of work and effective process flow via adequate data and information. Also, by replicating such endeavor, it should result into better tenant satisfaction and the premises maintaining a good shape in long term. (--) on different levels on the other hand, I would connect the advantages to the owner, for the singular property assets and overall building stock is maintained in good condition physically but also through rate of occupancy and property value“ R4: ”First of all, a huge thanks for the developers of such applications and user-friendly REM systems, that in the big picture save us from many troubles and waste of time, but also bring forth easiness and better output quality to our work. So that with the help of these systems you can produce quality material and forward it to the location, with only a few clicks.“ R5: - R6: ”Of course it eases the daily operations and enable arguing your decisions, which also increases the job satisfaction in general. To have your arguments based on data to the owner and the tenants and customers helps a lot in terms of handling feedback and complaints. To have 130 tenants overall to do business with, various opinions may arise from the crowd in which data helps the argumentation instead of emphasizing your gut feeling, and also provides backup and in some cases an exemption from liability. In terms of job satisfaction, to be able to rely on the graphs and statistics helps massively in case of a conflict.“ R7: ”Of course data and information play a central role in my work and to be able to conduct it successfully. Those are the first things to be analyzed when we assess the need for repairs of any type. (--) what was already discussed about the users' operations, as well as regarding the operations in commercial properties, data and information improve both." R8: ”Considering my personal workload for instance, it becomes lighter in case I possess a lot of data and information about the property compared to a property where those things don't exist and aren't utilized to a similar extent. Surely, I have some sort of edge having these data solutions, to be able to make more effective and well-argued decisions as well as rationalize certain investments for the owner. Through this, my own productivity and effectiveness becomes better compared to other property managers perhaps and it makes the job more pleasant to be allowed to expedite things. And regarding this freedom to do things, to have the knowledge in the background for support and to justify your actions based on acquired data and information, why it would be reasonable to do something.“ R9: ”Again, the collection of data and information as well as producing it makes you busier, but on the other hand it is mandatory for the operations albeit requiring quite a lot of resources to be conducted sufficiently. But all in all, I believe data and information establish more benefits in comparison to what it requires producing it."

10	R1: ”The way I see it, the more rapidly digitalization is expedited, AI is implemented, and accurate data is utilized within real estates, the more cost efficient the building usage is for the owners in the future. Because respectively, as there are still underutilization in data utilization in terms of monitoring in, digitalizing it, and not to mention the limitless, unlocked opportunities of AI implementation. So utilizing and enhancing all these correspondingly, the operational processes can be developed: moving towards more efficient and real time service manuals and acquisitions of virtual data. Then of course from the user's point of view, the reliability enhances even more as well as the safety, security and feasibility regarding their occupancy. And this way the users may focus their energy and time away from the technical and practical issues of the property and leave them for the parties responsible of it.“ R2: ”Once more, the biggest tangible achievement from data utilization is the optimization of building usage and conditions. So that is the greatest benefit of data, and that from my point of view emphasizes a lot on the energy aspect.“ R3: ”To succeed in all the operations, data and information are essential. To be able to keep your value proposition to your clients, the more you have the data and information the better you succeed in terms of the value proposition, so these things go hand in hand. To understand what condition the property is in, what it includes and what should be done and when, the more operations and the property can be managed and developed too.“ R4: ”Again, the sky is the limit regarding data and information (--). In 2020s, the operators with the expertise on developing various digital solutions massively assist the property maintenance and REM and all that. To have innovative systems will be a huge help regarding the field of REM, for real estates are very measurable objects. Their value, profitability, costs, and value creation can all be measured, so there must be a liquid value for them. In case an owner decides to sell his asset, there must be a liquid value estimation for it from the acquisition to this day. And all these discussed themes have a massive impact on the liquidity of the property from here on as well. And after the estate liquidation, this becomes the concern of the buyer, but during the period of ownership it must be accounted.“ R5: - R6: ”A lot still, so considering customers for instance which is the easiest approach regarding my work, to be able to select the direction and necessary actions and support this decision making. It is very important for us to collect the customer data regularly, and in connection with digitalization, since a large share of shopping center customer base still consists of elderly that may have adopted digitality even less, to acknowledge to what extent things and services can in fact be digitalized. And how much should still remain on site, in a concrete form, to understand this customer viewpoint and how they can be provided with added value. And the same goes with the entire management process of the property, the preparedness of the internal team to adopt digital solutions and from the owner's perspective, the price of implementing them. One practical example is that shopping centers have a lot of different campaigns including special materials and decorations which nowadays has a sustainable, eco friendly emphasis as well as more digitalized solutions, something with QR-codes and augmented reality technology. So that when visiting a store, an offer conducted with AR technology pops up instead of manual advertising or something like that. So there has been a lot of discussion about this, but also whether the customers are ready for it, what are the costs for such investments for the owner and the willingness to implement such changes. So the information we have, steers the decisions of making this kind of digital leaps." R7: - R8: ”In a sense I'd say that my own work will change in the future drastically. Virtual reality will definitely be highlighted and even virtual properties, instead of on-site visits. So that most of the work happens behind the screen, monitoring and addressing the concerns of the functionality and behavior of certain building parts. And even to the extent of having sensors in all premises for predictive maintenance and prevention of leakages for instance. So instead of having readable main meters for detecting possible leaks, or the level of surveillance based on leakage alerts, we could have complete sensorization for remotely monitoring any leaks and repair requirements from one user interface.“ R9: ”Assessing the operations, to be able to evaluate the current level of operations with certain meters and monitoring systems and set targets and measurable objectives to the future which is impossible without data and information basically. Then again, from the customer perspective, they tend to rate and evaluate our operational success. So these things help in identifying what the customers value and thereby the development areas, basic requirements for the customers to be fulfilled. And also, the added value, increasing the customer satisfaction for example, through which our revenues may improve as well."