
**Managing Renovation, ESG, and Financial Targets:
an analysis on success factor interrelations**

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Background:

In order to reach climate neutrality by 2050, the European Commission has laid out a preliminary goal of renovating 35 million building units, that are either publicly owned or publicly occupied, by 2030.¹ This is intended to continue into, and passed, 2050. Furthermore, corporate sustainability reporting for large and listed companies will be required as of the 2024 financial year.² This will require financial reporting on ESG risks to inform investors, asset managers, and civil society regarding held, tangible assets and resources.³ The intent is to increase sustainable investments, while reducing greenwashing.

Within real estate investing, the four asset classes, Core, Core-Plus, Value-Add, and Opportunistic, are used to categorize buildings and their intended investment strategy. Accordingly, both opportunistic and value-add level investment strategies, which include renovation projects, are of a financially riskier asset class than that of core investments, which do not include renovations. Moreover, a higher rate of leverage is often used to obtain and manage value-add and opportunistic investments.⁴ As of September 2023, the European Central Bank held interest rates at 4.5%, which is an 18-fold increase from the 2013 rates of 0.25%.⁵ Accordingly, the financial risk associated with building renovation projects has clearly increased over the past ten years. While renovation projects are required to dramatically increase to meet climate goals, their financial sustainability will also need to be provided for. However, they also represent an opportunity for providing environmentally sustainable investment assets.

With regards to private real estate development, as defined by Gehner⁶, the decision-making aspects for property development can be distilled into two main stages. Firstly, investment proposals, ideally with significant research, are provided to the general management for their review and approval. After which, the real estate development can then occur. While with regards to a renovation project, once the decision to invest is made, asset management prepares secondary proposals to determine the next steps for the existing asset; typically to either maintain, sell, or renovate. Once the decision to renovate is made project management is engaged, and the renovation process can begin.

In Eray et al.'s⁷ 2019 study, which reviewed where interfaces between events and stakeholders lead to data loss and conflicts in adaptive reuse renovation projects, it was noted that the challenge with the most interface points is related to poor management. Furthermore, in Pukite et al.'s⁸ 2017 study, which analyses management systems for renovation projects in Latvia, it is noted that problems in renovation projects usually arise from stakeholders and consultants working individually rather than cooperatively. Correspondingly, as one of the main roles of the project manager is to manage the consultants, the success of a renovation project is thus heavily reliant on project management.

With the high financial risk associated with the renovation of value-add and opportunistic properties combined with the approaching ESG reporting requirements, skilled project management is required to ensure the success of a sustainable renovation project. Although there is significant research currently being undertaken on; how ESG reporting is to be prepared, how project management is used in renovation projects, and what investment strategies yield the highest returns, there is little that consolidates these themes to answer how project management can be used as a tool to increase environmental and social sustainability, while also reducing the financial risk seen in a renovation project. Accordingly, this master's thesis will attempt to address this identified research gap.

Research Questions:

The research questions that this master's thesis will attempt to address are the following:

1. Main Question: How can renovation projects be used to manage unused office space, add housing supply, and meet EU ESG targets?
 - a. Sub-Question: What are the success factors an adaptive reuse project?
2. Main Question: How can project management be used as a tool to ensure ESG ratings, while also reducing the financial risk seen in a renovation project?
 - a. Sub-Question: What are the success factors of adaptive project management?
3. Substantive: What are the interrelationships between the success factors identified in the main research questions?
 - a. Sub-Question: How can this research be generalized and distilled into a practical framework?



Methodology:

This thesis will focus on real estate development within the European context, specifically Germany. To achieve the research objectives listed above, a qualitative data collection will be provided through a multi-organizational approach and modified Delphi method. Representatives from various firms within the real estate and construction industry will be interviewed. In-person or online interviews will be performed. The overall intent for these interviews will be to provide quality feedback from a selected small sample, rather than brief responses from a myriad of responders. Contacts with the firms will be provided through the author's professional network, as well as the network of the first supervisor.

Furthermore, the anonymity and confidentiality of the respondents will be ensured through private interviews during the first individual interview round. While their responses will be kept confidential during the second group interview round, and only respondents who agree to the sharing of their contact information will be included.

Using a deductive approach, the interview questions will be formulated to further an existing theory developed through the literature review process. As such, the interviews will be used to test these expected outcomes. The interviews will each be allotted a one-hour time slot and will be recorded. The author will also take notes during the interview and attempt to provoke further in-depth responses from the interviewees. These recorded interviews will then be further reviewed to assist with data analysis and non-verbal communication.

The interview results will be disseminated into pre-determined categories. This process will form a matrix that helps to illustrate the interrelationships found between success factors found in the literature review. These relationships will be tested against alternative explanations in the second round of interviews, which helps to verify the conclusions. Finally, these conclusions will be distilled into a theoretical framework, that can be adopted by applicable professionals.

This thesis will adhere to the Ethical Guidelines of the Hochschule für Technik und Wirtschaft Berlin and the Code of Conduct of the Metropolia University of Applied Sciences.

Resources:

Anticipated resources required for this master's thesis are minimal. The use of the university libraries will provide access for the literature review. The author's personal computer and cell phone will support the data collection and analysis, and report writing processes, while a Microsoft Office subscription is provided through the university. The largest financial costs are expected to be incurred from travelling to and from the interviews.

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Abstract

To obtain climate neutrality by 2050, the European Commission has laid out a preliminary goal of renovating 35 million building units by 2030. While the decline in the demand for office space in major German cities, coupled with a depletion of the housing stock supply, provides real estate developers with a market opportunity to adaptively reuse these office properties. However, with the current high cost of leverage paired with the increased risk that value-add and opportunistic projects face, there is a lack of incentive.

The objective of this master's thesis was to reach a justified conclusion on how project management can be used to obtain an ESG approved and financially viable renovation project, as well as identify the success factors and their interrelations with one another. This dissertation attempted to consolidate this understanding into a guiding framework. A deductive research approach and a modified Delphi methodology was used that included a case study within the two interview rounds with industry experts.

The analysis completed in this master's thesis indicated that the achievement of the success factors alone does not guarantee a successful project, as such the outcome of this dissertation is the identification of the interrelationships between the success factors, through the provision of a framework. This framework abridges the current research, through the advancement of available knowledge towards an understanding of the secondary impacts of the success factors. As such, this graduate thesis provides a platform for the advancement of the understanding of the interrelationships between success factors involved in the management of renovation, ESG, and financial targets and their secondary and sometimes negative impacts on one another.

Further recommended research includes the justification of the interrelationships outside of the limitations of this thesis, as well as the findings that were outside of the thesis scope. The concluding framework can be used as a tool to assist with the real estate development of renovation projects on both a company-wide and project-based scale.

Keywords: renovation, ESG, adaptive reuse, adaptive project management, value-add and opportunistic investing

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List of Abbreviations

APM	Adaptive Project Management
BKI	Bau Kosten Index (Construction Cost Index)
B-Plan	Bebauungsplan (Zoning Plan)
CSRD	Corporate Sustainability Reporting Directive
EBA	European Central Bank
EC	European Commission
ESG	Environmental, Social, and Governance
EU	European Union
EVM	Earned-value Method
GEG	Gebäudeenergiegesetz (Building Energy Act)
GFZ	Geschoßflächenzahl (Floor Space Index)
GHG	Greenhouse Gas
GRESB	Global Real Estate Sustainable Benchmark
EFRAG	European Financial Reporting Advisory Group
LCA	Life-cycle Analysis
LCC	Life-cycle Cost
OECD	Organization for Economic Cooperation and Development
PM	Project Management
PMBOK	Project Management Body of Knowledge
ROI	Return on Investment
REIT	Real Estate Investment Trusts
SDG	Sustainable Development Goals
SREP	Supervisory Review and Evaluation Process
UN	United Nations
WFH	Work from Home

1. Introduction

As the EU and member states move forward to attain the goals of the Green Deal, the impact that ESG and CSRD will have on real estate investors and developers proves significant [1] [2] [3] [4]. With a highlight on renovation measures as the EU's key to reaching climate neutrality, real estate developers play a significant role in the green transition.

The decline in the demand for office space in major German cities, and a shift in demand towards flexible spaces, mainly within the city centre, is leaving a large amount of office buildings, that do not meet these new criteria, without tenants [5]. Leading to a loss of income and asset depreciation for real estate owners of office space. Meanwhile, major German cities are also seeing a significant increase in the amount of inward migration [6]. In turn, depleting the housing stock supply.

These current problems and urgencies could have potentially positive impacts on one another through the implementation of adaptive reuse. Consequently, transforming underperforming offices buildings to residential, poses an opportunity to; 1. Meet the EU's ESG renovation targets, 2. Recuperate income losses for real estate owners of office buildings, and 3. Increase the housing supply to meet the growing demand. Although this solution appears unequivocal, adaptive reuse projects have an undisputable weakness.

As the ECB currently holds interest rates at 4-4.75 per cent, the cost of leverage is at an all-time high from pre-pandemic levels [7]. Accordingly, the provision of a successful adaptive reuse project that has; 1. A positive ESG ranking, and 2. A significant ROI, proves difficult in current markets. This difficulty stems from an increased risk on the owner's side. However, project management may provide a route through this uncertainty.

The position of communication within the project manager's toolbox is increasing in importance. Accordingly, adaptive project management, which attempts to navigate through uncertainty with the use of experience-based decision-making, can provide a basis for controlling this increased risk. Accordingly, this master's thesis focuses on

the perspective a project manager, from the real estate owner's side, and how they can provide a successful adaptive reuse project.

The objective of this graduate thesis is to reach a justified conclusion on how project management can be used to obtain a successful ESG ranking and financially viable adaptive reuse project, as well as identify and guide the management of success factors and their secondary impacts on one another. The outcome of this dissertation is a theoretical framework that can be used by project managers to navigate an adaptive reuse project and achieve ESG and financial targets.

This master's thesis begins with secondary research, used to inform the primary research, provided through two interview rounds. Accordingly, the interviews are provided in a modified Delphi approach. The results compare and contrast the primary research with the secondary research, in order to reach a justified and consolidated framework for practical application.

Renovation, project management, ESG, and sustainable investing are the main topics of this master's thesis. Each of these topics is narrowed into a specific variant. Renovation is analysed within the realm of adaptive reuse projects. Project management is explored through the lens of applied project management. ESG is reviewed within the boundaries of GRESB Real Estate Assessments, and sustainable investing is discussed through value-add and opportunistic asset class investment. This master's thesis aims to provide a guiding framework of the main topic success factors and their secondary impacts on one another. Accordingly, the hypothesis of this master's research is that project management can be used to decrease the financial risk and increase the production of successful and sustainable real estate assets that assist in the green transition through adaptive reuse renovation projects.

Chapter one introduces the master's thesis, while chapter two provides a background review of the key topics, narrowing the research and providing context and direction for the literature review. Chapter three outlines the research questions. Chapter four provides a blueprint of the methodology used for the secondary and primary research collection. Chapter five builds upon the roadmap of the background defining challenges, as well as success factors of; adaptive reuse, adaptive project

management, GRESB, and value-add and opportunistic investing. Chapter six summarizes the results of the literature review and compacts the findings into a relationship diagram that illustrates the interrelationships of the defined success factors. Chapter seven attempts to triangulate and justify the results of the literature review through a modified Delphi methodology of primary research. Chapter eight discusses the triangulated results of the primary and secondary research, reviewing and summarizing remarks in relation to the research questions, while chapter nine distils the justified results of the primary and secondary research into a guiding framework for management applications. Finally, chapter ten summarizes and concludes the research performed in this dissertation, noting the implications of these findings and further research suggestions.

2. Background

In order to work towards climate neutrality by 2050, the European Commission has laid out a preliminary goal of renovating 35 million building units by 2030, that are either publicly owned or publicly occupied [1]. However, in 2020, construction and demolition debris made up 37.1 per cent of the total waste produced within the EU [8]. Moreover, the construction industry alone represents between 40 to 50 per cent of the raw material consumption in most developed economies [9], and the load-bearing system of a building accounts for 39 to 50 per cent of its embodied carbon [10]. Accordingly, researchers argue that the reuse and renovation of an existing building offers clear reductions for the carbon footprint of the construction industry when compared with new construction projects [11].

COVID Impacts on Office Building-Stock

During the post-COVID reopening in 2022, more mid-sized office renters opted to sign in favour of flex spaces over typical office rental units. Further, lease incentives, such as lease-free periods, increased at the end of 2020 by 11.1 per cent. In Spring 2022, the number of employees looking to work mostly from home, rather than in the office, increased from 30 to 40 per cent [12].

Furthermore, a 2023 Q1 research report prepared by AEW noted that during the pandemic, office REITs in Europe showed the highest levels of discounts, second to retail, and by the end of 2022, office was trading at a discount of 26 per cent, which is lower than both retail and residential. While the average ROI, Return on Investment, for office buildings remained behind those for industrial, residential, and retail. Further noted in this report, is that the authors anticipate that over the next five years, there will be an office space reduction demand of 18 per cent, which vary per industry, with the largest in the finance, tech, retail, and automotive sectors. Furthermore, the projected worst-affected German cities from the WFH, work from home, impacts included Frankfurt, Dusseldorf, Hamburg, and Munich [13].

Although, in the 2023 AEW outlook report for 2024, office vacancy rates are projected to come down to 6.4per cent by 2027. Notably, this is only with reference to prime office, as most occupiers focus on securing prime office space, leading to a surplus in vacancy of secondary office space. Furthermore, the projected reduction to 6.4per cent by 2027 would still not be equal to that of pre-covid levels [5].

Housing Shortage in Major German Cities

From mass-migration to a lack of subsidized housing projects, the major German cities of Berlin, Hamburg, and Munich have been facing a housing shortage since the late 2010s [14]. As of October 2023, the JLL research report noted the city with the highest average residential rental price increase was Berlin, at €17.50 per square meter, which was an all-time high for the city. This increase is noted to be due to the rise in interest rates and the decrease in private mortgages. Accordingly, the average purchase price in Berlin only increased by 0.5 per cent and prime purchase prices fell by 4.4 per cent. This has created a significant increase in the demand for residential rental units as the city of Berlin sees an increasing inward migration to the city-centre. Moreover, this rise in interest rates has also decreased the amount of new development projects which have also been faced with rising construction costs. It is predicted that in 2024 the forecasted complete projects in Germany will further decrease from 240,000 to 190,000-200,000 [15]. Accordingly, this will create a catch-up effect over the next few years as the construction industry and policymakers attempt to improve the housing rental unit shortage in Berlin and other major Germany cities.

ESG and Sustainable Reporting Role-out

In order to guide the renovation of these 35 million residential units and discourage the tendencies for greenwashing, the EU has set out key principles for these renovation goals; 1. Energy efficiency, 2. Affordability of housing with regards to energy, 3. Promotion of local renewable resource use, 4. LCA promotion including high energy efficiency and green infrastructure, 5. High health standards, such as air and water quality, and the removal of harmful substances, 6. Utilizing smart building technology for sustainable outcomes, and 7. Continued respect for architectural heritage and quality [16]. As the target group for these principles are the businesses that will complete these renovations, a further list of guiding principles for the integration of circular economic principles into building renovation has been developed by the EU. These circular economic principles include; 1. Increase in product durability, which will reduce risks associated with investing in buildings as they age, 2. LCC analysis and additional income being captured during renovation and deconstruction from deconstructable and modular design, 3. Include the adaptability of a building into its financial value, and 4. Reduce waste through minimum standards, in order to facilitate investment [3].

These two sets of principles are under the umbrella of the ESG and CSRD, corporate sustainable reporting directive, that the EU has mandated for the first year of 2024. Accordingly, the first reporting is to be completed in arrears and is to be published in 2025. As such, partaking companies are to have an audit of their report completed by an approved third party [17]. Additional companies impacted also include: 1. third country branches with more than 40 Million EUROS, 2. small and medium companies, within the regulated Union market, and 3. micro companies required to report starting for financial years after 2026 [17].

These corporate sustainability requirements are guided according to the EU's CSRD, which is based on the Green Deal and aims to increase resource efficiency and competitiveness of the EU economy, as well as strengthen the EU's social market economy. Moreover, the CSRD includes the *Action Plan on Financing Sustainable Growth*, which is to redirect capital towards sustainable investing and decrease financial risks due to climate change [4].

SREP, Supervisory Review and Evaluation Process, which is guided by the EBA, European Banking Authority, are to disclose ESG risks to credit institutions and investment firms [18]. The EBA defines an ESG risk as; a risk that may arise from current or potential future core activities of a business process, that stems from financial risks such as; credit risk, market risk, operational risk, reputational risk, as well as liquidity and funding risks. In the 2022 ESG Risk Report prepared by the EBA, it is further noted that the management of these ESG risks should be incorporated into the institution's main business processes, strategies, internal governance, and risk management processes. Furthermore, a company's strategic planning should be extended to a minimum of 10 years, while the internal directives of ESG compliance and development should begin from the top of the institution and trickle downwards. Notably, the EBA is still currently developing a supervision framework to be used to guide the implementation of this [19].

It is worth noting that EFRAG published recommendations on the corporate sustainability reporting standards in March 2020. While the European Commission is to complete second set of standards by June 30, 2024, which will be sector specific [4].

2.1. Renovation

Typically, buildings are intended to have a useful lifespan of 50-60 years, after which it is likely that the building no longer meets the user's needs. However, studies show that the actual lifespan of a building is much longer than the deemed 50-60 years of usefulness [20]. Renovation is often defined as either a term used to denote a certain number of interventions or the substantial rehabilitation of a building [21]. There are several positive impacts building renovation can have. As described in the research by Grecchi, they include; 1. Increase in the indoor environmental quality, 2. Improved building performance, 3. Space usage, 4. Decreased costs, when compared to demolition and new builds, as well as 5. Increased social and cultural capital within the boundaries of the building and the surrounding neighbourhood [20]. Accordingly, this master's thesis will review the benefits of renovation from the perspective of real estate development and management.

2.1.1. Definition of Successful Renovation

A renovation project is deemed successful when it completes the following criteria; the renovation is completed, on-time, within budget, and at an agreed upon quality level [22] [23].

2.1.2. Challenges to Renovation Works

The decision to renovate, for a large company with many assets, is often prioritized by; 1. the condition of the building and MEP systems, and 2. the security of the asset. While less often, some companies choose to renovate simply based on the age of the building. Notably, tenants' opinions are often only considered in companies that do not operate within the growth market, such as social housing providers. [24] The technical challenges to renovations works are divided below in two stages; 1. Planning and 2. Construction.

Planning

At the beginning of a project, most project managers order an inspection, however this often does not include the thorough analysis of energy use, thermal comfort, moisture, noise, or daylight [24]. Furthermore, even when the technical inspections are completed they often include the following short comings: 1. Not accordingly to the construction standards, 2. No recommendations for prevention, 3. No solutions for prevention, 4. Does not include all MEP systems, 5. Incomplete description, 6. Natural air supply and ventilation not reviewed, 7. Conflicts with the energy audit, 8. No explanation on why components are noted as deteriorating, 9. No valid accreditation. Finally, with regards to the building design, common shortcoming include; 1. Technical inspection report and energy audit not considered and as such do not comply with taken measures, 2. Inspection performed after the design, when the inspection should inform the design [25].

Construction

Although renovations are generally considered as more environmentally sustainable than new build projects, there are still concerns with regards to waste production. In a study of apartment renovations in China, it was noted that the types of renovation

activities with the highest production of waste were; 1. Layout transformation, 2. installation, 3. Masonry works, 3. carpentry works, and 4. Painting [26]. It is noted by the author that waste management regulations differ from country to country, however the general construction activities of renovation remain the same.

2.2. Project Management

In the 2023 management research book, *The Illusion of Control*, the author defines project management in relation to the Latin etymology of the words; project, meaning the verb to shoot forward, and manager, meaning to lead a herd with the hand. Accordingly, the project manager should purposefully lead the herd forward [27].

PMBOK, an internationally recognized project management standard, divides Project Management into 9 key categories; 1. Project integration management, 2. scope, 3. time, 4. cost, 5. quality, 6. HR, 7. communication, 8. risk, and 9. Procurement [28]. Benefits of using project management are widely researched and include; well-planned projects, clear layout of expectations, defined products, good business case, project control methods, appropriate scope, time and quality, effective risk management, in-depth information for analysis during the various phases. Notably, the most ill-used tool of project management is communication [29]. Accordingly, this dissertation will review the benefits of communication in project management from the perspective of real estate development and management.

2.2.1. Definition of successful PM

Successful project management is often defined as the effective organization and leadership that balances the parameters of time, cost, and quality. While the result of successful project management is, accordingly, a project with the time, cost, and quality scope. However, some researchers warn against the limiting nature of this 3-aspect parameter, noting the 1996 definition of project management as the cumulation of producing a product from a vision [30].

Furthermore, as technology continues to advance and tasks become more automated by machine learning, many current tasks of the project manager, such as the creation of tables and charts, will be generated faster, while the ability to read and understand

these charts will remain crucial, the tasks that remain less easily delegable to software remains the human interactions, such as the involvement of, and communication with, stakeholders [27].

2.2.2. Current Challenges to Project Management

It has been documented in many research projects, that there is a general disconnect between research and practical use. This phenomenon displays itself very prominently within the realm of project management, as decision making often comes down to intuition and experience, rather than theory [31] [32] [33]. The general rule of thumb for the application of experience-based management is 10 years of direct work experience, at this point the steps of a project become a habit to the manager. However, these habits are the result of knowing what to do, but not necessarily why they should be done [34] [35].

Furthermore, as it is noted by Liu, every person has their own innate confirmation bias, and ruling this out of intuition-based decision making is rather difficult, as to act on intuition can be done from a misunderstood or misinterpreted gut feeling [34]. However, as described by McNulty et. al, a true expert is aware of the limitations of their expertise and should then ask the appropriate people the appropriate questions [36]. The literature review will further discuss what the current research suggests can be done to manage these challenges of project management.

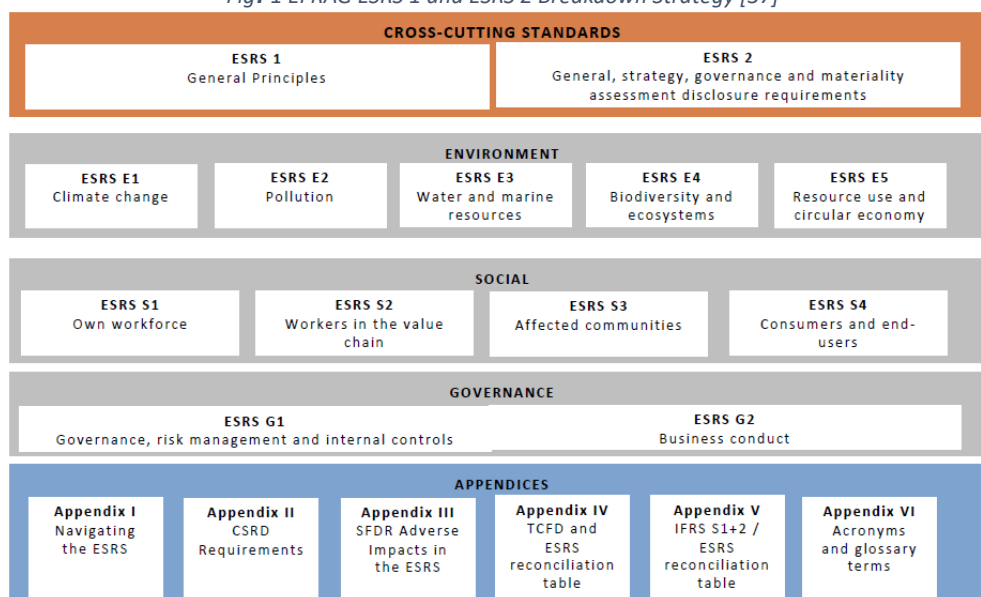
2.3. ESG and Sustainability

The requirement for corporate sustainability reporting is impacting both large and small businesses operating within the EU. As such, a 3rd party assessment of sustainable real estate assets will not only prove useful in managing investments, but it is also a requirement of the EU, as previously mentioned. Accordingly, this graduate thesis will review the benefits of ESG conformance in real estate assets from the perspective of real estate development and management.

2.3.1. Definition of Successful ESG and Sustainability

Working closely with the EC, European Commission, the EFRAG, European Financial Reporting Advisory Group, is a private association that provides technical knowledge to the EC to support the CSRD. Accordingly, EFRAG is preparing a standard reporting template and guideline. Currently, the interim draft has been published which notes the success of ESG Reporting being organized into three main sections; 1. Environmental, being the largest group, is divided into five subcategories, 2. Social divided into four subcategories, and 3. Governance, is divided into two subcategories [37]. This can be seen in Fig. 1. It should be noted that, currently the EC has laid out the environmental requirements based on these 5 subcategories in the form of the EU Taxonomy. These requirements are industry specific. Ultimately, meeting these requirements is the definition of a successful ESG rating. It should also be noted that currently the EU has only published the requirements for the Environmental section of the Taxonomy.

Fig. 1 EFRAG ESRS 1 and ESRS 2 Breakdown Strategy [37]



2.3.2. Challenges of ESG and Sustainability

There has, however, been criticism into the clarity of the ESG ratings, as many companies have formed to fill this knowledge-gap between the regulatory bodies and the practical application. Since there are no complete standards for ESG as of yet, investors often purchase data from external companies [38]. However, the CSRD

legislation does note that the third-party, data-providers role is increasing in importance [4]. As such, within Europe many companies have formed all of which cannot be explored within the limitations of this dissertation. Accordingly, GRESB Real Estate Assessments will be used as the success metric of the sustainability of a real estate asset and will be explored further within the literature review.

2.4. Sustainable Investing

In the 2021 literature by Silvalo & Landau, it is noted that from 2016 to 2018 there was a global increase of 34 per cent in sustainable investments. Furthermore, in 2018, 82 per cent of 650 global institutions included ESG information in their decision-making processes. For example, Norway reported that their government pension fund reported that sustainable investments outperform general markets. Even though ESG analysis involves additional costs and time to prepare studies and source information and sustainability is often seen as a negative risk, when compared with traditional investment [38].

The process of real estate investing can be divided into three main steps; 1. the development organization, 2. investment decision process, and 3. the real estate development [33]. For risk-taking investors, companies that are undervalued in terms of the sustainability can be improved upon with value and growth investing strategies [38]. For example, this can be seen in value-add and opportunistic real estate investing strategies. Accordingly, this master's thesis will review the benefits of sustainable investing into value-add and opportunistic real estate assets from the perspective of real estate development and management.

2.4.1. Definition of Successful Sustainable Investing

In a 2021 study, researchers found that long-term investment decisions informed by ESG screening had on average a 10.4 per cent larger return than traditional investment methods. As such, the traditional notion that sustainable investing underperforms traditional is not entirely true. It is furthermore suggested by the researchers that this strategy can also be used by institutional investors, such as pension funds [39].

Accordingly, pension funds are some of the largest investors in real estate. On average, European pension funds include 15-18 per cent in private assets, this is also common among all OECD countries [40]. As such, with a large amount of pension investment into private assets and the current recommendations for pension success to be increased by sustainable investment practices, the success of a sustainable investment can be defined as the increase in profit, while also meeting ESG screening.

2.4.2. Challenges to Sustainable Investing

In a global UN report conducted in 2020, it was found that over half of municipalities do not have the proper funding to support sustainable development within their cities [41]. While the OECD countries that are reluctant to invest into sustainable infrastructure note sustainable development projects as being too risky and excessively liquid [40]. As argued by Gehner, a procedural rational is the best process for decision making for real estate development with regards to risk management. Accordingly, she divides the notion of knowingly taking risks can be divided into 3 indicators: timeliness, justifiability, and accountability [33].

2.5. Background Concluding Thoughts and Thesis Aim

The development of the real estate market over the next few years will ultimately conclude how the housing and office demand move forward. However, with the current depictions of office still not recuperating by 2027 [5] and the lack of available rental units in major German cities [14], it is the informed opinion of the author that this situation provides a positive use case for the application of adaptive Reuse renovations of undesirable office buildings into housing units. Furthermore, as the structure of a building accounts for the highest embodied carbon, the adaptive reuse of a building does not reemit these carbon dioxide levels, known as grey energy [42].

Accordingly, the reuse of grey energy from underutilized office buildings provides a potential solution to the high levels of carbon dioxide emitted from new construction projects. However, as the investment and development of such sustainable properties often contains higher risk levels than new build projects [38], this will require

sustainable investing methods that do not only provide an environmentally sustainable asset, but also an economically sustainable asset.

As the EU enacts the various regulations relating to the European Green Deal and the ESG reporting requirements, companies will be required to employ 3rd party reviewers to verify the compliance with the EU ESG Taxonomy and CSRD Sustainable Financing regulations [4]. Furthermore, as the EU has yet to release a regulatory license for 3rd party ESG providers, the selection of a provider is an important step for a company's provision of an ESG strategy, in order to prove the sustainability of their real estate asset. Accordingly, the current global leader that adheres to not only the EU ESG standards, but the ISO standards is GRESB Real Estate Assessments [43].

Finally, the sustainable investment in adaptive-reuse projects that are certified using a ESG ranking provider will require oversight by project management. However, a lack of communication and overreliance on experience and intuition does not provide a concrete framework for the successful provision of such projects [44]. Accordingly, the adoption of an adaptive approach to project management should be used to create a supportive framework for such a project. The relationship between the four main themes of this master's thesis is represented in TABLE I below. In this table the market driven, and regulatory driven factors are addressed through the themes of Renovation and Sustainable Investing, while the challenges from these two themes are supported through the themes of Project Management and ESG Ranking. This dissertation is based on this relationship and is further developed throughout the thesis. Ultimately, this graduate paper attempts to address the challenges of each theme through its interrelation with the other themes. This research area is displayed visually as the overlap of the themes as shown below in the Venn Diagram of

Figure 2.

TABLE I
RELATIONSHIP TABLE:
How Project Management and ESG Ranking support Renovation and Sustainable Investing through addressing current market and regulatory driven urgency factors

Market Driven Factors:		Regulatory Driven Factors:					
Office Demand Decrease	Housing Demand Increase	CO2 Levels of Construction	EU 7 Principles of Renovation	EU 4 Principles of Circular Economics	3 rd Party ESG Report Review	CSRD Financing Sustainable Growth Action Plan	EBA to disclose ESG risks to investors
Addressed through:				Addressed through:			
Renovation				Sustainable Investing			
Challenges				Challenges			
1. Inspections 2. Design 3. Contracts 4. Waste				1. Increased Risk			
Supported by:							
Project Management				ESG Ranking			
Challenges				Challenges			
1. Reliance on intuition 2. Communication				1. Unclear Requirements			

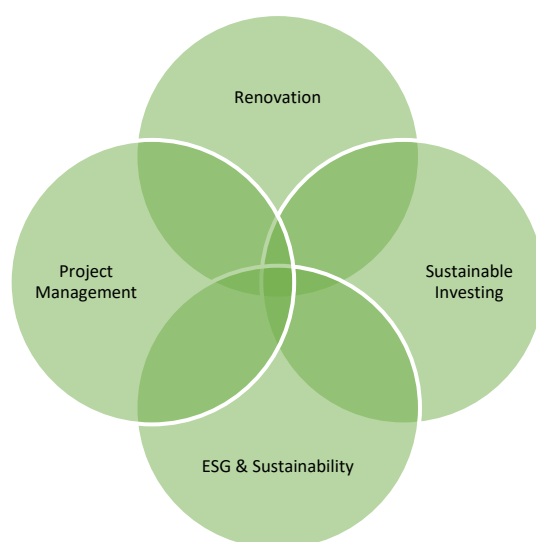
To reiterate, a successful project is defined by the four themes of this master's thesis and are shown in TABLE II below.

TABLE II
Summarization of Success Criteria

Theme	Success Criteria
-------	------------------

Renovation	Project delivered; on-time, within budget, and within agreed upon quality
Project Management	Balance of; time, cost, quality, through communication and innovation
ESG	Meeting the criteria of EFRAG and EU Taxonomy
Sustainable Investing	Increased profit and ESG rating

Figure 2 Venn Diagram of Main Themes



3. Research Questions

The research questions that this dissertation will attempt to address are the following:

1. Main Question: How can renovation projects be used to manage unused office space, add housing supply, and meet EU ESG targets?
 - a. Sub-Question: What are the success factors of an adaptive reuse office to residential project?
2. Main Question: How can project management be used as a tool to ensure ESG ratings, while also reducing the financial risk seen in a renovation project?

- a. Sub-Question: What are the success factors of adaptive project management?
3. Substantive Question: What are the interrelationships between the success factors identified in the main research questions?
 - a. Substantive Sub-Question: How can this research be generalized and distilled into a practical framework?

4. Methodology

This master's thesis was focused on real estate development from the perspective of the client within the European context of Germany. To achieve the research questions previously stated, a qualitative data collection was provided through a multi-method approach. The strategy for the data collection was an inductive one, where the data collection began broad and narrowed as the research continued. As such, the background was used to inform the literature review, after which a theory was formulated. This theory, derived from the literature review results, was then assessed through a modified Delphi method. The results of the literature review have been shown in TABLE V and TABLE VI. Notably, Appendix A below has been provided for definitions of the success factor terminology.

The modified Delphi method contained two interview rounds and was focused within the context of a case study. The use of the modified Delphi method attempted to justify the resulting theory derived from the literature review. The first interview round consisted of individual, one-on-one interviews with the selected experts. A list of respondents has been shown in TABLE VII, while the interview questions has been included in the Appendix C below. The case study was selected based on conformance with the adaptive reuse success factors, derived from the literature review. A list of supportive case study materials and figures has been included in Appendix B below. Due to the limitations of this dissertation, only four success factors, from TABLE V and TABLE VI, were selected for further justification due to their high rating in amount and type of interrelationship. The selected success factors further explored in the first interview round are shown in TABLE VIII. The second interview round was completed as a single group interview with the same expert panel. The intent of the second

interview round was to reach a consensus on the results from the first round. Accordingly, only one success factor was further explored in the second interview round, as the results from the first interview round were unclear. These results have been shown in TABLE XVI and TABLE XVII.

This master's thesis was an exploratory analysis, that was continuously narrowed as the thesis evolved, and reached a justified theory in the form of a framework and conclusion. This has been shown in Table XX, while graphical depictions of success factors that were further justified in the interview rounds have been shown in Figure 7, Figure 8, Figure 9, and Figure 10. Accordingly, the research theory for this graduate thesis was developed through analysis, and as such a grounded theory was applied in order to reach a conclusion [45].

The literature review was conducted through the review of academic, peer-reviewed, scientific journal articles and books, as well as government and regulatory documents, within the subject of; project management, renovation, ESG, and sustainable financial management. The majority of the sourced material was published within the past ten years. The search for literature was performed, using these afore-mentioned parameters, within the library databases of the Metropolia UAS and HTW Berlin.

The interviews, which help to reinforce the results of the literature review, were case-study-based and semi-structured. This was completed in an attempt to triangulate the data from the literature review as well as the subsequent first interview round. Furthermore, these qualitative interviews employed open-ended questions, which offered opportunities for further in-depth discussions as well as the chance to explore alternative explanations [45].

Representatives from within the real estate and construction industry were interviewed, and in-person or online interviews were performed. The overall intent for these interviews was to provide quality feedback from a selected small sample, rather than brief responses from a myriad of responders. Contacts with representatives were provided through the author's professional network, as well as the network of the first supervisor. Furthermore, the anonymity and confidentiality of the respondents was

ensured through private interviews during the first individual interview round. While their responses were kept confidential during the second group interview round.

Using a deductive approach, the interview questions were formulated to further the theory developed through the literature review process. As such, the interviews have been used to test the hypothesis of this dissertation. The interviews were each allotted a one-hour time slot and were recorded. The author also took notes during the interviews and attempted to provoke further in-depth responses from the interviewees. These recordings and notes were further reviewed to assist with data analysis and understanding of non-verbal communication.

The literature review results were disseminated into the pre-determined categories, made up of the four main themes of this dissertation. This process formed a matrix that helped to illustrate the interrelationships between the success factors. These relationships were tested against alternative explanations during the interviews, which attempted to verify the conclusions. Finally, these conclusions were distilled into a final framework, that can be adopted by applicable professionals.

Below is the step-by-step process of the modified Delphi method, case-study interviews, and analysis, that was applied in this master's thesis:

1. Using the results from the interview, outlying success factors were selected from TABLE VI for further analysis. A list of the selected success factors has been shown in TABLE VIII. The terminology of these success factors has been provided for in Appendix A below.
2. Background research and site visits, using the asset condition success factors derived from the literature review, were performed to select a property for the case study. This has been discussed in Chapter 7.1, while further supportive materials have been included in Appendix B below.
3. Fictional scenarios were formulated for the case study that applied the interrelations between the selected success factors from step 1.
4. Open-ended questions were formulated from the scenarios developed in the previous step to inquire what the expert would do in this situation and what

type of impact this scenario would have on the project. These have been included within Appendix C below.

5. Five interviewees were selected based on their qualifications and the relevance to the dissertation topic. A list of interviewees with their agreed upon personal data has been provided for in TABLE VII.
6. The first round of interviews was performed, either online or in-person, each interviewee was provided with the same set of questions.
 - i. Firstly, the interviewees were asked if they agreed with the success factors used to select the case study, from step 2.
 - ii. Secondly, the interviewees were asked the open-ended, scenario-based questions, from step 4.
 - iii. As the interviewee responds, follow-up questions were used to formulate a decisive opinion.
7. The results of the interviews were compared and contrasted with that of the literature review. This was completed using a scoring method, with 20 per cent of the result from the literature review and 16 per cent, per respondent result, used to provide a final score on the type of interrelation the success factors had. Respondent scores were also counted if they agreed to more than one type of interrelation. Changes to the literature review results from the post-interview results were tabulated. These results were shown in TABLE IX, TABLE X, TABLE XI, TABLE XII, and TABLE XIII.
8. Based on these results, outstanding success factors were selected, and a theory formulated, regarding the type of interrelation they have, as well as a compiled list of justified asset condition success factors. A revised results list of TABLE VIII has been provided for through TABLE XV. While TABLE XIV has been provided for to summarize the revised results for the adaptive reuse success factors in TABLE V.
9. The second interview round was performed, in the form of one online, group interview.
 - i. Respondents were provided the post-interview results and asked to agree or disagree, with regard to the interrelation type of the

- selected success factors and asset condition success factors derived from step 8 and explain why.
- ii. A consensus was attempted to be reached among the interviewees.
10. The results of the second interview were compared and contrasted with that of the literature review and the first interview round. This was completed using the same scoring method from step 7. Any changes to the first post-interview results from the second post-interview results were tabulated. This has been tabulated in TABLE XVI and TABLE XVII.
 11. These results were summarized, and the practical implications discussed.
 12. A final theoretical framework was developed, based on the second post-interview results. This is shown in Table XX, as well as graphically in Figure 7, Figure 8, Figure 9, and Figure 10.

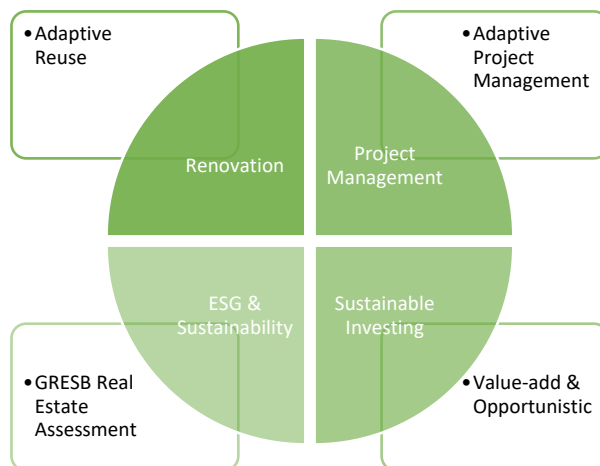
This thesis adhered to the Ethical Guidelines of the Hochschule für Technik und Wirtschaft Berlin and the Code of Conduct of the Metropolia University of Applied Sciences.

5. Literature Review

This section will review the current research available for the four main themes of this graduate paper, focusing on a specific proposition for each theme. The research area as described in the background section and in

Figure 2 is narrowed in this chapter and displayed visually below in Figure 3 Venn Diagram: Narrowed Research Area .

Figure 3 Venn Diagram: Narrowed Research Area



5.1. Renovation: Adaptive Reuse

Although there are many forms of building renovation, this graduate research will look specifically at that of adaptive reuse and its role in the conversion of office buildings to residential, as an opportunity of underutilized office buildings to serve the lack of housing, as discussed within the background section.

5.1.1. Selected Recommendation: Adaptive Reuse

When faced without tenants, most owners of empty office buildings opt to hold their investment as is and wait for potential tenants, as the value of an office building is based on the potential rental yield. As such, it could lead to a potential loss if the asset is sold. Further, once value has been lost on an investment, it has proven difficult to rally the will to reinvest in renovation or conversion works [46]. For the building owner, a loss in revenue, due to vacancy, can outweigh the costs of ownership and upkeep. Further, Graham & Dutton reinforce that vacancy rates decrease property values and in turn the property taxes that they generate for the city. In a case study, Graham & Dutton examine the Canadian City of Calgary. From 2014 to 2020 the office vacancy

rate had steadily increased from 6.1 to 24.7 per cent, which was double the Canadian average of 11.9 per cent in 2020. Furthermore, in Calgary, like many OECD cities, non-residential buildings are taxed higher than residential, and in 2015, downtown office property represented 32 per cent of the municipal non-residential tax income, while in 2019, that number decreased to 18 per cent, as the average asset value decreased. Accordingly, the municipal government produced legislation that supported office building conversions and increased permit approval speeds [42].

A further notable example of adaptive reuse occurred in New York City in the 1990s. As a recession hit, New York City was relocated out of Manhattan to mid-town, as such the Manhattan office buildings had a vacancy rate of 20 per cent. In response, the NYC government subsidized converting obsolete Manhattan office buildings into apartments, with a focus on studios for first time renters and owners. Over the span of 10 years, more than 60 office buildings were converted to residential [46].

5.1.2. Challenges and Opportunities to Adaptive Reuse

Public Policy

Vardopoulos, et al., argue that reusing buildings to meet the demands of the post-industrial societies can lead to employment opportunities and create locations for economic, social, and cultural activities to take place. Accordingly, increasing political support is integral to the promotion of adaptive reuse, and policies should be developed that support economic growth, while public interest and opinions should be gathered to address the needs of the community [47].

Building standards and codes vary from office to residential use, making it difficult for conversion project to meet the building code [48]. For example, acoustic insulation installations on the façade and ceilings are required in almost all office to residential conversion projects. However, this complete replacement of the façade often makes it impossible for sale on the affordable market. A further example is that emergency exits are stricter for residential than office, and issues of daylight access often occur in office buildings of the 1960s [46]. However, government agencies often note the importance of increasing sustainability in existing real estate assets without providing flexibility within the building code, fire code, and accessibility [48]. Although there a many

potential positives, there is also a high level of uncertainty involved with the estimating fiscal viability of adaptive reuse projects.

Reluctance on Owner's Side and Financial Risk

In the 2011 study by Bullon & Love, it was noted that, owners are reluctant to practice adaptive reuse due to six main reasons; 1. increased safety risks, 2. increased maintenance, 3. low rental returns, 4. special layout conflicts, 5. commercial risk and 6. uncertainty. However, these variables are related to the financial concerns of; 1. capital investment, 2. asset condition, and 3. regulation [48]. As mentioned above, buildings are only converted once they have lost a certain amount of property value or rental income.

In Toronto, Canada in the 1990s, the return on residential investments was 90 per cent higher than that of office and commercial. This stimulated a growth in conversion projects. However, it should be noted that developers who specialize in residential rarely own office, and there is a general lack of knowledge of conversion projects from the owner's side. In Toronto, this was further challenged by difficulties receiving loans on complex and uncertain projects. It is notably mentioned in this study that often when a building was updated to increase sustainability, financial gains were unlikely [42]. Unfortunately, tradespeople are typically unfamiliar with working with existing materials, and construction firms can be hesitant to bid on projects due to high level of unknowns. This can be further negatively impacted by a lack of accurate building modelling information on existing buildings, as such contingencies beyond 25 per cent can be seen in the cost estimates [42].

Architectural and Engineering Works

Both the aesthetic design and technical design of the existing building pose challenges to renovations. For example, making 60s office buildings aesthetically pleasing can create large barriers to conversion projects [42]. Furthermore, there is a clear correlation between specific building alterations and cost, as it is often the external materials and finishes of a building that have high technical issues, which then require more extensive renovations [48]. For office buildings the costliest alteration is the façade, as the façade costs are dependent on; how well the building was maintained,

building shape, desired aesthetics, energy efficiency, acoustics, and quality of the materials and finishes [46].

Further challenges include defects in the structure, hazardous materials, lack of accurate information on existing services, and the risk that the structure gives out during renovations [48]. However, as the super structures of office buildings are often designed to hold more weight than that of a residential building, additional floors can often be added to the existing structure. It is however important to note that office floors are often thin and require an increase in acoustic insulation.

Residential buildings require more servicing lines. In buildings with prestressed concrete the addition of vertical shafts for MEP installations increases costs, as prestressed concrete loses strength when cut. However, due to the higher number of users per square meter, offices often have a surplus of staircases and elevators, and these additional shafts can be used for HVAC and additional servicing requirement [46].

Location and Demand

Central locations, residential areas, and along downtown edges are good success factors for residential conversions [42]. However, often business parks, that were planned in the 1930s are now within the boundaries of the city centre, and also offer potential for conversion. While developers often hesitate to develop in mainly industrial neighbourhoods, if social, commercial, and business amenities are nearby, it can be successful [46].

In central business locations, developers noted reuse projects and investments are particularly attractive due to the premium received in rent. Furthermore, higher premiums are also often seen for sustainable buildings, as these tend to have an aesthetic quality and lower operation costs. However, there is considerable risk if the product will not meet the needs of the tenant or end-user [48]. As such, the addition of balconies for residential projects is often necessary to attract the target income group [46]. Furthermore, good candidates for conversion have often been vacant for an extended amount of time. However, it is worth noting that although housing may currently be in demand, that may not be the case when the project is completed [42].

As such, forecasting and continuous research is also required for real estate investment companies.

Cultural Significance

Often successful conversions are from buildings with cultural or heritage value. As heritage buildings often offer higher success rate for building conversions, due to the unique and ornate building elements [42]. Furthermore, it is noted that successful heritage adaptive reuse projects stem from a mutual respect on the significance of the building and a desire to instil contemporary value [48]. However, changing the façade to allow for additional insulation requirements for heritage buildings is often not possible [46].

5.1.3. Specific Opportunities and Constraints in Berlin, Germany

A projection by JLL's research division for unused office space in Germany by the year 2025 is estimated to total 7.87 million m². This space could potentially create 19,600 residential units with an average of 65 m² each. This study noted 4 common arguments against office conversion projects in Germany; 1. Residential may be provided where people do not want to live, 2. It is not clear how long the decreased demand for office space will continue, 3. Empty office space could also be used for other uses, and 4. High construction costs for new builds will likely reduce the amount of empty office space [15].

There are however many potential benefits when comparing adaptive reuse projects to new builds in Germany. These include: 1. Savings on MEP can be achieved through minor changes in the office building's structure to allow for the additional servicing lines required, although not possible with pre-stressed concrete as previously mentioned in this master's thesis. 2. Total costs are estimated at €1,700 – 2,200 per m² including construction and permitting costs, when compared with new builds this cost is around half as much. 3. Notably, as the amount of rental income is also heavily influenced by the location, the construction costs can therefore be additionally offset by the rental income when the property is in a prime location. Furthermore, when high rental income is coupled with the densification of the property the potential earnings for such a project

can significantly outweigh the costs. 4. CO₂ emissions for conversion projects averages at 500kg of CO₂, while for new builds the average is 1,500kg of CO₂ [6].

An additional benefit specifically related to projects within Germany was noted in a 2017 report from the Federal Institute for Construction, City, and Space Research. Accordingly, 33 per cent of the BKI, building costs index, is automatically saved in conversion projects as they do not require excavation, foundation, or superstructure construction. While the highest expense is often related to the measures required to achieve energy efficiency, noise, and fire ratings. However, it was noted that conversion projects in Berlin tend to have higher rental costs than average asking prices [49].

Recommendations for office to residential conversion projects specific to Germany include: 1. good candidates for conversion are when more than 5,000m² of the office space is currently empty, according to economies of scale and total rental income compared to total project costs. 2. The use-change of large office land parcels to mixed use provides densification, as well as complementary uses like retail and amenities. 3. The location of a conversion project has a large impact on its success. Access to various transportation options, noise pollution levels, park and open-space access, and access to retail and leisure facilities. 4. Assets with floor plans that allow for good ventilation are often central core or rectangular in layout [6].

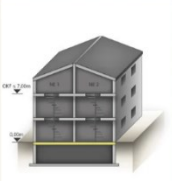

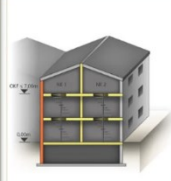
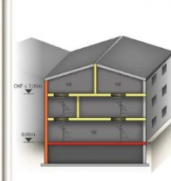
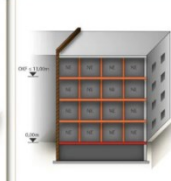
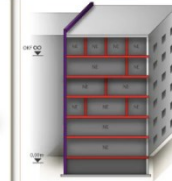
With regards to the permitting process in Berlin it was noted that in 2015, 10 per cent of new residential units were the product of conversion projects, however with the exception of the Treptower-Köpenick district, the city has yet to provide clear strategies for the support of conversion projects. In order to receive a use-change amendment, a building permit must be applied for along with the use-change request. Furthermore, even when only parts of the building are being converted, each section will require a separate building permit. Furthermore, the largest obstacles in securing the permit often occur with regards to the noise levels, insulation, and fire protection measures [49].

In Germany, fire protection is categorised in relation to a designated building class. Accordingly, the building height, usage type, and size and number of units define the

classification given. Building classes range from class 1, a freestanding building under 7 meters tall, with less than 2 units, and less than 400m², to class 5, other building including underground structures from 13-22 meters with an unlimited number of units less than or greater than 400m² per unit. Accordingly, the higher the classification the higher the required fire protection measures. Class 1 buildings require fire-retardant load bearing materials, while class 5 buildings require fire-resistant load-bearing materials. This can be further seen in

Fig. 4.

Fig. 4 German Standard for Building Fire Rating [50]

GK 1a	GK 1b	GK 2	GK 3	GK 4	GK 5
					
<ul style="list-style-type: none"> feuerhemmend NE = Nutzungseinheit (Brutto Grundfläche) 		<ul style="list-style-type: none"> feuerhemmend von innen nach außen feuerhemmend und von außen nach innen feuerbeständig 	<ul style="list-style-type: none"> feuerhemmend feuerbeständig von innen nach außen feuerhemmend und von außen nach innen feuerbeständig 	<ul style="list-style-type: none"> hochfeuerhemmend feuerbeständig Wand unter zusätzlicher mechanischer Beanspruchung hochfeuerhemmend 	<ul style="list-style-type: none"> feuerbeständig Brandwand unter zusätzlicher mechanischer Beanspruchung feuerbeständig
<ul style="list-style-type: none"> freistehende Gebäude OKF ≤ 7m ≤ 2 Nutzungseinheiten Σ NE ≤ 400m² ohne UG 	<ul style="list-style-type: none"> freistehende Gebäude land- und forstwirtschaftliche Nutzung 	<ul style="list-style-type: none"> nicht freistehend OKF ≤ 7m ≤ 2 Nutzungseinheiten Summe NE ≤ 400m² ohne UG 	<ul style="list-style-type: none"> sonstige Gebäude OKF ≤ 7m + NE > 400m² 	<ul style="list-style-type: none"> OKF ≤ 13m NE jeweils ≤ 400m² ohne UG 	<ul style="list-style-type: none"> OKF ∞ NE > 400m²
Feuerwehreinsatz mit Steckleiter möglich				Feuerwehreinsatz mit Drehleiter nötig	
Höhe im Sinne des Satzes 1 ist das Maß der Fußbodenoberkante des höchstgelegenen Geschosses, in dem ein Aufenthaltsraum möglich ist, über der Geländeoberfläche im Mittel.					

In Germany, noise level protection is regulated with the DIN 4109. Within this norm 4 main noise sources are defined as; external, airborne, impact, and technical. As office buildings have significantly lower noise level requirements as residential, the renovations required to reach the designated noise level depends on the existing wall construction. Accordingly, with regard to metal substructures, which is a common system for office buildings, a 2015 study of German apartment buildings recommended metal sheets complete with felt pads for abrasion resistance, coupled with mineral fibre and air spaces covered by a double layer of gypsum board facing provides the required noise subduction [51]. Notably in Germany, office buildings typically have a higher ceiling height than residential [6]. This can help significantly in terms of allowance for additional heat and noise insulation. Subsequently, improving the energy efficiency of the building.

Energy efficiency is regulated in Germany by the GEG, Building Energy Act. Accordingly, the GEG determines the limits for the energy requirements for renovated buildings. In Berlin, this includes but is not limited to; 1. CO₂ emissions for heating, 2. Renewable energy generation, 3. Heat generation systems, 4. Ban on oil and coal

heating systems from 2026 onwards. In order to ensure these requirements are met and not only planned for, the City of Berlin also requires third party testing from accredited experts once the renovations are complete [52].

In terms of energy efficient ventilation however, there aren't clear standards required. In a 2021 study, researchers noted that mechanical ventilation is less energy intensive than manual ventilation, due to high heat loss, while automated manual ventilation provides even more potential efficiency [53]. This notion of resident impact is further reinforced by the previous 2016 study noting that the one of the most common causes of failures in energy efficiency renovation is the behaviour of the occupants [54].

5.1.4. Summary of Success Factors

Accordingly, the below success factors can be summarized from the literature review on adaptive reuse and conversion of office buildings to residential:

Asset Conditions

1. Adaptable site and floor plan, and ceiling height
 - a. For Berlin: potential for densification
 - b. Additional shafts for MEP
2. Façade condition
3. Location (central, residential, or downtown edge)
 - a. For Berlin: access to amenities, leisure, transportation
4. Balconies
5. Vacant building
 - a. For Berlin: 5000m² or above of empty office space
6. Hazardous materials not present/unlikely to be present
7. Superstructure allows for additional floors
 - a. Prestressed concrete not present
8. Heritage or cultural significance
9. Daylight & Ventilation
 - a. For Berlin: ventilation achievable from central core and rectangular layouts

5.1.5. Summary of Constraints

Accordingly, the below constraining factors can be summarized from the literature review on adaptive reuse and conversion of office buildings to residential:

Policy

1. Lack of government regulatory support
2. Government funding
3. Acoustic rating
4. Fire code and emergency exits
5. Accessibility
6. Energy efficiency

Financial

1. Construction firms with experience in conversions (lower contingencies)
2. Market forecasting
3. Increased asset value
4. Uncertainty and risk management
5. Maintenance costs
6. Loans secured through private equity
7. Sustainability and affordability
8. Office and residential experience

5.1.6. Conclusions

Adaptive reuse extends the lifespan of a building, by instilling usefulness into a building that no longer meets the needs of the users, while increasing sustainability metrics. However, renovation projects of this type are not without challenges. The ultimate decision to renovate is based on both managerial and technical elements. As real estate owners of office buildings are struggling to see ROIs on their investments, due to the lack of demand in the industry and a projected further decline of interest over the next 5-year period [13], the adaptive reuse of empty office buildings into residential

projects may help to balance the current forecasts of a continued decrease in demand of office space.

When the success factors are met adaptive reuse projects function well, creating a positive ROI plus profit. However, they require public policy support and the relaxation of regulatory requirements or subsidization. While challenges in the technical aspects of conversion are often expensive and these projects include a higher amount of uncertainty, this can lead to an increase in the price for the construction and accordingly making the project not economically viable from the private sector and as such unsuccessful. The management of this uncertainty will be discussed in the following section on project management.

5.2. Project Management: Adaptive Project Management

Although there are many methods of project management, this dissertation will look specifically at that of adaptive project management and its role as a support mechanism for communication as well as to help project management adapt in the age of information.

When a company has specific skills in project management, these skills will lead to efficiently executed projects, in comparison to companies that lack these management skills [55]. As such, project management is a necessary field and specialty within real estate development. This section will explore project management as a dynamic process when in the face of uncertainty, and the future of the field.

In the academic literature by Vanhoucke, the increasing importance of big data in project management is discussed through the theme of dynamic scheduling and data driven project management. Where static project management refers to the preparatory work, dynamic project management is then the reoccurring collection and analysis of data during the project execution. The static phase produces the creation of a baseline schedule, that is then used as the reference point throughout the project. While in the dynamic phase, or project execution phase, the task is to determine solutions from the newly available data and take timely actions [27].

Accordingly, Vanhoucke developed a variation on the EVM, earned value method, which he calls the EVM+Monte Carlo. He defines this method as an alarm, focus, shoot method. Where the alarm is set off using a Monte Carlo statical method, the focus is from a top-down method of drilling down to the problem activity, and the shoot is taking the corrective action. However, due to the complexity of the mathematical algorithm required to simulate this model, it was noted in a master's thesis of a student of his, that PMs weren't often willing to use the static Monte Carlo simulations to create the appropriate tolerances. Accordingly, she dedicated her PHD to developing an easy-to-use version, the so-called analytical project control method. This method required only the projects baseline schedule and a few EVM metrics to be calculated, to monitor the project. Ultimately, making this method very similar to the rule-of-thumb method, which is based on the experience of a PM, and is already widely used every day by PMs. However, these are not entirely random thresholds based on experience and bias but are project specific.

This intersection of theory and experience is described further in a 2016 study which defines this phenomenon as the interplay between intuition and rationality [56]. Ultimately, it is noted that managers should; 1. Interact with and enable points of tension, 2. Integrate these tensions and use their differences to elevate the ultimate solution, and 3. Apply this integration without faulting backwards into automated responses of one's intuition. The application of this informed intuition in decision-making can further be seen in the research of fast and frugal heuristics. Although heuristics is historically viewed as inferior to evidence based decision-making due to the reliance on a bias [57], it is a time-saving tool that can provide successful results using less resources when used appropriately [58]. This next section will focus further on this intersection of intuition and experience in project management communication through the application of adaptive project management.

5.2.1. Heuristics and Adaptive Project Management

Heuristics in Decision-Making

Heuristics and bias have been studied by behavioural and decision scientists since the 1970s. Heuristics in decision-making is the study of how mental shortcuts allow for

problem-solving through probability judgements. In project management there are many biases that impact the decision-making process [59]. The theory of heuristics relative to project management that will be discussed in this section is related to fast-and-frugal heuristics, where only minimal information is used to make a decision [48]. Already used in law and medical fields, understanding heuristics and bias can provide a good tool for decision-making in construction. Decision-making can be classified into three categories, 1. Certainty, where actions have a known result, 2. Risk, where the results and probability of the results are known to provide certain outcomes, and 3. Uncertainty, where results may be known, but the probability of said result is not known [60].

The decision-making tool used should reflect the problem at hand. Problems that have a high degree of uncertainty are particularly well suited to applying heuristics [60]. Accordingly, as decisions that are made in the field of renovation projects tend to have a high degree of uncertainty, heuristics lends itself very useful to project managers.

In an uncertain market, heuristics, ironically, provides a rational strategy for navigation, when compared with information intensive approaches [61]. In a 2019 study, researchers noted the use of heuristics on large, complex projects, in contrary to popular belief, did not perform less than that of rational and information intensive strategies. Instead, often the intake and analysis of more information does not guarantee a better result when faced with uncertainty factors. The main advantage of heuristics is the ability to use less resources, such as time, to meet an accurate decision. Interestingly, this study notes that in the age of information, where big-data plays an ever-more important role, the value of being able to provide a quick and accurate response is an increasingly important skill [60].

Adaptability in the face of uncertainty seen in heuristic decision-making can be applied to the management of renovation projects through the implementation of flexibility. Traditional project management lacks the ability to provide tools for uncertainty in projects and underestimates the impact of dynamic shifts from environmental factors [62] [63].

Adaptive Project Management

Structured decision-making can greatly improve the ability of a project manager to make good and successful decisions. However, renovation projects deal with a high level of uncertainties, and each decision made effects another down the road. Once the project plan has been derived, which is noted as the static project phase in Vanhoucke's work, as mentioned above, the project moves beyond the theoretical and into physical, what Vanhoucke refers to as the dynamic stage. At this dynamic stage is where any necessary adjustments from the static plan can be made in the form of adaptive project management [27].

Trumper and Virine summarize the principles of adaptive project management into 4 principles; 1. Project Data & Original Assumptions, as a form of monitoring and control, here regression analysis helps with the addition of actual project data and compares these with the original analysis, 2. Minimize decision reversals, as these are often costly to implement, instead formulate alternatives, 3. Small, sequential decisions, in other words employ iterative decision-making where all requirements are not completely defined rather incrementally redefined. 4. Creative environments, this is provided with a balance of being able to improve the project with current information without creating large disruptive changes, 5. Fix problems early, the longer an incorrect action is continued the more difficult it is to reverse its impacts [59].

Within renovation projects, static project management alone does not allow for continuous improvement of the project implementation. As the parameters of the investment and development of a property may change at any moment, dynamic project management is required. In a 2023 conference forward, adaptive management is defined as management with the use of partial, previous information that is updated as more information is acquired. The study of uncertainty in construction and investments is particularly important due to the variable nature of construction, however personal experiences can be shared within the company. Accordingly, these experiences could be stored in a management system, which would provide a situational development model. This would then include the use of AI. The author argues that this model of adaptive project management would increase the efficiency and accordingly the accuracy of the decision-making process [64].

In construction, human error is the most common action leading to a negative result. As such, adaptive project management implemented through AI software can provide an optimum tool for increasing project success. A startup in India recently released an AI driven construction management software called Zepth [65]. This AI management software could assist with the provision of adaptive project management through machine learning analysis as the project enters the dynamic phase. Based on the limitations of heuristics, adaptive project management could be elevated with the support of AI and machine learning.

5.2.2. Challenges and Opportunities

In a 2010 review of the research by Gigerenzer, Hilbig argues that heuristics should not be applied to all management strategies, as its reliability is not proven [66]. Further, in a 2022 research article it is noted that heuristics are not appropriate where there are changing goals and cues [67]. Accordingly, and as previously noted, the application of heuristics into decision-making is required to be balanced and used only when there is uncertainty and limited time.

In a 2023 study, a review of the success factors required to properly implement AI into safety management on construction sites was conducted. It was noted in this study that AI can significantly improve overall management as well as safety, but there are gaps in the current research [68]. Furthermore, in a 2023 study by Chang, it was noted that there are also significant hurdles to introducing AI software into company workflows. Notably, the cost of AI software is quite high, while the training curve of employees is also high. While they recommend training programs being required for all levels of the company [69].

Communication and Soft Skills

As AI increases in adoption from project managers and it changes what tasks project managers are required to perform, it will also impact the competencies that productive PMs should have. A 2023 study explored what these skills would be. Accordingly, it was found that skills within leadership and communication, such as integrity, vision, and interpersonal are thought of to be more important when AI is integrated into the

workflow. These skills are notably the most human abilities. As such, the interpersonal requirements and soft skills are thought to be what allows for successful problem solving [70].

It was found in a 2023 report by the BCG, that executives and managers tend to employ AI more than employees lower in the hierarchy [71]. Further noting the requirement of leadership skills within management. In this race to outpace the abilities of AI it is assumed that there will be a continuation of upskilling for workers to ensure their work cannot be entirely completed by AI. In another 2023 study, it is further argued that strong communication and interpersonal skills are required to combat the ethical and bias downfalls of AI [72].

5.2.3. Success Factors

Accordingly, the below success factors can be summarized from the literature review on the role of and tools available to the project manager in uncertain projects:

1. Simplicity, e.g. informed thresholds for rule-of-thumb
2. Mental Shortcuts
3. Understanding uncertainty level
4. Limited information for time limited response
5. Flexibility and open-ended incremental changes
6. Creative working environment
7. Problems addressed early on
8. Avoiding reversals, instead developing alternatives
9. Support through AI and machine learning, training made available
10. Increased importance of leadership and communication skills.

5.2.4. Conclusions

It is often noted that the most mishandled tool of a PM is that of communication. However, while project management in the age of innovation automates the mundane tasks, the tool of communication will only become a more favourable skill of a good project manager. As such, the requirement for successful communication in project

management is expected to only increase. While decision-making based on intuition is the most common form in project management and is often successful when based on expert level experience, it does not allow itself to be a transferable skill and can also be based on biases that are not well understood by the project manager.

Accordingly, adaptive project management offers a method of managing that focuses on the shift of the project from static to dynamic once the construction work begins. AI is shown to have a significant impact on the implementation of adaptive project management due to its nature of being a dynamic machine-learning software. However, what AI lacks is the interpersonal, or more human, skills. Accordingly, communication is one of the most important tools of the project manager and its importance will continue to increase as the use of AI increases. As such, in the use of adaptive project management that may be further supported by AI, project managers should not only ensure that they are able to use the software but use this as an opportunity to enhance their use of appropriate communication and leadership skills within the project.

5.3. ESG and Sustainability: GRESB

With the requirements of adhering to the ESG taxonomy of the EU, companies are required to verify their real estate assets through a 3rd party provider. As GRESB is one of the leading asset benchmarking tools in terms of ESG performance ranking, this graduate research will review the ranking system of GRESB and explore how it can be used to inform the preliminary project plan during the static phase of a real estate development project.

5.3.1. GRESB Real Estate Assessments

GRESB, Global Real Estate Sustainability Benchmarking, is currently a global leader in the benchmarking of ESG within real estate. This service provides ESG ratings and as such best practices, specifically for real estate assets, that is based on industry reports. This type of ESG benchmarking is based on real estate fund and asset level valuations. Accordingly, it provides standardized information to the capital markets to assist with analysis. To date, the GRESB ESG data contains information on

approximately 4.5 trillion USD in assets. It is noted, that although GRESB is an important tool in investment management and ESG ratings, most companies that aim to provide ESG, should also provide ESG metrics beyond that of what is covered in GRESB [73].

GRESB divides the ESG ratings for real estate assets into 3 main components; 1. Management, with 30 points, and 2. Performance, with 70 points, or 3. Development, with 70 points. As the total amount of points possible is out of 100, the asset is either in use, where it would be reviewed under Performance, or the asset is being developed, where it would be reviewed under Development. Furthermore, each component has a differentiating level of E, S, and G. Management contains; 0per cent E, 35per cent S, and 65per cent G, while Performance contains; 89per cent E, 11per cent S, and 0per cent G, respectively, Development contains; 73per cent E, 21per cent S, and 6per cent G. The point provision method is then further broken up into various aspects within the main components, with the most amount of points allocated under the Development components; stakeholder engagement with 15 points, and building certifications with 13 points, and Performance and Development component Energy with 14 points. This can be seen clearly in

Fig. 5. It is important to note that GRESB ranks funds not only in comparison to the points system, but also with each other on a global and regional scale. For example, only the top 20 per cent of funds within the ranking receive a 5-star ranking. The organization argues that this annually improves the threshold for the ESG rating of a fund [43]. Ultimately, for funds to stay competitive with their ESG rating they are then pressured by this ranking system to continually improve their assets to either increase in rankings or remain within the top percentile. Notably, this is aligned with the EU Green Deal that attempts to implement ESG as a upwardly moving target.

Fig. 5 GRESB Real Estate Assessment Point Breakdown Structure [74]

Component	Aspect	# Points	% Component	% Overall Score
Management	Leadership	7	23%	7%
	Policies	4.5	15%	5%
	Reporting	3.5	12%	4%
	Risk Management	5	17%	5%
	Stakeholder Engagement	10	33%	10%
Total		30	100%	30%
Performance	Risk Assessment	9	13%	9%
	Targets	2	3%	2%
	Tenants & Community	11	16%	11%
	Energy	14	20%	14%
	GHG	7	10%	7%
	Water	7	9.5%	7%
	Waste	4	5.5%	4%
	Data Monitoring & Review	5.5	8%	6%
	Building Certifications	10.5	15%	11%
Total		70	100%	70%
Development	ESG Requirements	12	17%	12%
	Materials	6	9%	6%
	Building Certifications	13	19%	13%
	Energy	14	20%	14%
	Water	5	7%	5%
	Waste	5	7%	5%
	Stakeholder Engagement	15	21%	15%
	Total		70	100%

Examples of funds successfully using GRESB

Mandatum plc, a Finnish real estate investment firm, had a fund of theirs reviewed in 2023 by GRESB and received 4 out of 5 stars, which was an increase from the previous year rating of 3 out of 5 stars. The reason for the raise in the rating was equated to management and special focus on environmental impacts, tenant satisfaction, and governance. Substantializing in the form of Green Lease addendums, BREEAM certifications, and energy and water consumption monitoring devices [75].

Specifically, within the residential sector were regional leading funds for the European market in the 2023 GRESB Assessment. This was won by two Dutch investment firms, Altera and Vesteda. Both residential funds not only received 5-star GRESB ratings in 2023 but were leaders within the residential sector within Europe. Both companies notably use GRESB as a KPI for their company targets [76]. Furthermore, both companies also noted using energy and water monitoring devices as a key to ensuring their GRESB scoring. This also coincides with the published EU Taxonomy requirements of water and energy reduction through monitoring.

5.3.2. Challenges and Opportunities of GRESB

In a 2022 paper, GRESB was compared with the ISO 21929-1, which is based on the sustainable development goals set by the United Nations, it was found that GRESB did not address all aspects of the SGDs, whereas the ISO 21929-1 does [77]. However, since this paper was published 2 years ago, the GRESB scoring has since been updated to newer versions of the rating system, and they note that their system is currently aligned with the SDGs. Accordingly, this reinforces the requirement for the EU to provide standardization of the ESG rating providers.

GRESB is quickly gaining in popularity as it becomes the world leader in ESG rankings for real estate funds [78]. Within Europe these high ratings appear to be dominated by the Nordic countries and the Netherlands. Second to the UK, Germany has the highest amount of participation within Europe, however Germany has very few investment funds that top the charts on GRESB ratings [79]. Although this can initially be seen as negative, this can also act as an opportunity for German investment firms to increase their funds GRESB scores before their German counterparts.

In a 2020 report, key criticisms of ESG-led economies are discussed to be; 1. The criteria for ranking with ESG can be contradictory due to the amount of ranking systems available, 2. Non-ESG stocks will be artificially lowered in value, and 3. ESG prioritization over stakeholder opinion can be detrimental and should not be the responsibility of the private sector, rather the public sector [80]. Further to these economic criticisms, in a 2022 study, researchers noted that increasing a company's ethical behaviour has a significantly negative effect on company earnings [81].

5.3.3. The GRESB Process

The below summarizes the various elements that will impact the scoring of the real estate asset when ranked with the GRESB process. It is important to note; 1. Typically there is a 3-month window during the year where GRESB assessments can be applied for yearly, and 2. A pre-submission check is not required but strongly encouraged by GRESB.

1. Management: this section of the review looks at how the company's structure integrates ESG into everyday practice and business strategy. This section is broader and less project specific.
 - a. Leadership: How ESG initiatives are incorporated into the total business strategy. This section reviews public commitments, responsible parties, and communication methods
 - b. Policies: Specific internal ESG policies of the business
 - c. Reporting: How the ESG indicators are communicated with investors
 - d. Risk Management: How the company prevents ESG related risks
 - e. Stakeholder Engagement: How the company engages stakeholders of all levels within the company
2. Performance: this section is relevant for asset management funds to review how well their properties perform with regards to ESG. This section looks at the fund as a whole, as well as asset specific measures.
 - a. Reporting Characteristics: Detailed information of the properties, including floor area and location
 - b. Risk Assessment: How have ESG assessments been performed
 - c. Targets: A confirmation and communication tool for the company's set goals
 - d. Tenants & Community: Reviews the tenant satisfaction and community engagement
 - e. Energy: Reviews energy consumption and efficiency
 - f. GHG: Reviews GHG emissions
 - g. Water: Reviews water consumption and efficiency
 - h. Waste: Reviews wastewater production
 - i. Data Monitoring & Review: Third party review of energy, GHG, water and waste figures
 - j. Building Certifications: Reviews if third party certifications were achieved during construction
3. Development: this section is relevant for asset development funds to review how the development of their properties rank in term of ESG. This section looks at the fund as a whole, as well as asset specific measures. It should be noted that

for the static phase of a development project this section would be the most important to use when preparing the project plan.

- a. Reporting Characteristics: Detailed information of the properties, including floor area and location
- b. ESG Requirements: Effort taken during the design and development to integrate an ESG strategy
- c. Materials: Reviews steps taken to reduce harmful substances and increase the life cycle
- d. Energy: How net-zero energy performance will be achieved
- e. Water: How water conservation is integrated
- f. Waste: How waste will be managed during construction
- g. Building Certification: Reviews if third party certifications will be achieved
- h. Stakeholder Engagement: How the contractor and the community is involved in the development [74]

5.3.4. Success Factors

Accordingly, the below success factors can be summarized from the literature review on the use of GRESB Real Estate Assessment within a real estate investment and development company:

1. Company-wide ESG strategy required
2. Continued, annual use of GRESB rating
3. GRESB as an internal KPI
4. EU-Taxonomy updates monitoring
5. EU ESG 3rd party standardization monitoring
6. Balanced company earnings with ESG ranking

5.3.5. Conclusion

In order for the construction industry to reduce emissions, as required for the EU climate goals, renovation is seen as a key process as it; 1. Reduces waste produced, 2. Reduces new material consumption, and 3. Reuses embodied carbon already stored in the super structure of a building [9] [10] [11]. EU renovation goals and circularity principles for renovation projects fall under the ESG and CSRD, which are

mandated to begin for large companies in the reporting year of 2024, while all companies who perform business within the EU, in the reporting year of 2026 [4].

The goal of these institutional changes is to de-risk the economy from the impacts of climate change and unsustainable environmental, social, and governance practices. Although they aren't without criticism, ESG assessments offer a researched based rating system that can be used as a tool to ensure the sustainability of a renovation project. GRESB Real Estate Assessments offers an approach that not only provides a points-based ranking system, but it also allows the ranking to be an annually moving target, where the best ranking is only received by the top 20 percentile. For the purposes of this dissertation GRESB will be used as the basis for what makes a sustainable project. Moreover, sustainable investing through ESG validated real estate funds can also offer growth potential and will be further discussed in the next section.

5.4. Sustainable Investing: Value-add and Opportunistic

Various methods of investing can be used to achieve sustainability; however, this master's thesis will look specifically at that of value-add and opportunistic investing and its role in the support of renovation projects. As it is discussed in the background building reuse is almost always more sustainable than demolition and newbuild projects. Accordingly, this dissertation will review the dynamics of the interaction between renovation projects and investing that help to achieve not only environmental but also financial sustainability.

5.4.1. Selected Recommendation: Value-Add and Opportunistic Investing

Impact of Leverage

The purchase of an existing building is typically considered a value-add or opportunistic real estate investment, depending on the building condition. Furthermore, the use of leverage tends to be higher for renovation projects, as core investments have the lowest typical leverage amount of 12.28 per cent, value-add of 34.15 per cent, and opportunistic of 57.5 per cent [82].

In a 2013 study it was found that in weak markets the effect of leverage on project profitability is significantly negative. While investment type has an impact on the

amount of leverage used. On average, core funds had the lowest standard deviation in return at 14.05 per cent, and therefore the lowest risk, while value add at 19.85 per cent and opportunistic at 42.84 per cent and therefore the highest risk. It is worth noting that prior to the sub-prime mortgage crisis, both opportunistic and value-add funds earned on average more than double that of core funds, at 14.23 per cent and 13.91 per cent [82].

This was further studied in the 2020 report prepared by Pagliari Jr., where it is shown that the risk and financial burden of borrowing increases as leverage increases. On average the higher the strategy risk, the greater the dispersion in manager-specific returns. For example, in the core funds there was little to no deviation in the index and the returns of a fund, while in opportunistic the standard deviation of the index was 16-33per cent for the returns. Accordingly, investors face increasing deviation in net returns as the risk increases. In other words, they can win more or lose more. In conclusion of this study, it is noted that value-add funds have significantly underachieved in comparison to core funds, when risk-adjusted, between the periods of 1995 – 2012. However, when examining the period post the 2008 financial crisis, opportunistic funds had instances of overperformance of their core counterparts. As such, on a risk adjusted basis, the value-add funds have just barely underperformed the opportunistic, and dramatically underperformed the returns on the core funds [83]. Although the risks of value-add and opportunistic funds are higher than that of core real estate funds, a 2016 study showed that the most impactful factor to a fund's performance is the total vintage years, or how many years have passed since the first influx of capital was received into the fund [84].

Decision making process in Real Estate Investments

Understanding risk management within the decision-making process of sustainable real estate investing can assist with the reduction of ROI deviation within value-add and opportunistic funds. Within the decision-making process of real estate investing are 7 main activities: 1. deciding on decision criteria, 2. recognition, 3. research, 4. analysis of way forward, 5. evaluation, 6. authorization, and 7. decision efficiency. As a PM is not typically authorized to make investment decisions, timely response from general management on the decision is required, and if not, more risk is then allocated

to the project. Accordingly, the speed of the decision-making process must be aligned with the project activities, as speeding up the process should not conflict with the authorisation process. Respectively, the preparation, submission, and approval of the investment decision must all be completed timely, or risk is increased. However, the risk capital of the project and the company's portfolio must be balanced, as risks below the set limit are acceptable, while risks above are a gamble [33].

In the German market, core strategy investing compared with value-add and opportunistic properties typically have a 50per cent lower debt to capital ratio, while the risk and according ROI are also significantly lower. Furthermore, the focus on value-add projects is less geared towards cash-flow management and more towards increasing the value of the asset. Thus, this increased associated risk is required to be supported by practical investment gains. As such, an exit strategy is recommended including risk management and risk minimisation from the leverage effect [49].

5.4.2. Success Factors

Accordingly, the below success factors can be summarized from the literature review on the investment in value-add and opportunistic assets within a real estate investment and development company:

1. Cautious use of leverage
2. Understanding of investment risk and deviation
3. Low total vintage years
4. Timely and accurate investment preparation and decision making
5. Company defined risk tolerance limit

5.4.3. Conclusion

The use of leverage can negatively impact a project when the market is down, as well as increase the risk, which in turn increases the deviation in ROI. This deviation is a risk factor that can be either an increase or decrease in the profit produced from the fund. When managed properly this risk can support an increase in the profitability of the fund or investment asset.

6. Results of the Literature Review

The adaptive reuse of office buildings into residential developments poses a significant potential benefit to the housing demand in Germany as well as potential profit for the real estate owners. While the security of this profit is greatly dependent on uncertainty factors that are both managerial, technical, and property specific, the management of this uncertainty is required to ensure success. Current management strategies do not provide the adaptive and dynamic nature that is required to manage uncertainty, as such adaptive project management that is based on informed decision-making capabilities provides a good starting point for the management of uncertainty.

Furthermore, as technology and AI continue to advance, the required skills of the project manager in the near future appear to be shifting more towards that of interpersonal and communicative soft skills. Accordingly, an adaptive project manager, as well as company strategist, would then possess this ability to adapt to the evolving environment and provide the required leadership to guide the project and real estate development company towards success.

While on a larger company strategic scale, ESG and sustainable investing provide static methods to ensure growth targets are met. In order to ensure that the project and fund reaches the set ESG targets, the GRESB ranking system provides a clear static sustainability-management method of controlling as well as continuous improvement measures. While the management of financial risk in value-add and opportunistic investment methods provides the company wide strategy for economic growth.

To build upon the relationship diagram of TABLE I the discovered success factors of each theme, that were summarized at the end of each section, are applied. TABLE III displays how these relationships help to support the success factors of the four topics, with the ultimate goal of providing a successful project as defined in TABLE II.

The use of the four themes to inform and ensure a project meets this success criterion can be further divided into how a company organizes themselves as well as a specific project. Accordingly, adaptive Reuse is attributed to the specifics of a project, while value-add and opportunistic investing is related to the financial management and

acquisition strategy. Adaptive project management would then be the style used by the project manager assigned to the project and fund organization, while GRESB is best used to inform the overall company strategy.

TABLE III
RELATIONSHIP TABLE:
Displaying how the main themes support each-other in terms of company organization

Project Specific Strategy			General Management Strategy		
Renovation			Sustainable Investing		
Adaptive Reuse			Value-add & Opportunistic Investing		
Supported through Adaptive PM	Supported through GRESB Real Estate Assessments	Supported through Value-add & Opportunistic Investing	Success Factors Supported through Adaptive PM	Supported through GRESB Real Estate Assessments	Supported through Adaptive Reuse
<ul style="list-style-type: none"> • Façade quality • Construction firms with experience in conversions • Balconies 	<ul style="list-style-type: none"> • Government support in regulation (office vacancy policy and building code) • Empty building 	<ul style="list-style-type: none"> • Adaptable floor plan and ceiling height • Location (central, residential, or downtown edge) • Date of original construction • Market forecasting • Cultural significance 	<ul style="list-style-type: none"> • Cautious use of leverage • Timely and accurate investment preparation and decision making 	<ul style="list-style-type: none"> • Understanding of investment risk and deviation • Company defined risk tolerance limit 	<ul style="list-style-type: none"> • Low total vintage years
<ul style="list-style-type: none"> • Simplicity, e.g. analytical control method/informed rule-of-thumb • Mental Shortcuts • Problems addressed early on 	<ul style="list-style-type: none"> • Understanding uncertainty level • Limited information for time limited response • Creative working environment • Increased importance of leadership and communication skills. 	<ul style="list-style-type: none"> • Flexibility and open-ended incremental changes • Avoiding reversals, instead developing alternatives • Support through AI and machine learning, training made available 	<ul style="list-style-type: none"> • EU-Taxonomy updates monitoring 	<ul style="list-style-type: none"> • GRESB as an internal KPI • Balanced company earnings with ESG ranking • Company-wide ESG strategy required • EU ESG 3rd party standardization monitoring 	<ul style="list-style-type: none"> • Continued, annual use of GRESB rating
Supported through Adaptive Reuse	Supported through Value-add & Opportunistic Investing	Supported through GRESB	Supported through Adaptive Reuse	Supported through Value-add & Opportunistic Investing	Supported through Adaptive Project Management
Adaptive Project Management			GRESB Real Estate Assessment		
Project Management			ESG & Sustainability		
Project Specific & General Management Strategy			General Management Strategy		

Interestingly, the majority of the success factors for an adaptive Reuse project are determined at the investment stage of the project, allowing the project management to influence less than a 3rd of the success factors. With regards to value-add and

opportunistic investing, adaptive project management can support the use of leverage and investment preparation in company-wide measures, while a focus on adaptive reuse projects allows for low vintage years due to the speed at which these projects can be executed.

For adaptive project management, support from experience of past adaptive Reuse projects and general management strategies of uncertainty and risk from typical value-add methods can be used to guide the project during the dynamic phase, while GRESB can be used to build the project plan in the static phase. Provision of well rated GRESB assets and funds is supported through the reduced CO₂ emissions of adaptive-reuse projects which will continue to grow in importance as the EU-Taxonomy is further defined and refined. Companywide sustainable investment strategies currently support one third of the GRESB rating, while adaptive project management allows for the continued achievement of the constantly increasing GRESB ranking.

Furthermore, this acknowledgement of the relationship between the themes as either project specific or general management strategies can be used to manage the constraints of adaptive Reuse projects. Accordingly, TABLE IV below discusses which of the four themes reviewed in this graduate paper can be used to effectively control the typical constraints of an adaptive Reuse project in Germany based on the findings of the literature review. These constraints are potential risks for adaptive Reuse projects, and the control of such risk is paramount to the success of a single project, but as discussed in the literature review should be further coordinated into the large business strategy of a company on how adaptive Reuse projects are to be generally managed.

Notably, in this chart the asset conditions and adaptive project management themes provide the most impact, followed by value-add and opportunistic investing, and finally GRESB. This is not surprising based on the findings in TABLE I, TABLE II, and TABLE III. As previously noted, an ESG ranking and sustainable investing are used to address regulatory factors and have broader business implications, while renovation and project management are focused on market-driven factors. Accordingly, these correlations are again displayed in TABLE IV.

TABLE IV
RELATIONSHIP TABLE:
Management of Adaptive Reuse Constraints

Adaptive Reuse Project Constraints	Managed through:			
	Project Specific Strategy		General Management Strategy	
	Adaptive Reuse	Project Management	ESG	Sustainable Investing
	Asset Conditions	Adaptive PM	GRESB	Value-add & Opportunistic
Policy				
1. Lack of government regulatory support			X	
2. Government funding		X		
3. Acoustic rating	X			
4. Fire code and emergency exits	X			
5. Accessibility	X			
6. Energy efficiency	X			
Financial				
1. Construction firms with experience in conversions		X		
2. Market forecasting		X		
3. Increased asset value				X
4. Uncertainty and risks		X		
5. Maintenance costs		X		
6. Loans secured through private equity				X
7. Sustainability and affordability			X	
8. Office and residential experience		X		

Furthermore, to summarize the findings of the literature review, the interplay between the success factors of the four themes in this graduate research have been graphically represented in TABLE V below. The impacts that success factors have on factors within the same theme is unsurprisingly similar. Within adaptive Reuse the vast majority of interrelations are heavily dependent on the situation, as these factors are all technical in nature and, accordingly, heavily reliant on the existing conditions of the asset. While value-add and opportunistic interrelations are mainly positive. The outlier

of this similarity effect of the interrelationships within the same theme is that of APM and GRESB. Within both APM and GRESB the types of relations are relatively equally distributed between the success factors, with an even amount of positive, negative, and situation-based relations.

The success factor with the highest number of positive interrelationships is that of Communication. This is relatively unsurprising as the negative impacts of poor communication are cited often in the literature. The second and third success factors with the most positive interrelationships are Uncertainty Level Understood and Informed Rule of Thumb. This illustrates the importance of understanding and managing risk as well as the impact that informed, yet simple, decision-making methods can impact the success of a project as well as the company. Furthermore, it is worth noting that all three of the most influential success factors are within the theme of APM, reinforcing the importance and impact that management strategies have. Alternatively, the success factor with the greatest number of negative interrelations is Info. Limit followed by Taxonomy Update.

Concurrently, although a limit of information is a success factor for time sensitive decision making, there is an inherent risk when information, that situationally may be important, is not included. Similarly, the negative correlation for taxonomy updates is unsurprising as a fundamental goal of the EU's ESG theory is to continually increase and revise the requirements and, in line with the literature review, criticisms of the ESG ranking system is that this lack of a concrete definition increases uncertainty and risk. However, it is worth noting that throughout all the themes negative correlations were less than half of that of positive.

The success factors with the highest number of situation-based interrelations, meaning that they could have either positive or negative impacts depending on scenario conditions, were Mental Shortcut, follow by Balanced Earnings and Heritage. It is the author's opinion that this conditional ranking for Mental Shortcut is due to the common criticisms of heuristics having too much reliance on a bias as noted in the literature review. While the majority of these ratings for Balanced Earnings was mainly due to the adaptive Reuse factors, this can also be due to the fact that these factors are heavily variant and depend on the condition of the asset, ultimately determining if the

ESG measures taken can also be financially viable for the real estate development company. Moreover, Heritage, as noted in the literature review, is a success factor that needs to be carefully applied due to the large number of regulatory limitations that heritage buildings face.

Finally, the success factors with the least number of interrelations are Vacancy, followed by Location and 3rd Party Monitored. Accordingly, these success factors can theoretically be managed without many secondary impacts on other factors. While the greatest number of interrelations was Informed Rule of Thumb, followed by Mental Shortcut, Communication, Taxonomy Update, Risk Deviation, and Company-wide Risk. Contrary, these factors should be managed with the awareness of their potential impacts on the other factors. This result of the interrelationship between the success factor can be seen in detail below in TABLE VI, where the total amount of interrelations is tabulated.

TABLE V
RELATIONSHIP TABLE: Interrelationships between the Determined Success Factors

			Project Specific									Project Specific & Company Wide									Company Wide						Company Wide								
			Renovation									Project Management									ESG & Sustainability						Sustainable Investing								
			Adaptive Reuse (Asset Condition)									Adaptive Project Management									GRESB						Value-Add & Opportunistic								
			Floorplan	Facade	Location	Balconies	Vacancy	Materials	Structure	Heritage	Daylight &	Informed Rule of	Mental Shortcut	Uncertainty Level	Info-Limit	Open-ended	Creative	Early Addressed	Limited Reversals	AI Workflow	Communication	Company-wide	Continued use	Internal KPI	Taxonomy Updates	3 rd Party Monitor	Balance	Limited Leverage	Risk & Deviation	Low Vintage Years	Time / Accuracy	Company-wide risk			
Project Specific	Renovation	Adaptive Reuse (Asset Condition)	Floorplan	/	/	/	/	/	/	+	/	+	-	-			/	+	+	+	+	/	/	/	/	+	/	/	/	/					
			Facade		/		/	/	/	/	+	/	+	-	+		+			+	+	+	+	/	/	/	/	+	+		/				
			Location				-	/		/	+	/	+	-				/	+	/						/	/	+			/				
			Balconies					/	-	/	+	/	+	-	+	/	+			+	+	+	+	/	/	/	/	+	+		/				
			Vacancy									+	/		-		/	+			+	/					/	/	+	+		+			
			Materials									/	/	+	-	+	/	+			+	+	+	+	/	/	/	/	+	+		+			
			Structure							/	/	+	/	+	-	/	/	+			+	+	+	+	/	/	/	/	+	+		+			
			Heritage								/	/	/	/	-	/	/					+	+	/	/	/	/	/	/			/			
Project Specific & Company Wide	Project Management	Adaptive Project Management	Daylight & View							+	/	+	-	+	+	/	/	+	+	+	+	+	/	/	/	/	+	+	+	-					
			Informed Rule Thumb									-	/	+	/	+	+	+	+	/	/	-	-	/	-	/	+	/	+	+	-				
			Mental Shortcut										/	+	/	-	/	/	+	/	/	-	/	-		+	/	+	/	+	-				
			Uncertainty Level Understood											-	/	+	+	+	+	/	/			+	+	+	+	+	+	+	+				
			Info-Limit												+	/	-	-	-	/					-	-	-	-	-	+	+				
			Open-ended													+	/	-	-	/					+	-	/	/	/	/	/				
			Creative															/	-	/	/	+	+	+	+	/	/								
			Early Addressed															+	+	+	+	+			/						-				
			Limited Reversals																-	+	+	+	-	/	-	/	+	+	-	+	+	/			
			AI Workflow																		/	/	+	+	/		+	+	+		/	/			
			Communication																			+	+	+	+	+	+	+	+		-	+			
			Company Wide	ESG & Sustainability	GRESB	Company-wide																		+	+	-	+	/	/	/	/	-	+		
						Continued Use																					/	/	+	/	-	-	-	-	/
						Internal KPI																						/	/	-	-	-	-	-	+
Taxonomy Updates																										+	-	-	-	-	-	-			
3 rd Party Monitor																											-	-	-	-	-	+			
Balanced Earnout																												+	+	+	/	+			
Company Wide	Sustainable Investing	Value-Add & Opportunistic	Limited Leverage																							+	+			+					
			Risk & Deviation																									+	/		+				
			Low Vintage Years																											/		+			
			Time/Accuracy																													/			
			Company-wide																													/			

LEGEND: + = positively - = negatively / = situation dependent. See the appendices for table terminology

TABLE VI
Interrelationship Type: Tabulated Result

	Success Factor	Interrelationship Type				
		+	-	/	Any	NULL
Adaptive Reuse	Floorplan	7	2	11	20	9
	Facade	10	1	10	21	8
	Location	4	2	7	13	16
	Balconies	7	2	11	20	9
	Vacancy	6	2	4	12	17
	Materials	10	1	7	18	11
	Structure	7	1	10	18	11
	Heritage	2	2	15	19	10
Daylight & Vent.	11	1	11	23	7	
Adaptive Project Management	Informed Rule of Thumb	15	5	9	29	0
	Mental Shortcut	5	5	17	27	1
	Uncertainty Level Understood	17	2	6	25	4
	Info. Limit	5	17	2	24	6
	Open-ended	7	5	12	24	5
	Creative	6	1	12	19	10
	Early Addressed	12	2	3	17	12
	Limited Reversals	9	6	6	21	8
	AI Workflow	9	3	8	20	9
	Communication	19	1	7	27	2
GRESB	Company-wide	13	3	10	26	3
	Continued Use	11	7	4	22	7
	Internal KPI	9	6	6	21	7
	Taxonomy Updates	5	10	12	27	2
	3rd Pary Monitored	6	7	2	15	14
	Balanced Earnings	9	3	15	27	2
Value-add & Opportunistic	Limited Leverage	9	5	3	17	12
	Risk & Deviation	14	7	6	27	2
	Low Vintage Years	12	5	5	22	7
	Time/Accuracy	5	7	6	18	11
	Company-wide risk	13	3	11	27	2
	TOTAL	274	124	248	646	224

LEGEND: + = positively - = negatively / = situation dependent

*See Appendix A below for table terminology

7. Triangulating the Literature Review Results

This section attempts to apply the results of the literature review to a case study and use a case study as an exemplar during the interview process. This primary research provides a verification of the secondary research.

7.1. Case Study: Zinnowitzer Str. 8, Berlin, Germany, 10115

The adaptive reuse success factors determined in the literature review are that of technical asset condition for the adaptive Reuse of office buildings into residential, they can accordingly also be used as a selection criterion for determining the success of an investment in such an asset. As such this section will discuss the reasoning for the selection of the case study Zinnowitzer Str. 8 in Berlin, Germany, after which it is applied to the interview process. All supportive materials and site images can be found in Appendix B below.

Floorplan:

The floorplan is rectangular in shape with a consistent depth of 8 meters and an average distance between the columns of 3.7 meters. The stair wells are located on the south-east, centre, and west ends of the corridors. The ceiling height is not confirmed, but based on Google Earth is assumed to be 3.0 meters. The area of the property is 2,340m², while the average GFZ for this mixed-use zoned area is 3.5 which would allow for a total of approximately 8,190m² of above-grade floorspace, not including an attic level. Accordingly, the floorspace of the building is approximately 1,200 m² with 5 above-grade floors, equalling 6,000m². While the courtyard has an approximated area of 1,140m², which could support the build out of 2,190m² of above-grade floorspace. As such it is also possible to densify this property.

Façade:

The building orientation is north south, with the street facing façade facing north, and courtyard façade facing south. The condition of the façade cannot accurately be

determined without a due diligence report, however based on site photos the façade does not appear to have damages.

Location:

The location of the building is in the neighbourhood called Mitte and is extremely central to the City of Berlin. The block of the building is located on the U6 subway line at the Naturkundenmuseum station. The site is also a 15-minute walk to the Berlin Central Train Station. Accordingly, there are museums nearby, as well as parks and a new development neighbourhood called Europa City, where many grocery stores, restaurants, office buildings, and new parks are located.

Balconies:

The floorplan and building orientation and heritage aspect appear to support south facing balconies within the courtyard. The exact location and structural aspects of the balconies cannot be confirmed without a certified technical inspection.

Vacancy:

Based on the office lease advertisement for this building, the top two floors appear to have no current tenants, totalling an existing area of approximately 2,400m² that could be converted to residential units. With an average 2 room unit in Berlin being 60m², these two levels, could potentially equal 35 residential units, subtracting common use hallways, stairwells, and elevator shafts. Notably, this is not including any densification of the courtyard or the attic floorspace. Furthermore, as this area is zoned as mixed-use, a rezoning permit is not required for the use of this building as residential.

Materials:

Without a technical due diligence inspection, it is not possible to determine whether hazardous materials are currently within the building requiring removal.

Structure:

Without a technical due diligence inspection, it is not possible to determine whether the building structure could allow for additional storeys, however the build out of the attic level is more than likely to be easily achieved.

Heritage:

The asset is legally recognized by the state of Berlin as a heritage building, which has specific regulations as to the aesthetic and physical appearance of the building, mainly the street facing façade.

Daylight and Ven:

As the floorplan is rectangular in shape and does not have core stair wells, the units would not allow for a direct north-south manual ventilation. As such mechanical ventilation may be required for the conversion of the building. Daylight access is assumed optimal for the units along the south façade, while the north façade would most likely receive only the required minimum.

Additional Information:

It is worth noting that this property does not have a B-Plan and its height is as such zoned as per paragraph 34 of the German building code.

7.2. List of Interviewees

A list of interviewees including authorized personal information is illustrated in the TABLE VII below. Notably, interviewee number 3 was unable to attend the second interview round completed on 21.05.2024.

TABLE VII
List of Interviewees

No.	Date of Interviews	Professional Title of Interviewee	Type of Office of Employment	Location of Professional Experience
1	16.03.& 21.05.2024	Development Project Manager	Real Estate Trade Developer	Hamburg, Germany
2	15.04.& 21.05.2024	Architect	Architectural Firm	Munich, Germany
3	19.04.2024	Consulting Architect	Architectural Consultancy	Munich, Germany
4	20.04.& 21.05.2024	Project Management Consultant	AEC Firm	Denver, Colorado, USA
5	27.04.& 21.05.2024	Managing Director	Real Estate Consultancy	Berlin, Germany

7.3. Selection of Interrelations to be Triangulated in 1st Interview Round

Due to the limitations of this dissertation, not all interrelations can be further explored. Accordingly, four success factors have been selected due to the fact that they are outliers within the results of TABLE V and TABLE VI.

As such, Communication has the highest number of positive interrelationships, Information Limit has the highest negative relations, and Mental Shortcut has the highest amount of situational dependent relations. While Informed Rule of Thumb has the most relations of any kind. These have been summarized in the TABLE VIII below. Each success factor is reviewed in-terms of its impact with one factor from the other categories. Notably, all the highest-ranking success factors are from the project management theme and are accordingly further explored with success factors from GRESB, Value-Add and Opportunistic, and Adaptive Reuse. Each of these high-ranking success factors and their selected interrelations with the other themes are reviewed further through a series of interviews, in order to triangulate the results from the literature review

TABLE VIII
Success Factors and Interrelationships to be Further Explored

Highest Ranking Success Factors		Interrelationships		
Project Management		ESG & Sustainability	Sustainable Investing	Renovation
Adaptive Management	Project Interrelationship Result	GRESB	Value-Add & Opportunistic	Adaptive Reuse
Communication	+	Company-Wide	Limited Leverage	Location
Info. Limit	-	Taxonomy Update	Low Vintage Years	Materials
Mental Shortcut	/	Balanced Earnings	Risk & Deviation	Heritage
Informed Rule of Thumb	Any	Internal KPI (-)	Company-wide Risk (/)	Floorplan (+)

7.4. Results of the 1st Interview Round

This section will summarize the results of each of the five first-round interviews, comparing them to one another and finally to the results of the literature review. The results begin with the asset condition success factors and are discussed in detail for this exemplar case study. The reader is reminded that terminology is provided in the Appendix A below. The list questions provided to the interviewees in the 1st interview round can be found in the Appendix C below.

7.4.1. Adaptive Reuse Asset Condition Success Factors: Office to Residential

The heritage success factor was mentioned, by four out of five interviewees, as conflicting with the success of the project, as it adds complexity to the project. One interviewee further argued that a heritage building should only be converted when the goal is high-end residential. This respondent noted that, because of the heritage status, there would be an increase in bureaucracy and authorities involved and the project would have an increased risk. Consequently, requiring a rebalance of the time, cost, and quality triangle. While three out of five of the interviewees mentioned a concern about the heritage designation and the success factor Balconies. This negative impact the balconies and the heritage designation have on one another is also aligned with the literature review results shown on TABLE V. However, these same interviewees noted that the courtyard façade for this case study is likely not under heritage protection, due to the external insulation and plaster finish, as well as being a better location for the balconies, supporting a situation dependent relationship between the

balcony and heritage success factors. Furthermore, two out of five interviewees noted that a floor addition can also conflict with the heritage designation. While one of these interviewees mentioned that this can typically be managed through a setback for the additional floors. This is in line with the literature review results as the interrelation between Heritage and Floorplan, and Heritage and Superstructure are both situation-dependent.

Interestingly, two out of five interviewees mentioned ceiling heights and MEP having more importance than other factors. Similarly, these two interviewees further noted that the ventilation of this case study would likely need to be mechanical. While all five interviewees noted that the daylight success factor was the most important to the success of the conversion, due to the orientation of the building. While further noting that this case study was of optimal orientation, north-south. As the courtyard façade faces south, it would support balcony placement. These qualitative results have been quantified in TABLE IX below.

TABLE IX
Asset Condition Success Factors: Resulting Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Post-Interview Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor	Result	Interrelation
		0.20		1 person = 0.16		
Heritage and Balconies	Negative (-)	0.20	Negative (-)	3 x 0.16=0.48	0.68	Negative (-)
			Situation Dependent (/)	3 x 0.16=0.48	0.48	Situation Dependent (/)
Balconies and Daylight	Null	0.20			0.20	Null
			Situation Dependent (/)	4 x 0.16=0.64	0.64	Situation Dependent (/)
Heritage and Superstructure	Null	0.20			0.20	Null
			Situation Dependent (/)	2 x 0.16=0.32	0.32	Situation Dependent (/)

Asset condition success factors not listed here had no conflicting results with the literature review

In accordance with TABLE IX the interrelationship between Balconies and Daylight, as well as Heritage and Superstructure, changed from null to situation-dependent. All other interrelationships, including that of Heritage and Balconies, remained as per the literature review results.

From the interviews three interviewees would include additional success factors with regards to the asset condition selection criteria. Two interviewees recommended the inclusion of minimized common spaces, for example the hallways and stairwells. Since these areas do not provide rental income. While one interviewee recommended the

addition of the current fire code of the building as an asset condition success factor, and another recommended the inclusion of the current energy consumption rating.

7.4.2. Project Management Success Factor: Communication

As previously mentioned, the review of all interrelations of the communication success factor is not within the scope of this dissertation. In accordance with TABLE VIII this portion of the interviews reviewed the interrelation Communication has with; 1. Companywide GRESB, 2. Limited leverage, and 3. Location. According to the literature review these interrelations were all found to be positive.

Within the realm of the theoretical case study of Zinnowitzerstr. 8, respondents were asked to analyse the skills a project manager would use in a scenario, where an element to reach the ESG goals was forgotten in the tendering stage of a project, as well as how this could have been avoided. Three out of five of the respondents noted the relationship the project manager has to the contractor plays a significant role, as they need to work together to meet the goals of the project and include this ESG element. Notably, another three out of five interviewees mentioned that they may be inclined to leave out the ESG element or replace it with another element that is, construction-wise, easier to implement at later stages of the construction. They all noted that this would depend on the project stage. Two out of five respondents noted that a secondary workflow would be required to implement this ESG element.

When posed with a scenario where the project manager must appease the project budget limits to ensure the project has a limited use of leverage, respondents were asked how they would manage the contractor in order to provide for the project goals. Three out of five of the respondents noted that the project manager would require negotiation skills to meet the project goals inclusive of the limited use of leverage. While one out of these three mentioned that verbal negotiations would further lead to less changes to the project. While four out of five noted that the project manager would have to decrease an element of the time-cost-quality triangle, all three mentioned that when the quality is decreased by too much this would negatively impact the project goals. For example, in terms of securing the planned rental income. While if the time

is increased by too much the income generated from rent would be delayed, further increasing the use of leverage beyond the set limit.

When posed with a scenario regarding the management of community stakeholders who are protesting the project, respondents were asked how they would suggest a project manager move forward with the project. All five of the respondents noted that the communication with the community was required. Furthermore, they noted that the community needs to feel a sense of trust and honesty with the project manager and the proposed project. While one respondent mentioned that this communication needs to be done carefully to ensure that the project manager steers the community stakeholders towards his/her interests. None of the interviewees mentioned this management of the stakeholders having a negative impact. Thus, in accordance with TABLE X below the three interrelations explored under that of Communication remained positive.

TABLE X
Communication: Resulting Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Post-Interview Result	
	Interrelation	Weight Factor 0.20	Interrelation	Weight Factor 1 person = 0.16	Result	Interrelation
Communication and Company-Wide GRESB	Positive (+)	0.20	Positive (+)	3 x 0.16=0.48	0.68	Positive (+)
			Situation Dependent (/)	3 x 0.16=0.48	0.48	Situation Dependent (/)
			Null	2 x 0.16=0.32	0.32	Null
Communication and Limited Leverage	Positive (+)	0.20	Positive (+)	3 x 0.16=0.48	0.68	Positive (+)
			Null	4 x 0.16=0.64	0.64	Null
Communication and Location	Positive (+)	0.20	Positive (+)	5 x 0.16=0.80	1.00	Positive (+)

7.4.3. Project Management Success Factor: Information Limit

In accordance with TABLE VIII this portion of the interviews reviewed the interrelation an Information Limit has with; 1. Taxonomy Updates, 2. Lower Vintage Years, and 3. Material. According to the literature review these interrelations were all found to be negative.

When faced with a scenario of the EU releasing a new taxonomy update within the design phase and the project manager being unaware of this update, respondents were asked how this impacted the project, what they would suggest, and if there could be a positive outcome. Three out of five respondents noted that this would severely impact the market value of the project, creating a negative effect, while one out of these three respondents mentioned that, in a project of this size, this is out of the control of the project manager, and would likely be the responsibility of the ESG team. While two respondents noted that the problem could be solved with less intrusive, day-two installations. For example, the addition of non-fixed items, such as appliances. However, two respondents noted that the situation could be positive as there could be a large amount of hesitation from other developers, leading to an opportunity in the market.

The following question was a continuation of the previous scenario, where the loan for the project is extended, leading to additional vintage years on the loan. Respondents were asked what this meant for the project and the project manager. All five of the respondents noted that this would lead to increased costs and accordingly increased risks for the project. Furthermore, two respondents noted that there will also be a loss in rental income, while one of the two mentioned that this would be market dependent. Two respondents noted that this is outside the scope of a project manager's influence, with one mentioning that it would depend on the exit and financial strategy for the project.

When faced with a scenario where hazardous materials are found on site, respondents were asked what the impact to the project would be, to explain what they would have done differently, and if there could be a positive impact. Four out of five of the respondents noted that they thought the impact was extremely negative to the project and recommended that a technical due diligence be performed, as the upfront cost would be far less, than the last-minute, clean-up costs. While one of these four mentioned that if a 3rd party project manager is used, it should also be referred to in their contract. Two out of the four respondents, although they noted that the impact was predominately negative, noted that it would be better to find the problem before the construction is completed, than having to remobilize and start construction post

tenant move-in. These qualitative results have been quantified in TABLE XI below. Accordingly, the three interrelations explored under that of Information Limit remained negative.

TABLE XI
Information Limit: Resulting Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Post-Interview Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor 1 person = 0.16	Result	Interrelation
Information Limit and Taxonomy Update	Negative (-)	0.20	Negative (-)	$3 \times 0.16 = 0.48$	0.68	Negative (-)
			Situation Dependent (/)	$2 \times 0.16 = 0.32$	0.32	Situation Dependent (/)
			Positive (+)	$2 \times 0.16 = 0.32$	0.32	Positive (+)
Information Limit and Low Vintage Years	Negative (-)	0.20	Negative (-)	$3 \times 0.16 = 0.48$	0.68	Negative (-)
			Situation Dependent (/)	$3 \times 0.16 = 0.48$	0.48	Situation Dependent (/)
			Null	$2 \times 0.16 = 0.32$	0.32	Null
Information Limit and Materials*	Negative (-)	0.20	Negative (-)	$4 \times 0.16 = 0.64$	0.84	Negative (-)
			Positive (+)	$2 \times 0.16 = 0.32$	0.32	Positive (+)
			Situation Dependent (/)	$1 \times 0.16 = 0.16$	0.16	Situation Dependent (/)

*only 4 out of 5 respondents answered

7.4.4. Project Management Success Factor: Mental Shortcut

In accordance with TABLE VIII this portion of the interviews reviewed the interrelation a mental shortcut has with; 1. Balanced Earnings, 2. Risk & Deviation, and 3. Heritage. According to the literature review these interrelations were all found to be situation dependent.

When asked, with regards to a scenario where the project manager had a good previous experience with a contractor who has experience on ESG rated projects, but has a high bid, what they recommended the project manager do to balance ESG performance and project costs, four out of five respondents referred to the professional relationship between the project manager and the contractor as having a positive effect on the project goals. One of the four further argued that the upfront costs most likely out weight the cost of securing a cheaper bid. While one of the four mentioned there is a limit to this relationship, and the other mentioned that a large price difference should raise some concern for the project manager.

When faced with a scenario where the project manager assumes additional financing is able to be acquired based on a previous experience, respondents were asked if this increased or decreased the project risk. Three out of the five respondents noted that this experience would likely decrease the risk in the project, creating a positive effect. With two of the three respondents noting that the accuracy in the decision-making is increased, and one noting that it is best to know about the risk as early as possible.

Faced with a scenario of a project manager that refuses a project that has heritage status, based on a negative previous experience, respondents were asked if they agreed with the project manager's decision. Two out of the five interviewees agreed with the decision made by the project manager, with one of the two noting that it would depend on the negotiations that would take place with the city representative and what heritage protection measures can be mediated. Two out of the five interviewees disagreed, noting that the experience of one project manager is not enough information. While one respondent argued that this is not within the decision-making power of the project manager, rather the boss of the project manager. These qualitative results have been quantified in TABLE XII below. Notably, one interrelationship explored under that of Mental Shortcut remained situation dependent, the remaining two, Balanced Earnings and Risk & Deviation changed to positive.

TABLE XII
Mental Shortcut: Resulting Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Post-Interview Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor	Result	Interrelation
		0.20		1 person = 0.16		
Mental Shortcut and Balanced Earnings*	Situation Dependent (/)	0.20	Situation Dependent (/)	2 x 0.16=0.32	0.52	Situation Dependent (/)
			Positive (+)	4 x 0.16=0.64	0.64	Positive (+)
Mental Shortcut and Risk & Deviation*	Situation Dependent (/)	0.20	Situation Dependent (/)	1 x 0.16=0.16	0.36	Situation Dependent (/)
			Positive (+)	3 x 0.16=0.48	0.48	Positive (+)
Mental Shortcut and Heritage	Situation Dependent (/)	0.20	Situation Dependent (/)	2 x 0.16=0.32	0.52	Situation Dependent (/)
			Positive (+)	2 x 0.16=0.32	0.32	Positive (+)
			Null	1 x 0.16=0.16	0.16	Null

*only 4 out of 5 respondents answered

7.4.5. Project Management Success Factor: Informed Rule of Thumb

In accordance with TABLE VIII this portion of the interviews reviewed the interrelation the informed rule of thumb method has with; 1. Internal KPIs, 2. Company-wide Risk,

and 3. Floorplans. According to the literature review these interrelations were found to be negative for the Internal KPI, situation dependent for the Company-wide Risk, and positive for the Floorplans.

Respondents were presented with the scenario of a project manager disregarding the new company KPIs, as based on his/her own experience the KPIs were incorrect. Respondents were asked to agree or disagree with the actions of the project manager. Three out of the five respondents disagreed with the project manager's decision, with one of the four noting that it would depend on the alignment of the project goals and the KPI goals, while another of the four noted that the company would be required to communicate this to the employees and offer training. One respondent argued that it is situational dependent, noting that if the KPIs are not realistic they may not be reachable, however the project manager should be required to provide reasoning.

When faced with a scenario, where a company implements a risk tolerance zone, but the project manager is accustomed to and continues to make decisions based on previous experience, interviewees were asked if they thought this was acceptable. Two out of the five respondents thought that this would be acceptable depending on the situation, with one noting that if there is a divergence from the project goals and the risk variance than this should be communicated, while the other noted that it would be dependent on the size of the risk. While two respondents argued that this is unacceptable, as it doesn't support the project goals, when the risk variance is not supported.

When faced with a scenario regarding a project manager who assumes a project will be successful as the floorplan is similar to a previous project, respondents were asked if they disagreed or agreed with the project manager. All five of the respondents agreed with the project manager's decision. Two respondents noted that the quick analysis with rough calculations supported by previous experience can provide a good standpoint for decision making. Two other respondents noted that in general the conversion from office to residential is fairly simple and in most cases, they support one another, while one of these two further recommended to use the previous project as a reference and provide it to the planning team. While one respondent also argued that the more similar a floorplan is, the more likely it is that this relationship would be

positive. These qualitative results have been quantified in TABLE XIII below. Accordingly, the three interrelations explored under that of Informed Rule of Thumb remained as per the literature review results.

TABLE XIII
Informed Rule of Thumb: Resulting Changes to Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Post-Interview Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor 1 person =	Result	Interrelation
		0.20		0.16		
Rule of Thumb and Internal KPI*	Negative (-)	0.20	Negative (-)	$3 \times 0.16=0.48$	0.68	Negative (-)
			Situation Dependent (/)	$2 \times 0.16=0.32$	0.32	Situation Dependent (/)
Rule of Thumb and Company-Wide Risk*	Situation Dependent (/)	0.20	Situation Dependent (/)	$2 \times 0.16=0.32$	0.52	Situation Dependent (/)
			Positive (+)	$2 \times 0.16=0.32$	0.32	Positive (+)
			Negative (-)	$1 \times 0.16=0.16$	0.16	Negative (-)
Rule of Thumb and Floorplan*	Positive (+)	0.20	Positive (+)	$4 \times 0.16=0.64$	0.84	Positive (+)

*only 4 out of 5 respondents answered

7.4.6. Conclusions of the Interview Results

The results of the review of the asset conditions from TABLE IX are summarized in TABLE XIV below. Notably, two interrelations changed from the results of the literature review. These are that of Daylight & Ventilation and Balconies, and Structure and Heritage. From the results of the literature review, these two interrelations were noted as being null, or having little to no impact on each other. However, the results post-interview showed that these two interrelations exist and have a situation-dependent impact on each other. Furthermore, this increases the total amount of situation-dependent interrelations from 15 to 17, indicating that the majority of interrelations between the adaptive reuse success factors are situation-dependent. What is not shown on this table is the three suggested additional success factors, suggested by the interviewees. These are; 1. Minimized Common Spaces, 2. Fire Code Rating, and 3. Energy Consumption Rating. These are not shown, as there was no data collected with regard to the interrelation between these additional success factors and the current success factors.

TABLE XIV
Interrelationship Table (Asset Condition only): Updated per post-Interview Results

			Renovation								
			Adaptive Reuse								
			Floorplan	Facade	Location	Balconies	Vacancy	Materials	Structure	Heritage	Daylight & Vent *
Renovation	Adaptive Reuse	Floorplan		/		/			/	/	/
		Facade				/		/	/	/	/
		Location					-	/		/	
		Balconies							/	-	/*
		Vacancy									
		Materials									
		Structure								/*	/
		Heritage									/
		Daylight & Vent									

*= change post-interview

While the results from TABLE VII, TABLE IX, TABLE X, and TABLE XI are summarized in a comparison chart below in TABLE XV. This illustrates the results of the interrelationships from the literature review next to the interrelationship from the interviews. Out of a total of 12 interrelationships explored, two interrelationships were found to have a significant enough difference from the post-interview results to equate to a change in the interrelationship type. These two interrelationships were both with regard to the project management success factor Mental Shortcut and are the Balanced Earnings and Risk & Deviation success factors. In the literature review, these two factors had situation-dependent interrelations with that of a Mental Shortcut, after the results of the interviews, both of their interrelations were revised to positive.

TABLE XV
Comparison Table: Results of the Literature Review & post-Interview

Highest Ranking Success Factors	Interrelationships								
	ESG & Sustainability			Sustainable Investing			Renovation		
Adaptive Project Management	GRESB	LR	RI	Value-Add & Opportunistic	LR	RI	Adaptive Reuse	LR	RI
Communication	Company-Wide	+	+	Limited Leverage	+	+	Location	+	+
Info. Limit	Taxonomy Update	-	-	Low Vintage Years	-	-	Materials	-	-
Mental Shortcut	Balanced Earnings	/	+	Risk & Deviation	/	+	Heritage	/	/
Informed Rule of Thumb	Internal KPI (-)	-	-	Company-wide Risk (/)	/	/	Floorplan (+)	+	+

LR = Literature Review Results
RI = Results post-Interview

7.5. Selection of Interrelations to be Triangulated in 2nd Interview Round

Due to the limitations of this graduate paper, not all interrelations could be reevaluated from the 1st interview round in the 2nd. Accordingly, only the outlying factors and interrelations have been further explored in the 2nd round of interviews. As such, the 2nd interview round consisted of two main topics for discussion; 1. The main interrelationship type between the adaptive reuse asset conditions, and 2. The main interrelationship type for the project management success factor with a varying results from the 1st interview round and the literature review results.

Accordingly, the adaptive reuse asset condition success factors that lead to a change in the result post-interview were; 1. Heritage, 2. Balconies, 3. Daylight, and 4. Superstructure. As shown in TABLE IX, the resulting interrelation between Balconies and Daylight was found to have a 64 per cent agreement that the interrelationship is situation-dependent, while the interrelationship between Heritage and Superstructure was found to be 32 per cent agreement that the interrelationship was situation-dependent. Both of these interrelationships led to a change in the interrelationship post-interview and are shown on TABLE XIV. As mentioned, this increased the majority of situation-dependent interrelations between the asset condition success factors. Accordingly, this notion that the interrelation between the asset condition success factors is, on average, situation-dependent, has been further explored in the 2nd round of interviews.

The project management success factor Mental Shortcut was the only project management success factor to have a varying result from the literature review and the 1st interview round. This has been clearly shown in TABLE XV. As the results of the literature review noted Mental Shortcut as having the highest number of situation dependent interrelations out of any other success factor, while the results from the 1st interview round showed some disagreement between the panel experts. Thus, leading to a change in the resulting interrelationship, between Mental Shortcut and two success factors, from situation dependent to positive. As such, the 2nd interview round aimed to further discuss the impact of the decision-making method of a mental shortcut, in order to reach a consensus.

7.6. Results of the 2nd Interview Round

This section summarizes the results of the 2nd interview round. The 2nd interview was completed as a group interview of the same expert panel, with the following exceptions; 1. One expert was unable to attend the 2nd interview round, this has been shown on TABLE VII, 2. One expert was late to the 2nd interview and was unable to provide a concrete response, and 3. The 2nd interview round included the addition of the 1st supervisor of this dissertation. The results begin with the asset condition success factors followed by the project management success factor Mental Shortcut. The list of questions provided to the interviewees in the 2nd interview round has been provided for in Appendix C below.

7.6.1. Adaptive Reuse Asset Condition Success Factors: Office to Residential

Three out of the three respondents who provided a response agreed with the literature review results that the listed success factors of an adaptive reuse project have, on average, a situation-dependent interrelation to each other. Two out of these three respondents specifically noted the highly situation-dependent interrelation and impact that a heritage building has on the other success factors, while one went on to note the impact that this would have on the superstructure success factor would depend on varying factors of the project and project scope. This result was in line with the post-interview results as shown on TABLE XIV.

One out of the three respondents specifically noted the impact that the floorplan has the on the façade and vice-versa, would also be situation-dependent as these factors are heavily dependent on the design of the building, however the facade is also a factor related to the post-occupancy phase of the building. This result was in line with the post-interview results as shown on TABLE XIV.

Finally, one out of the three respondents specifically noted that the success factor vacancy may additionally have a situation-dependent impact on the location. As this was only one vote, as is counted with a weight factor of 0.16 per person and 0.20 per for the literature review, it was determined that this one vote did not provide significant justification to change the interrelationship type of the location and vacancy. As such, the resulting consensus of the interrelation between the asset conditions success

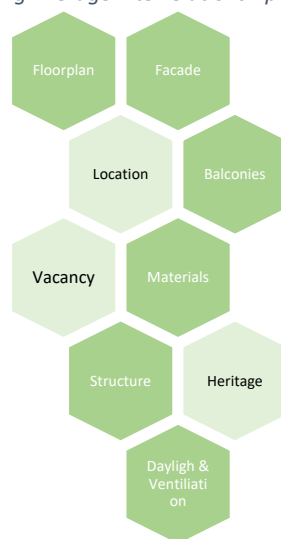
factors was found to be predominately situation-dependent. This is shown in the TABLE XVI below.

TABLE XVI
Average Interrelationship: Asset Condition Success Factors

	Result from Literature Review		Post-Interview Result (1 st Round)		Post-Interview Result (2 nd Round)		Final Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor 1 person =	Interrelation	Weight Factor 1 person =	Result	Interrelation
Average Interrelationship	Situation Dependent (/)	0.20	Situation Dependent (/)	9 x 0.08=0.72	Situation Dependent (/)	3 x 0.08=0.24	1.16	Situation Dependent (/)
			Negative (-)	3 x 0.08=0.24			0.24	Negative (-)

Accordingly, this justified data is summarised visually in the Figure 6 below. The success factors with darker hexagons represent the asset condition success factors with only situation dependent interrelationships. While the asset condition success factors in light hexagons represent the factors with an average of situation dependent, while containing some negative interrelationships with the other asset condition success factors.

Figure 6 Hexagon Diagram: Illustrating Average Interrelationship of the Asset Condition Success Factors



7.6.2. Project Management Success Factor: Mental Shortcut

Three out of the three respondents who provided a response agreed with the original literature review results that the interrelationship that the project management success

factor Mental Shortcut has with the other success factors from the three other categories is situation-dependent. However, one respondent noted that an experienced project manager should be able to understand the limitations of their own knowledge, and that this would lead to a Mental Shortcut having a positive effect. The resulting consensus of the interrelationship type and impact that Mental Shortcut has was found to be situation-dependent. These results have been tabulated into TABLE XVII below

TABLE XVII
Average Interrelationship: Project Management Success Factor: Mental Shortcut

	Result from Literature Review		Post-Interview Result (1 st Round)		Post-Interview Result (2 nd Round)		Final Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor 1 person =	Interrelation	Weight Factor 1 person =	Result	Interrelation
Average Interrelationship	Situation Dependent (/)	0.20	Situation Dependent (/)	5 x 0.08=0.40	Situation Dependent (/)	3 x 0.08=0.24	0.84	Situation Dependent (/)
			Positive (+)	9 x 0.08=0.72	Positive (+)	1 x 0.08=0.08	0.80	Positive (+)
			Null	1 x 0.08=0.08			0.08	Null

8. Discussion of the Triangulated Results

This chapter will summarize and interpret the results of the primary and secondary research in relation to the hypothesis. This section also looks to compare the primary and secondary research findings to one another within the frame of the four main themes of this graduate research, as well as discuss any further findings.

8.1. Main Findings

The main themes of this master's thesis are; 1. Renovation, 2. Project management, 3. ESG & Sustainability, and 4. Sustainable investing. Through the secondary research phase of the literature review, these themes were narrowed to; 1. Adaptive reuse of office buildings to residential, 2. Adaptive project management, 3. GRESB real estate assessment, and 4. Value-add & opportunistic investing. What this thesis attempts to achieve is the definition of the success factors for each of these identified themes, as well as analyse the impacts that these themes have on one another. Ultimately, creating a holistic understanding of the positive, negative, and situation-dependent

impacts that these success factors have, both within their own category, as well as within the other themes. This understanding is then distilled into a framework, with which a real estate development company and their project managers could orient themselves, in order to provide an economically and sustainably successful adaptive reuse development.

As was defined above in the background, a successful project for the purposes of this study is shown in TABLE II. Moreover, a successful project should also address the current needs of the local German market, as well as EU regulatory factors, as shown in TABLE I. Accordingly, these market and regulatory factors can be addressed through the renovation of unused office space in order to provide residential, while making use of sustainable investing methods. While the challenges of sustainable investing and renovation can be supported through project management and an ESG ranking system. While project management and ESG ranking have their own challenges. It is this overlap of the positive and negative influences that these factors have on one another that this graduate paper attempts to analyse.

These four main themes were also found to have differing applications. The success factors for an adaptive reuse project are best applied as asset condition factors when selecting an asset for transformation from office to residential, and are, as such, project specific. While the success factors of adaptive project management should be used during the dynamic phase of a project, and as such best applied and adjusted on a project specific scale, as well as a company-wide strategy. Finally, the success factors of both GRESB and value-add & opportunistic investing should be applied on a company-wide scale, as they have greater impacts when used as a general strategy.

Renovation projects have an increased risk, due to the high number of unknowns, when compared with new builds. This is clearly illustrated in the investment classification of existing buildings [82] [85]. However, when summarized, the current research provides a base line platform of wish-list items for the adaptive reuse of office to residential. These wish-list items have been condensed in this dissertation into asset condition success factors for adaptive reuse projects. However, this list of success factors alone does not entirely decrease the risks associated with renovation projects.

Project management includes biases that impact decision-making. These biases, although often based on the professional experience of the project manager, do not provide a foolproof method for decision-making. However, decisions often need to be made within a limited timeframe, increasing the need for quick, accurate decision-making methods [30] [35] [56] [57] [61]. The current research shows that the use of an adaptive project management method during the dynamic phase of a construction project can assist with this need [86]. Moreover, as technology increases in capability the skills a project manager should have will change. Accordingly, the current research underpins the requirement for project managers to have stronger interpersonal skills in the age of AI [70] [72]. However, adaptive project management and increased communication alone does not entirely decrease the risks associated with renovation projects.

In order to reach an ESG approved real estate asset, the EU directive clearly states that a 3rd party regulator is required [4]. Moreover, the fundamental principles of ESG include a constantly upward moving target [2]. Accordingly, the ranking system of GRESB provides for this, making it an appropriate tool to be used while defining project goals in the static phase of a renovation project to define project goals and objectives. However, the use of GRESB to define project objectives does not fully decrease the financial risks associated with renovation projects.

Sustainable investing through the acquisition of value-add and opportunistic assets includes an increased financial risk, often due to the increased amount of leverage used [80] [82]. Accordingly, the research notes methods for the management of said risks, however the provision of these methods alone does not entirely ensure the economic and environmental success of a renovation project.

As such, the success factors of these four elements of a successful renovation project; adaptive reuse, adaptive project management, GRESB benchmarking, and value-add and opportunistic investing, that were found in the secondary research, were brought together in this graduate paper and the impact and interrelationships they have on one another explored in an attempt to further the understanding of the interrelations between them.

The interview process revealed that there is a general consensus regarding the management and development of real estate assets. Specifically, how a project is selected for adaptive reuse as well as how such a project should be managed, in order to reach success as defined in TABLE II. Moreover, the interviews also supported the notion that the interrelations between the success factors of the four main themes of such a project; renovation, project management, ESG, and sustainable investing, impact one another differently. Signifying that, the indication and achievement of these success factors alone does not consistently provide a successful result, as some success factors have opposing, juxtaposing interests. Thus, the type of interrelationship between these success factors; negative, positive, or situation-dependent, should be understood by the project manager, and with this understanding, can they then be managed.

Appropriately, the interview process enhanced the understanding of these interrelationships between the success factors, that was gained through the literature review. This research has been distilled into a functional framework and illustrated in the following chapter. With this understanding of the interrelationships at play, a project manager can use this framework as a guiding tool to assist with managing the varying and opposing demands of an environmentally and financially sustainable adaptive reuse project that meets the demands of the green transition within the EU, as well as the unbalanced demand and supply currently facing the housing and office sectors in Germany.

8.2. Further Findings

The results of the literature review also led to the outline of constraining factors for an adaptive reuse project. These constraining factors were further reviewed in terms of the themes of this thesis that would be best suited to manage them. This was tabularized in TABLE IV. As it was beyond the limitations of this master's thesis, the justification of the secondary research through primary research was not completed. However, this overview of how the constraining factors involved in an adaptive reuse project can be managed through the themes of project management, ESG ranking, and/or sustainable investing provides a potential preliminary tool for managers.

Accordingly, the author recommends this preliminary framework for further research, in order to justify these findings, as well as discuss potential secondary impacts, positive, negative, or situation-dependent, they may have on the project.

The first round of interviews provided further insights into some of the asset condition success factors. Namely, the success factor Heritage was mentioned by the majority of the interviewees as being the most challenging factor. Most interviewees shared concerns with the high number of regulatory challenges that are likely to exist due to the heritage status of the project. Noting that, these challenges ultimately lead to longer permitting phases, thus making the project more expensive. Accordingly, this was in line with the results of the literature review, as although the heritage designation was deemed as increasing the success of an adaptive reuse project, it was often followed by a caution with regards to the increased bureaucracy [31] [46].

The success factor Material was also noted by all interviewees as having a significant impact on the project. With respondents noting that, in order to mitigate this impact, the project manager should order a technical due diligence report. The respondents further noted that this upfront cost can act as a form of insurance that may seem expensive at the time but will ultimately decrease the amount of risk in a renovation project, through decreasing the amount of unknowns. Similarly, this also coincided with the results of the literature review, as the research notes a pre-emptive approach should always be taken for renovation projects, especially where the building age further signifies the potential presence of toxins [31] [48].

The additional asset condition success factors recommended by the interviewees are outside of the scope of this dissertation, however they are recommended as a suggestion for further research. These additional asset condition success factors are; 1. Minimized common spaces, 2. Existing fire rating and fire code, and 3. Existing energy certificate.

With regards to the overall financial viability of the adaptive reuse of office buildings to residential, one respondent noted that, in most cases the architects can make the asset conditions work, however it is just a question of the business case. This respondent noted that conversion projects are typically expensive, and these costs can often only

be offset by providing luxury residential units. However, this does not meet the current market demand of affordable units. Subsequently, this respondent argued that in order to bridge this gap the authorities should provide financial assistance to developers who adaptively reuse office buildings for affordable residential purposes. Consequently, the lack of funding was also discussed in the reviewed literature as being one of the largest challenges of adaptive reuse [24] [25] [87].

Two respondents noted the use of prefabrication as providing a potential solution for the financial viability of the project, noting that it could be the construction method used for the densification of the case study project, either within the courtyard or as additional stories. Likewise, the direction towards the implementation of prefabricated solutions was also found during the literature review, with sources noting the potential for decreased waste production as well as reduced on-site construction time and noise pollution [87].

With regards to the skill of communication, all respondents noted the importance of stakeholder management techniques when handling disagreements with the development arising from the existing community. Furthermore, the notion of the significance of interpersonal skills within project management was further supported when almost all respondents mentioned the importance of the relationship between contractor and project manager. This was also found to be aligned with the literature review as it was reinforced that the importance of intrapersonal skills within project management will only increase with the increase of technological automation in managerial positions [71] [72].

9. Final Framework

Interrelationships that were found in the secondary research, which took the form of a literature review were distilled into a preliminary comparison in TABLE V found above. Thereafter interrelationships were further explored through primary research in the form of modified Delphi method interviews. Due to the limitations of this master's thesis not all interrelationships, that were found in the literature review, were fully explored during the primary data collection.

In accordance with the success factors found for the four main themes of this dissertation; renovation, project management, ESG and sustainability, and sustainable investing, the final interrelationship table between the success factors are illustrated per Table XX below. These main themes are focused on; adaptive reuse, adaptive project management, GRESB, and value-add and opportunistic investing. These topics have also been categorised as being best implemented either on a project specific or company-wide scale. Furthermore, this interrelationship table attempts to fill the current research gap of the how project management can be used as a tool to increase environmental and social sustainability, while also reducing the financial risk seen in a renovation project. This framework is an attempt to summarize the analyse that took place in this dissertation regarding the impacts that success factors have on one another. As per the research performed in this graduate research, the success factors can have differing impacts on one another. This is illustrated in the framework with either a negative (-), positive (+) or situation-dependent (/) interrelationship type.

For example, when the project specific, asset condition success factor Heritage is achieved, and a is building selected for adaptive reuse due to the heritage status that it has, there is a situation dependent impact to the project management success factor Mental Shortcut. As a mental shortcut is a decision-making method of using a first instinct based on previous experience, this could negatively or positively impact the heritage project, depending on the project conditions. If the project manager had a successful heritage project, the project manager could be more inclined to assume future similar projects will also be successful, and vice-versa.

As another example, when the project management success factor Information Limit is met it negatively impacts the ESG success factor of Taxonomy Update. As the decision-making method of an information limit places a cap on how much time is to be spent on gathering information prior to making a decision, while the Taxonomy Update success factor requires that the company stay informed about applicable updates to the EU taxonomy. Accordingly, good decisions made by the project manager within a limited time frame will be harder to reach when companywide strategies are newly updated, or updated after the decision has been made. Thus, making this interrelationship negative.

This framework has been further condensed into two separate tables, one showing only the negative and the other only the positive success factor interrelations. As shown in tables Table XVIII and Table XIX below. Accordingly, the negative interrelations framework can serve as an indicator for decision-makers, showing where renovation projects can potentially decline in the success metrics, as stated in TABLE II. As such, this table illustrates where the real estate development firm should focus more attention during a renovation project. While the positive interrelationships framework can serve as an indicator for decision-makers, showing where less attention can be given by management, once these success factors have been met. Furthermore, these two tables can assist in the static and dynamic project phases, as well as company-wide decisions; acting as a guiding framework for the managerial direction. Notably, the theme of adaptive reuse did not have a significant number of negative interrelationships and is accordingly not presented in the negative impacts table. Indicating that the negative interrelationships framework could be used by real estate development professionals, beyond the scope of adaptive reuse, for the development of value-add and opportunistic properties in general.

Table XVIII
Interrelationship Framework: Negative Impacts

				Project Specific & Company-wide		Company-wide					Company-wide						
				Project Management		ESG & Sustainability					Sustainable Investing						
				Adaptive Project Management		GRESB					Value-add & Opportunistic						
				Early Addressed	Limited	AI Workfl	Comp any-	Continued	Internal KPI	Taxonomy	3 rd Party	Balance	Limited	Risk & Deviat	Low Vintag	Time / Accura	Comp any-
Project Specific & Company-wide	Project Management	Adaptive Project Management	Informed Rule of Thumb				-	-	-	-							
			Mental Shortcut					-	-	-							
			Info - Limit	-	-	-						-	-	-			
			Open-ended		-	-	-										
			Early Addressed														
Company-wide	ESG & Sustainability	GRESB	Limited Reversals				-										
			Company-wide														
			Continued Use									-	-	-	-		
			Internal KPI									-	-	-	-		
			Taxonomy Updates									-	-	-	-		
										-	-	-	-				

*only success factors with 3 or more negative interrelationship are shown

Table XIX
Interrelationship Framework: Positive Impacts

			Project Specific & Company Wide								Company Wide					Company Wide							
			Project Management								ESG & Sustainability					Sustainable Investing							
			Adaptive Project Management								GRESB					Value-Add & Opportunistic							
			Informed Rule of Thumb	Uncertainty Level Understood	Info. Limit	Open-ended	Creative	Early Addressed	Limited Reversals	AI Workflow	Communication	Company-wide	Continued Use	Internal KPI	Taxonomy Updates	3 rd Party Monitor	Balance Earn *	Limited Leverage	Risk & Deviation	Low Vintage Years	Time / Accuracy	Company-wide risk	
Project Specific	Renovation	Adaptive Reuse (Asset Condition)	Floorplan	+	+					+	+	+	+				+						
			Facade	+	+		+				+	+	+	+				+	+				
			Location	+	+							+							+				
			Balconies	+	+		+					+	+	+									
			Vacancy	+								+							+	+			+
			Materials		+		+					+	+	+	+				+	+			+
			Structure	+	+							+							+	+			+
Project Specific & Company Wide	Project Management	Adaptive Project Management	David's 8-Point																				
			Informed Rule of Thumb			+		+	+	+							+		+	+			
			Mental Shortcut			+					+							+		+			
			Uncertainty Level Understood								+	+			+	+	+			+	+	+	
			Info. Limit					+													+	+	
			Open-ended												+								
			Creative												+	+	+						
			Early Addressed							+	+	+	+										
			Limited Reversals														+	+		+	+		
			AI Workflow														+	+	+				
Company Wide	ESG & Sustainability	GRESB	Company-wide																		+		
			Continued Use												+								
			Internal KPI																				+
			3 rd Party Monitor																				+
			Balanced Earning															+	+	+			+
Company Sustainable	Value-Add & Opportunistic	Limited Leverage															+	+			+		
		Risk & Deviation																	+			+	
		Low Vintage Year																				+	

*only success factors with 3 or more negative interrelationship are shown

Accordingly, this set of three final frameworks can be used by real estate development firms and project managers, developing an adaptive reuse project, not only as a list of success factors, but also as a guide to the dynamic and secondary impacts that these success factors have on each other. With the identification of these interrelations, they can be managed. Although this framework may provide a tool for decision-makers, there are limitations to the validity of this framework. Not all interrelations were able to be validated through the primary research, accordingly, the justification of the remaining success factors is recommended. Furthermore, additional success factors and their interrelationships may need to be added or removed as the research is continued and built upon.

To assist in the comprehension of the interrelationships between success factors, the following visual diagrams for the interrelationships that were further explored through the interview process are shown below in Figure 7, Figure 8, Figure 9, and Figure 10. Accordingly, these figures depict the four success factors; Mental Shortcut, Communication, Information Limit, and Informed Rule of Thumb, and displays the type of interrelationship they have with the other success factors as shown in Table XX. These graphical representations of the interrelationship types that these success factors have is depicted in a visual manner, assisting with the understanding of the secondary impacts. Figure 7 displays the success factor Mental Shortcut, here it is clearly shown that the average impact is situation-dependent, indicating that the impact could be positive or negative subject to the context. While Figure 8 depicts the success factor Communication, here it is clear that the average secondary impact is a positive one. Meanwhile, Figure 9 illustrates the success factor Information Limit, here it is clear that the success factor has mostly a negative secondary impact. Finally, Figure 10 depicts the success factor Informed Rule of Thumb, it is clearly shown that the secondary impacts fluctuate, as there is no average interrelationship type.

Figure 7 Interrelationship Diagram: Mental Shortcut

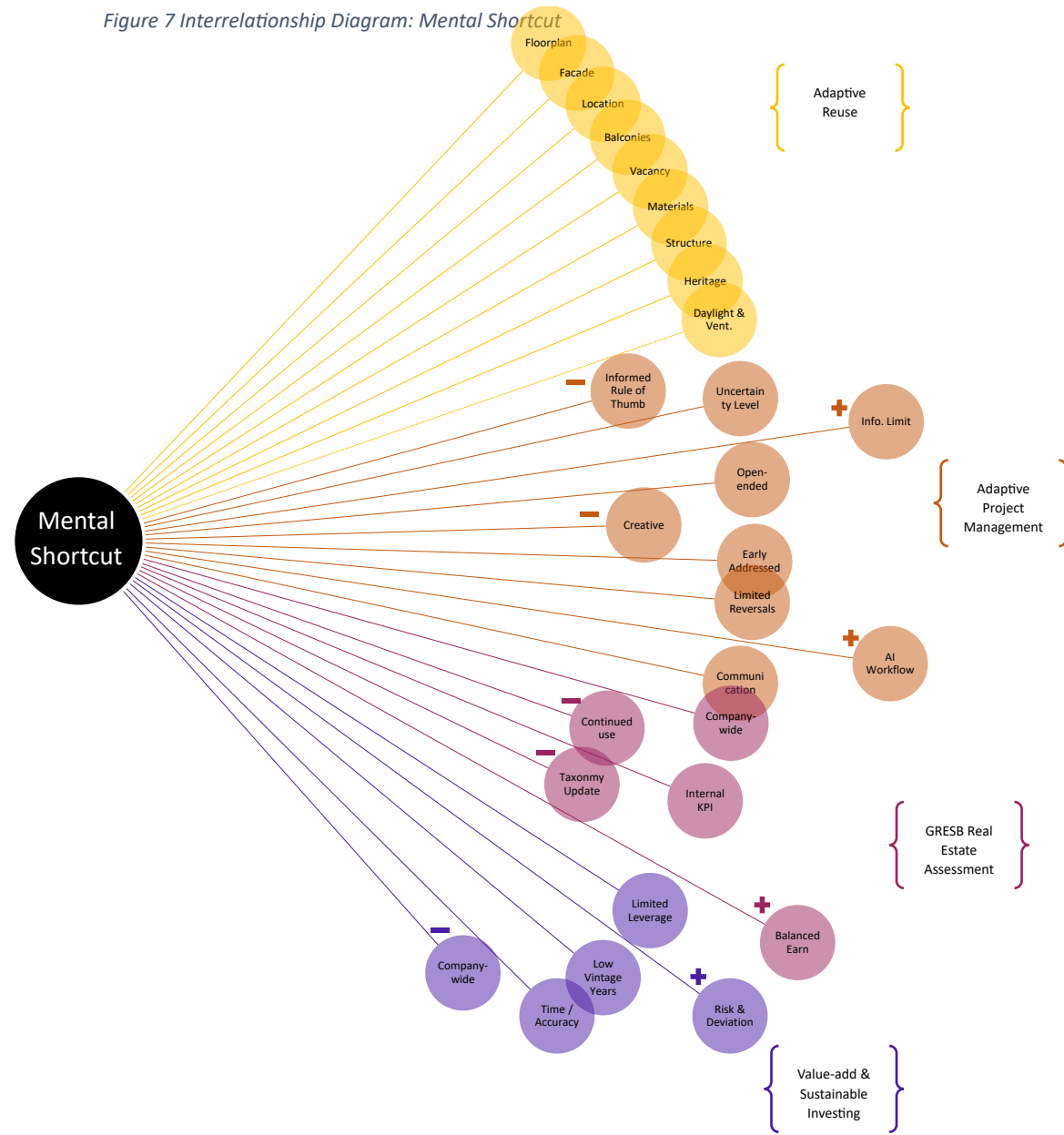


Figure 8 Interrelationship Diagram: *Communication*

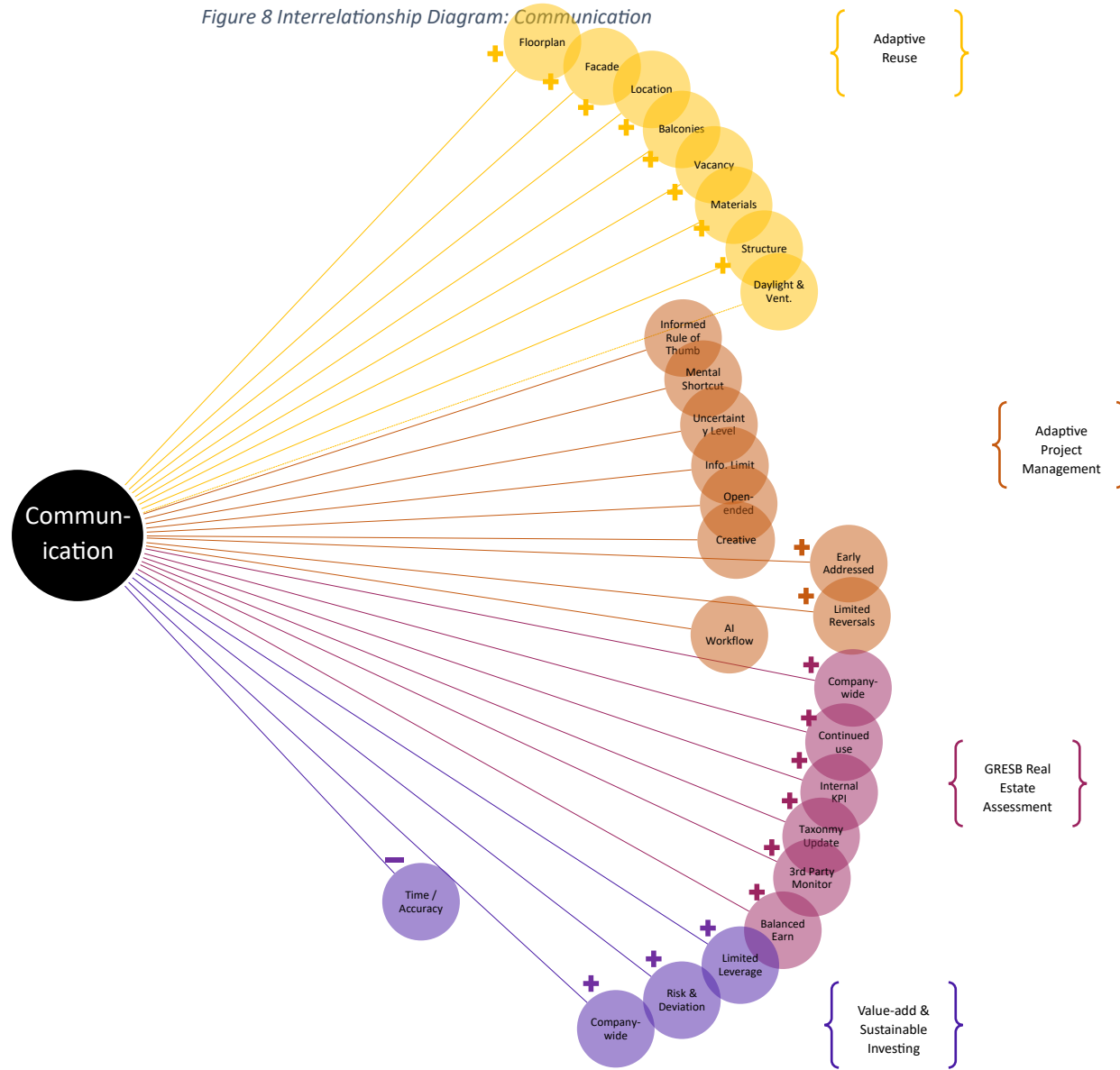


Figure 9 Interrelationship Diagram: Information Limit

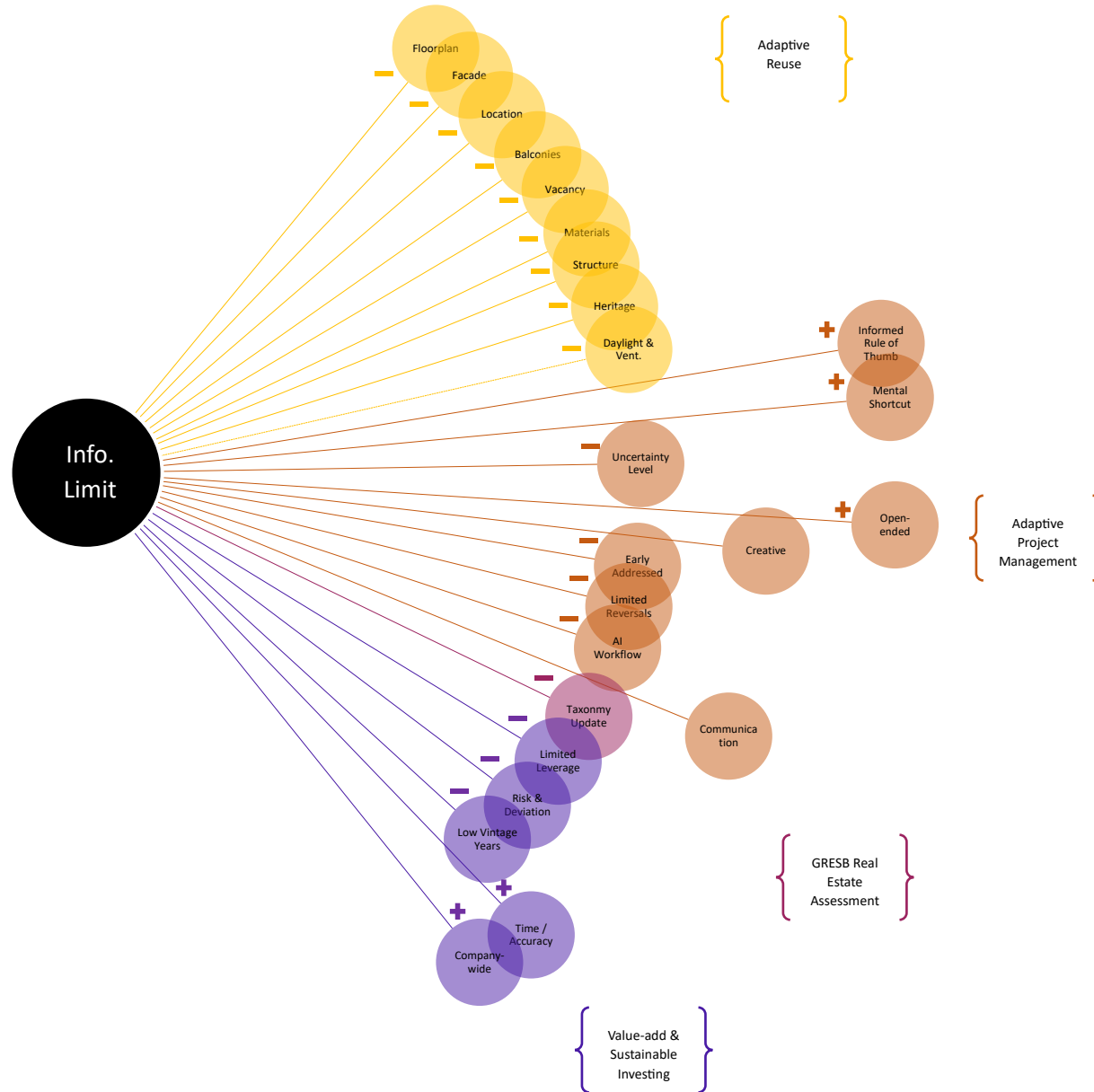
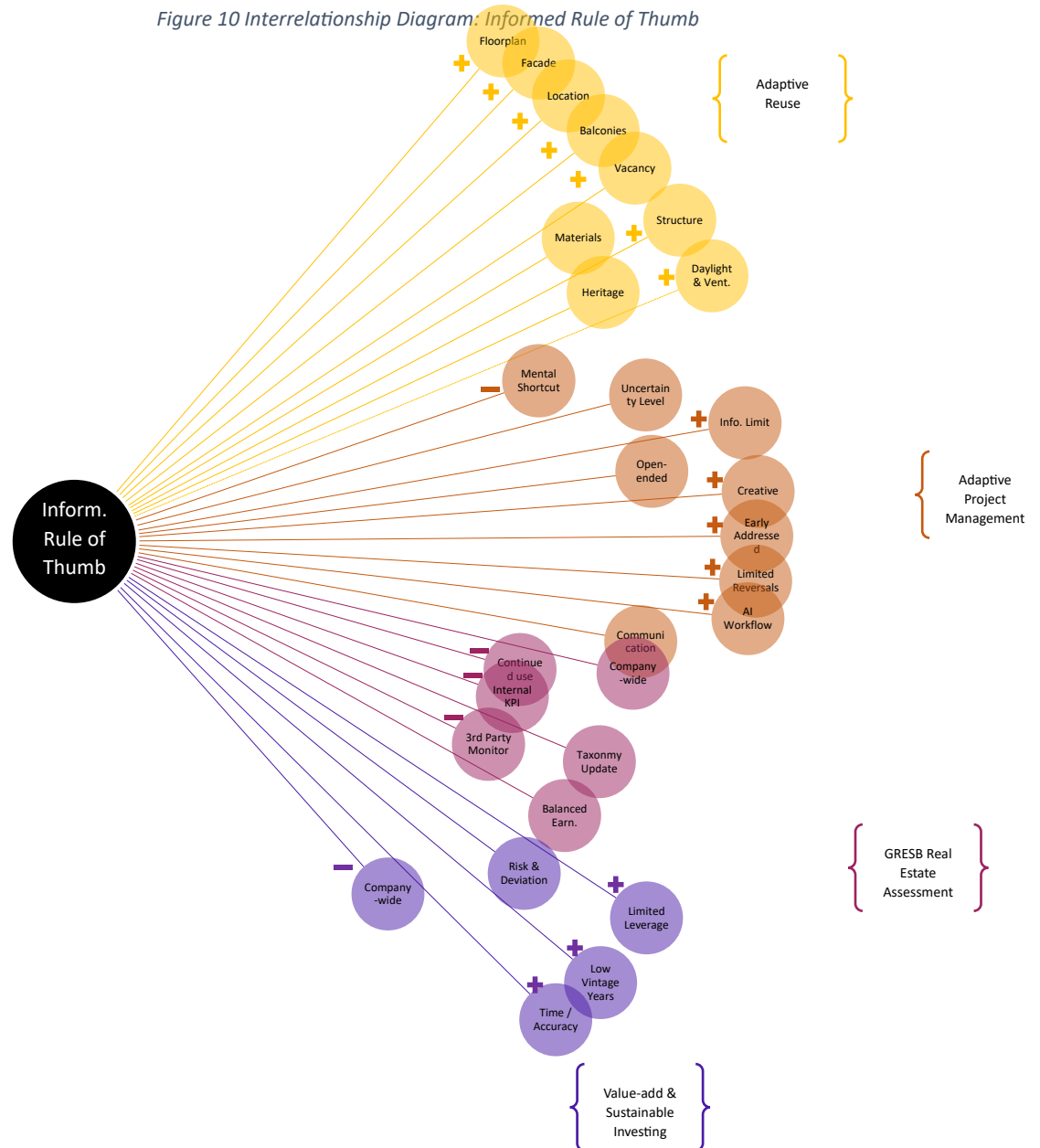


Figure 10 Interrelationship Diagram: *Informed Rule of Thumb*



10. Conclusion

The high financial risk associated with the renovation of value-add and opportunistic properties combined with the EU's ESG reporting requirements requires skilled project management, on both a project based and company-wide scale, to ensure the success of a sustainable renovation project. Although there is already significant research completed on; how ESG reporting is to be prepared, how project management is used in renovation projects, and what investment strategies yield the highest returns, there is little that consolidates these themes to answer how project management can be used as a tool to increase environmental sustainability, while also reducing the financial risk seen in a renovation project. Accordingly, this dissertation attempted to address this identified research gap. Furthermore, this master's thesis attempted to answer the following research questions.

1. Main Question: How can renovation projects be used to manage unused office space, add housing supply, and meet EU ESG targets?
 - a. Sub-Question: What are the success factors of an adaptive reuse office to residential project?
2. Main Question: How can project management be used as a tool to ensure ESG ratings, while also reducing the financial risk seen in a renovation project?
 - a. Sub-Question: What are the success factors of adaptive project management?
3. Substantive Question: What are the interrelationships between the success factors identified in the main research questions?
 - a. Substantive Sub-Question: How can this research be generalized and distilled into a practical framework?

This graduate paper was conducted with a focus on real estate development within the European context of Germany. A qualitative data collection was provided through a multi-organizational approach and modified Delphi method. Representatives from various firms within the real estate and construction industry were interviewed, with the intent of providing quality feedback from a selected small sample. Using a deductive approach, the interview questions were formulated to further the existing theory

developed through the literature review process. As such, the interviews were used to test this theory. Finally, the results of the primary and secondary research were distilled into a framework, in the form of a matrix that illustrates the interrelationships found between success factors of the four main themes of this master's thesis.

As this dissertation was performed using a deductive method, it began with a broad outlook of current trends within the German real estate market to identify the current regulatory and market factors. These factors were then used to determine the main themes of this graduate paper. These themes were further narrowed into selected recommendations, which were analysed in the literature review to extract a success factor list. Furthermore, the success factors were explored in terms of their impacts on one another, to determine if they have a positive, negative, or situation-dependent secondary impact. Prominent factors were further analysed through a primary data collection using a modified Delphi method. This was used to triangulate and justify the secondary research results.

The main outcome of this master's thesis is a set of guiding frameworks that can be used by real estate development professionals to assist with the attainment of economically, ecologically, and socially successful adaptive reuse of office buildings to residential use.

10.1. Managerial Implications

The results of this graduate research are provided in the form of a framework that can be used by decision-makers on both a company-wide as well as a project specific scale. The results are tailored to that of the transformation of unused office space to residential purposes, however the method used to reach these results can also be applied to renovation projects in general as well as other disciplines. The use of deductive research to define the scope of this thesis, and the application of a modified Delphi method in the form of individual and expert panel-interviews, can be applied to disciplines outside the field of real estate development. For example, this research method could be scaled and applied to other management fields, as management science focuses on decision analysis. Furthermore, this method could also be applied within the field of system science, as it attempts to provide an understanding of

dynamic and interdisciplinary processes. Moreover, this method could additionally be applied more generally towards social science studies, as there is an innate behavioural factor explored in this dissertation.

As previously stated, the increasing demand for housing within the German real estate market, coupled with the decreasing demand for office space, provides an opportunity for real estate developers. However, the increased risks and costs associated with renovation projects are major deterrents for developers. Despite that, this increased risk of an adaptive reuse project can be managed, when the various factors that create a successful project are better understood. As such, success factors can be used beyond the form of a checklist, when their secondary impacts are understood. As it was found in this master's thesis, success factors can have varying interrelationships on one another, either, negative, positive, or situation dependent. As such, it is insufficient to rely on achieving these factors alone. Thus, it is important to also understand the interrelationship between these success factors and the secondary impacts they have on one another. The output of this master's thesis is, as such, a guiding framework that attempts to identify these interrelationships that can then be used as a tool to assist with the development of renovation projects.

10.2. Thesis Evaluation

As this dissertation was performed through deductive research the explored themes were discovered from the analysis of the current market and regulatory trends within the EU context. Thus, justifying the explored topics and the narrowed approach used to select recommended subtopics of; 1. Adaptive reuse, 2. Adaptive project management, 3. GRESB real estate assessment, and 4. Value-add & opportunistic investing. The literature review was then performed through the results of the deductive approach to further reduce the themes into a list of success factors. Through the research produced from the literature review these success factors formed the preliminary framework, as was shown in TABLE V.

In order to triangulate and justify the resulting framework, a modified Delphi method was applied and two rounds of interviews with an expert panel was performed. The

interviews were semi-structured to allow the experts to further explain their rationale. The opportunity to provide rationale further supported the responses given by the interviewees, as it allowed for the examination of further justifications and explanations. The interviews also included a case study, that attempted to further justify the asset condition success factors found within the literature review. The application of a case study further provided the interviewees with a context, within which they could provide a response that is more grounded in reality.

The anonymity of the expert panel was retained until the second interview, which was performed as a group interview. As the first interviews were performed individually, they informed an average response. While the second interview was used to conclude the results in the form of a consensus of this average response. However, the initial responses were kept anonymous throughout the study, ensuring the validity of the responses provided. As such, the results of the secondary research were validated through the two-stage method used in the primary research to reach a conclusion and output for this graduate paper.

Although the results of the interviews were attempted to be anonymous, there were issues with the interviewees sharing their experience with one another outside of the interview process. As most of the interviewees were from the author's personal and professional networks, they knew the other people providing responses. This led to them sharing their experience and answers with one another, which may have negatively impacted the validity of their responses. Furthermore, not all experts were available for the second interview. As this was completed as a group interview, finding a date where the various experts were available proved difficult, and as such one expert from the first interview round was unable to attend the group interview.

Due to the time limitations of this master's thesis not all interrelationships were able to be further explored and verified through the triangulation process. Furthermore, not all interrelationships that were explored in the first interview were able to be further explored in the second interview. This led to the Delphi method only fully applying to the success factors that made it through to the second interview round. Due to time limitations, the intent for this dissertation was to reach an average response, either

positive, negative, or situation-dependent, for the selected interrelations. However, with a longer timeline the author would have explored the success factors that had the largest disparity in their impacts on the other success factors. Accordingly, the author would recommend that further research be performed on this topic to triangulate and justify the success factors with varying impacts. This is shown in TABLE XXI below.

It is also recommended by the author that the further findings outside of the main themes of this master's thesis be further researched. This includes the additional asset condition success factors found in the first interview round, which include minimization of common spaces, fire code rating, and current energy rating. Furthermore, additional research should also include the management of the constraining factors of an adaptive reuse project found in the secondary research, as was shown in TABLE IV. Finally, further composition of the success factor interrelationships should include the ranking of the success factors in terms of the primary impact they have on the project, as well as the interrelationship, or secondary impacts, that they have with the other success factors, and ultimately the success of the project.

TABLE XXI
Suggested Further Research: Success Factors with Varying Interrelations

		Success Factor	Interrelationship Type		
			+	-	/
Renovation	Adaptive Reuse	Vacancy	6	2	4
Project Management	Adaptive Project Management	Open-ended	7	5	12
		Limited Reversals	9	6	6
ESG & Sustainability	GRESB	Internal KPI	9	6	6
Sustainable Investing	Value-add & Opportunistic	Limited Leverage	9	5	3
		Time/Accuracy	5	7	6

The resulting interrelationship of situation-dependent is difficult to manage, as there are many possibilities and interdependencies that make the result in certain cases negative and in other cases positive. As such, the author recommends that further research be prepared addressing this ambiguity. Furthermore, the author would recommend that the validity of the research prepared in this dissertation would be additionally supported through a higher sample, and as such a larger expert panel.

10.3. Closing words

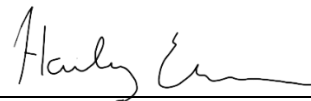
This graduate research reached a conclusion, in the form of a framework, with regards to how project management can be used to provide the environmentally and economically successful, adaptive reuse of unused office space. This conclusion outlined current available research of the four main themes of this graduate paper; renovation, project management, ESG & sustainability, and sustainable investing, in the form of success factors, while also furthering this research through the consolidation of this knowledge. Accordingly, the review of the interrelationships between the success factors abridges the current research, advancing it towards a better understanding of the secondary impacts and interrelationships of the success factors. While importantly noting that the achievement of these success factors alone does not guarantee a successful project, as certain success factors can have unintended negative impacts on the other success factors. As such, this master's thesis acts as a commencement towards the fulfilment of the identified research gap, providing a platform for the advancement of the understanding of the interrelationships between success factors involved in the management of renovation, ESG, and financial targets and their secondary and sometimes negative impacts on one another.

Declaration of Authorship

I hereby declare that the attached master's thesis was completed independently and without the prohibited assistance of third parties, and that no sources or assistance were used other than those listed. All passages whose content or wording originates from another publication have been marked as such. Neither this thesis nor any variant of it has previously been submitted to an examining authority or published.

Berlin, 04.07.2024

Location, Date



Signature of the student

Appendices

Appendix A: Table IV Terminology

Adaptive Re-use

Floorplan: the existing floorplan, building layout and property allows for residential uses. In Berlin it is especially important that additional MEP shafts can be outfitted, and that the property has potential for densification.

Façade: the good existing condition would not require intense reconstruction works

Location: the asset is in a desirable area, either central, residential, or along the downtown edge. In Berlin it is especially important that amenities, leisure and transportation connections are available.

Balconies: the asset either has balconies, or balconies can be provided for.

Vacancy: the office building is currently vacant and as such losing revenue and value. In the case of a zoning amendment, it is particularly important in Berlin that the floorspace or potential floorspace be a minimum of 5000m².

Materials: there are none, or there is a low likelihood of hazardous materials being found.

Structure: no prestressed concrete is present, and the structure allows for additional floors.

Heritage: the building has a heritage designation or has cultural significance for the neighbourhood.

Daylight & Vent.: The building is either core and rectangular, allowing for natural light and ventilation.

Adaptive Project Management

Informed Rule of Thumb: a decision-making method using research as well as professional past-experiences.

Mental Shortcut: a decision-making method that uses the first impulse based on experience.

Uncertainty Level Understood: how well the project manager comprehends the risk and uncertainty of the project.

Info. Limit: a decision-making method that places a maximum on the amount of information that can be used.

Open-ended: a decision-making method that uses unfixed solutions, allowing for alternatives and dynamic shifts in the outcomes

Creative: a work environment that allows for new ideas and methods to be tested

Early Addressed: a problem-solving method that encourages issues to be resolved as soon as possible using a priority system.

Limited Reversals: a decision-making method that discourages a change of course, ensuring that the original solution is continually used.

AI Workflow: the continued implementation of AI and digitalization into project management processes

Communication: the interaction and successful sharing of ideas and concerns.

GRESB

Company-wide: a concrete ESG strategy that is implemented on a large scale and used by all employees.

Continued Use: the yearly increase in ESG measures to ensure a GRESB ranking is held or achieved.

Internal KPI: the implementation of the GRESB ranking as a means of success measurement on a company wide scale.

Taxonomy Updates: the awareness of current and future changes and increases in ESG requirements on the EU level.

3rd Party Monitored: use of a certified external consultant to triangulate ESG numbers and controlling.

Balanced Earnings: the awareness of the requirement for financial success as well as ESG successful rankings

Value-add & Opportunistic

Limited Leverage: the careful use of loans and interest on a project wide and company wide scale.

Risk & Deviation: the monitoring of risk and deviation rates in the returns and profits of an asset and fund.

Low Vintage Years: the limited amount of years used for a loan to decrease the associated risk.

Time / Accuracy: an investment decision-making method that balances the lowest amount of time with highest amount of accuracy.

Company-wide Risk: a concrete variance zone allotted on a large scale for the company, that determines how much uncertainty is allowed

Appendix B: Case Study Supportive Materials



Fig. 11 Existing Conditions – Façade [88]



Fig. 12 Existing Conditions - Facade – Courtyard [88]



Fig. 13 Existing Conditions - Interior Office Unit [88]

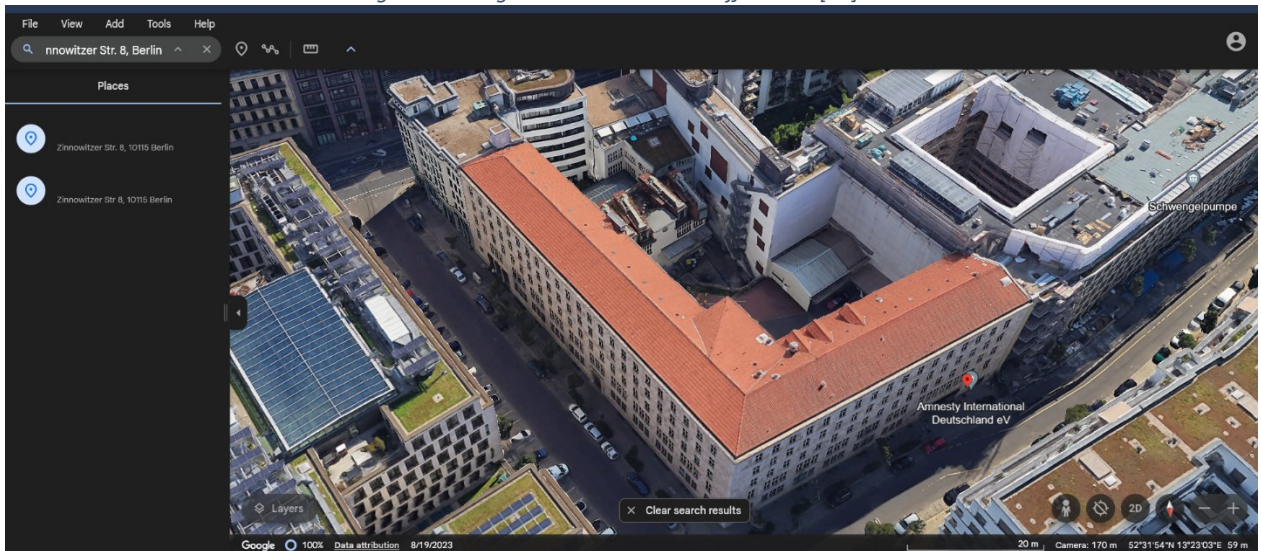


Fig. 14 Aerial Imagery – Façade – Street side [89]

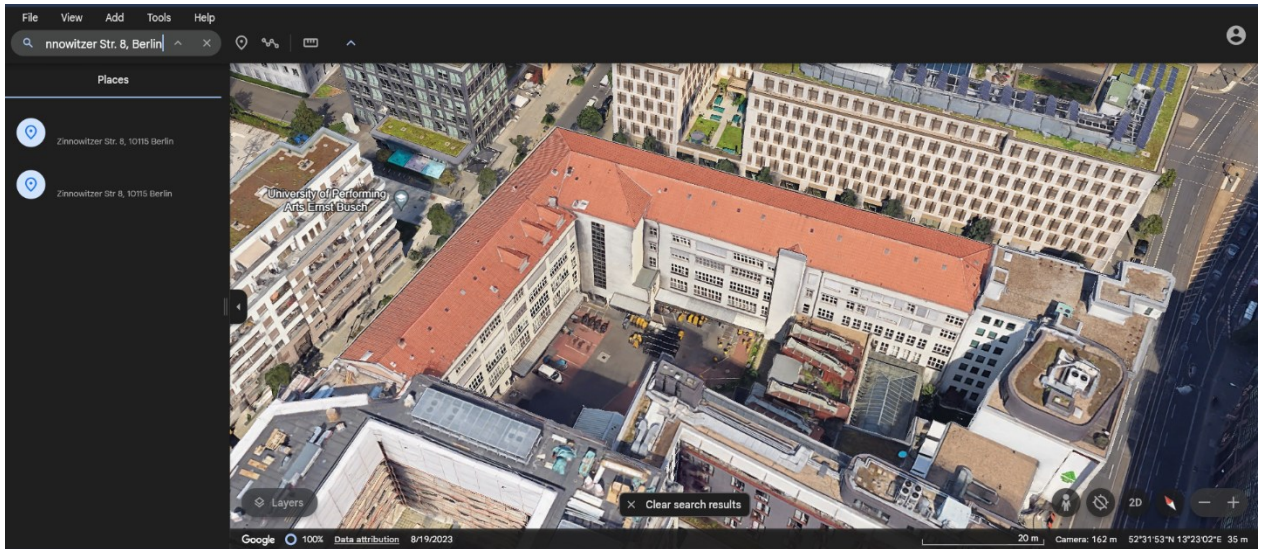


Fig. 15 Aerial Imagery – Façade – Courtyard [89]



Figure 16 Existing Conditions - 4th Flr. Floorplan [88]

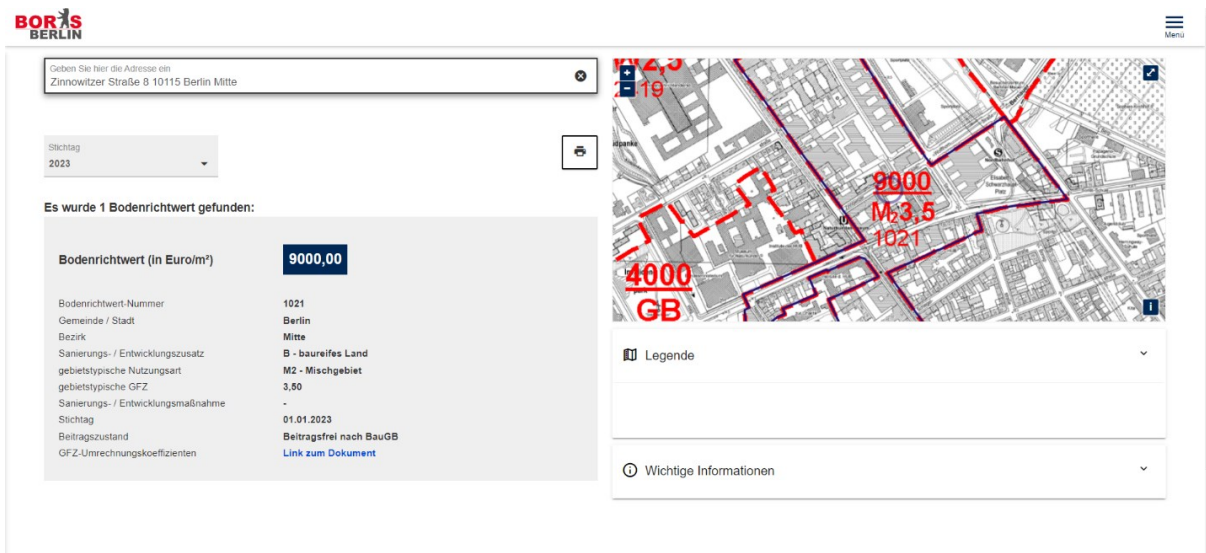


Fig. 17 Property Value for Neighbourhood District [90]

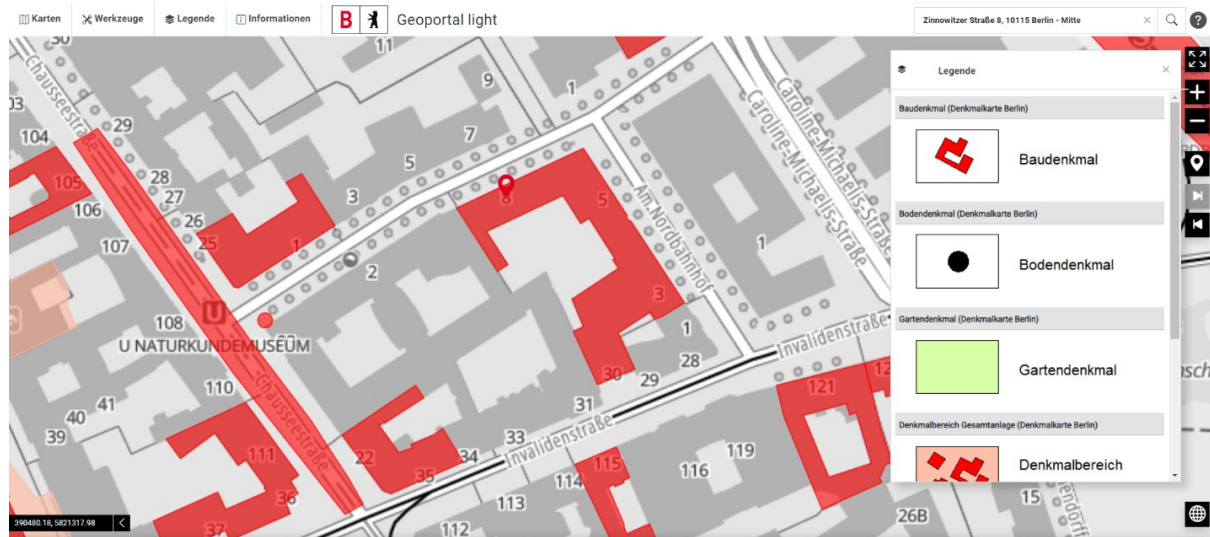


Fig. 18 Historical/Cultural Heritage Protection [91]

Appendix C: Interview Questions

First Interview Round: Individual Interviews

1. Do you feel that this selected case study meets all of asset conditions in the list below?

- Adaptable site and floor plan, and ceiling height
 - Additionally, potential for densification
 - Additional shafts for MEP
- Façade condition (estimate/best guess)
- Location (central, residential, or downtown edge)
- Potential for the addition of balconies (estimate/best guess)
- Hazardous materials unlikely to be present
- Superstructure allows for additional floors (estimate/best guess)
- Prestressed concrete not present (estimate/best guess)
- Heritage or cultural significance
- Daylight & Ventilation

2. Are there any items on the list that are not important? Any that you would add?

3. This section has to do with: the Role of Communication

Communication: the interaction and successful sharing of ideas and concerns.

Company-wide GRESB standards: a concrete ESG strategy that is implemented on a large scale and used by all employees.

- Scenario: Using GRESB as a companywide strategy for this project, real-time water usage monitoring devices are to be installed, but there is a conflict in the actual construction as they were not included in the tendering.
- Question: Which skills and approaches can the project manager use to address this challenge now and what could have been done previously?
Can you think of a situation where this would have a negative effect?

Limit of Leverage: the careful use of loans and interest on a project wide and company wide scale.

- Scenario: You are in the process of negotiating with general contractors. However, due to a limited budget and restricted use of financial leverage, there are challenges in securing favourable terms and prices.

- Question: How can the project manager contribute to maximizing the use of limited leverage resources when securing the contracts? Can you think of a situation where this would have a negative effect?

Location: the asset is in a desirable area, either central, residential, or along the downtown edge. In Berlin it is especially important that amenities, leisure, and transportation connections are available.

- Scenario: The location is highly desirable, and generally agreed on to create a successful project, however the neighbourhood community is protesting the project.
- Question: How can the project manager support both the community members and the project's success? Can you think of a situation where this would have a negative effect?

4. This section has to do with: the Impact of an Information Limit

Information Limit: a decision-making method that places a maximum on the amount of information that can be used.

Taxonomy Update: the awareness of current and future changes and increases in ESG requirements on the EU level.

- Scenario: The EU updates the taxonomy measures required, but the project manager, who is required to make a quick decision regarding a project in the design stage and are not aware of the update, leading to a lowering ESG ranking for the project than planned.
- Question: How does this decision by the project manager impact the project? What suggestions would you have? Can you think of a situation where this would have a positive effect?

Low Vintage Years: the limited amount of years used for a loan to decrease the associated risk.

- Scenario: A continuation of the previous scenario. To make up for the new requirement the project construction deadline is extended, increasing the vintage years for the project.
- Question: How does this lack of information increase the vintage years of the loan? Do you have any suggestions on managing this impact? Can you think of a situation where this would have a positive effect?

Material: there are none, or there is a low likelihood of hazardous materials being found.

- Scenario: A non-technical due diligence report is provided for the project, which does not include the investigation of hazardous materials on site. Accordingly, after construction has begun EU regulated toxic materials are found and require disposal.
- Question: How does this lack of information impact the project? What suggestions would you have, what would you have done differently? Can you think of a situation where this would have a positive effect?

5. This next section will look at the impacts of using a mental shortcut.

Mental Shortcut: a decision-making method that uses the first impulse based on experience.

Balanced Earnings: the awareness of the requirement for financial success as well as ESG successful rankings

- Scenario: When faced with a decision on which contractor's offer to accept, the project manager selects the contractor that was used on the previous project as they have experience on ESG certified projects, but they were underbid by other general contractors.
- Question: Does the experience that project manager have with the contractor have a positive or negative influence?

Risk & Deviation: the monitoring of risk and deviation rates in the returns and profits of an asset and fund.

- Scenario: Unexpected structural issues require an increase in the financial resources for the implementation of an additional floor. On a previous project, the project manager was able to secure additional financing, and plans to do so for this project.
- Question: Does this use of past experience increase or decrease the financial risk of the project?

Heritage: the building has a heritage designation or has cultural significance for the neighbourhood.

- Scenario: The heritage zoning on a previous project created severe conflicts between the legal restrictions and the project goals. As such, the project manager decides to not take on the project.
- Question: Is it appropriate to assume that this project will be unsuccessful based on past experience?

6. This section will look at the impacts of the Informed Rule of Thumb method.

Informed Rule of Thumb: a decision-making method using research as well as professional past-experiences.

Internal KPI (-): the implementation of the GRESB ranking as a means of success measurement on a company wide scale.

- Scenario: The real estate company owning and redeveloping this project develops new internal KPIs according to GRESB, an ESG benchmarking assessment tool. The project manager continues to use the previous experience to inform decision making. Not meeting the KPIs.
- Question: Do you think that this disregard for the new KPIs is justified? Would you have done anything differently?

Company-wide Risk (/): a concrete variance zone allotted on a large scale for the company, that determines how much uncertainty is allowed.

- Scenario: The real estate company sets an internal limit of the amount of risk that is acceptable for a project. Using an informed rule of thumb method the project manager makes decisions for the project.
- Question: Do the decisions made support the risk limit?

Floorplan (+): the existing floorplan, building layout and property of the office building allows for residential uses. In Berlin is it especially important that additional MEP shafts can be outfitted, and that the property has potential for densification.

- Scenario: The project manager worked on a previous office conversion project where the floorplan was very similar. Using this experience the project manager concludes that the floorplan supports a successful project.
- Question: Do you agree with the project manager's decision? Why?

Second Interview Round: Group Interview

1. Adaptive Reuse Asset Conditions: Results

Per the results of the literature review as well as the 1st interview round, the asset conditions of an adaptive reuse project have, on average, an effect on one another. However, this interrelationship between them is dependent on the situation, meaning that it could be a positive or a negative impact, but an impact nonetheless. See Tables X and XV below.

TABLE X
Adaptive Reuse Asset Conditions: Resulting Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Final Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor	Result	Interrelation
Heritage and Balconies	Negative (-)	0.20	Negative (-)	$3 \times 0.16 = 0.48$	0.68	Negative (-)
			Situation Dependent (/)	$3 \times 0.16 = 0.48$	0.48	Situation Dependent (/)
Balconies and Daylight	Null	0.20			0.20	Null
			Situation Dependent (/)	$4 \times 0.16 = 0.64$	0.64	Situation Dependent (/)
Heritage and Superstructure	Null	0.20			0.20	Null
			Negative (-)	$2 \times 0.16 = 0.32$	0.32	Situation Dependent (/)

Asset condition success factors not listed here had no conflicting results with the literature review

TABLE XV
Interrelationship Table (Asset Condition only): Updated per post-Interview Results

			Renovation							
			Adaptive Re-use							
			Floorplan	Facade	Location	Balconies	Vacancy	Materials	Structure	Heritage
Renovation	Adaptive Re-use	Floorplan		/		/		/	/	/
		Facade				/		/	/	/
		Location					-	/	/	
		Balconies						/	-	/*
		Vacancy								
		Materials								
		Structure							/*	/
		Heritage								/
		Daylight & Vent.								

* = change post-interview

+ = Positive Interrelation

- = Negative Interrelation

/ = Interrelation

Question: Using the Case Study of Zinnowitzerstr. 8 in Berlin, do you agree that the interrelation between these success factors is, on average, situation-dependent? Why or why not? Can you think of an alternative explanation for this relationship?

2. Project Management: Results

Per the results of the literature review as well as the 2nd interview round, the interrelationships of the adaptive project management success factor Communication had the highest agreement rating of a positive interrelation to the other success factors. While Information Limit had the second highest agreement rating that it has a negative impact on the other success factors. On the contrary, a Mental Shortcut was found to have, on average, a positive affect, differing from the literature review, which noted this interrelation as predominantly situation-dependent. Finally, Informed Rule of Thumb, was found to have a varying impact on the other success factors, which was in line with the literature review. Accordingly, the summarized results are shown below in Table XVI.

TABLE XVI
Comparison Table: Results of the Literature Review & post-Interview

Highest Ranking Success Factors	Interrelationships								
Project Management	ESG & Sustainability			Sustainable Investing			Renovation		
Adaptive Project Management	GRESB	LR	RI	Value-Add & Opportunistic	LR	RI	Adaptive Re-use	LR	RI
Communication	Company-Wide	+	+	Limited Leverage	+	+	Location	+	+
Info. Limit	Taxonomy Update	-	-	Low Vintage Years	-	-	Materials	-	-
Mental Shortcut	Balanced Earnings	/	+	Risk & Deviation	/	+	Heritage	/	/
Informed Rule of Thumb	Internal KPI (-)	-	-	Company-wide Risk (/)	/	/	Floorplan (+)	+	+

LR = Literature Review Results
RI = Results post-Interview

Due to the limitations of this master's thesis we will only review, during this interview, the success factor of Communication, as it had the highest agreement rating. See Table XI below.

TABLE XI
Communication: Resulting Interrelations

Success Factors	Result from Literature Review		Result from Interviews		Final Result	
	Interrelation	Weight Factor	Interrelation	Weight Factor 1 person =	Result	Interrelation
		0.20		0.16		
Communication and Company-Wide GRESB	Positive (+)	0.20	Positive (+)	3 x 0.16=0.48	0.68	Positive (+)
			Situation Dependent (/)	3 x 0.16=0.48	0.48	Situation Dependent (/)
			Null	2 x 0.16=0.32	0.32	Null

Communication and Limited Leverage	Positive (+)	0.20	Positive (+)	3 x 0.16=0.48	0.68	Positive (+)
			Null	4 x 0.16=0.64	0.64	Null
Communication and Location	Positive (+)	0.20	Positive (+)	5 x 0.16=0.80	1.00	Positive (+)

Using the Case Study of Zinnowitzerstr. 8 in Berlin, do you agree that the interrelation between these success factors is always positive? Why or why not? Can you think of an alternative explanation for this relationship?

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