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From theory to practice: evaluating success factors of adaptive reuse through a case study

Built Environment
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Fatemeh Vafaie, Hilde Remøy and Vincent Gruis

*Department of Management in Built Environment, Delft University of Technology,
Delft, Netherlands*

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Abstract

Purpose – This study assesses the success of a real project in practice, using identified success factors from recent systematic literature. It investigates how theoretical insights translate into real-world outcomes by answering the question: “How do success factors identified in existing literature contribute to the success of a real-world adaptive reuse project?”.

Design/methodology/approach – This research utilizes a case study methodology to explore the adaptive reuse phenomenon through the lens of the Fenix I in the Netherlands. Three comprehensive semi-structured interviews with key decision-makers provide insights into experiences, challenges, and ultimately the evaluation of success factors in practice. Data analysis involves deductive coding, systematically organizing success factors into ten categories derived from the literature, to implement the analysis and align with the research objectives.

Findings – The results demonstrate the application of a majority of success factors identified in literature within the case study. This study reveals differences in the levels of significance among these factors, their categorization and their existence, particularly between listed and non-listed heritage buildings. Moreover, it shows the remarkable impact of public-private collaboration from the early stages of decision-making through project implementation. The study confirms that a successful real-world project addresses a significant proportion of the success factors identified in the literature.

Originality/value – This research facilitates the decision-making process for stakeholders and practitioners in adaptive reuse projects, aiming to foster the development of more successful initiatives in this field.

Keywords Adaptive reuse, Adaptation, Case study, Success factors, Successful project, Industrial heritage building

Paper type Research paper

1. Introduction

The Industrial Revolution, which started in the second half of the 18th century, and a subsequent transformation in the early 20th century led to the disuse of existing industrial facilities as newer ones were built in alignment with technological developments (Albrecht, 2012). This revolution is considered one of the most significant changes in human history (Andrei, 2012). Industrial buildings are a crucial part of our cultural heritage, symbolizing the historical development of our society. As a result, they play a key role in shaping the identity of local communities (Grecchi, 2022). The preservation of historic industrial buildings and their heritage value became key topics of conservation discussions across various European nations during the latter half of the 20th century, albeit at different times (Rodopoulou, 2020). Brownfield lands and industrial sites often have essential infrastructure, such as roads and sewers, making adaptive reuse a reasonable choice in terms of minimizing additional infrastructure costs. Consequently, adaptive reuse has emerged as the primary approach for preserving and conserving old industrial buildings or brownfield areas (Douet, 2016).

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This research addresses a gap located at the center of a triangle, whose three corners represent gaps in adaptive reuse in practice (case study), the success factors of adaptive reuse (from the literature) and industrial heritage buildings. Consequently, this research seeks to investigate the success factors of adaptive reuse projects through a case study of an industrial heritage building. While the abandonment of older industrial heritage buildings can pose a threat, a well-devised plan can also turn it into a favorable opportunity for the city (Porkar *et al.*, 2023). Despite the rich body of literature emphasizing the value of industrial heritage buildings, the complexity and ambiguity of their adaptive reuse remain significant challenges (Rodopoulou, 2020). Moreover, not only in academia but also in practice, the adaptive reuse of heritage buildings require compatible, appropriate, and scientific means for assessing built heritage assets. However, at present, research in this area remains relatively limited (Li *et al.*, 2021). In addition, due to the lack of research concerning success factors and knowledge management in the adaptive reuse of historical building projects (Alauddin, 2014), more recent studies have looked into success factors of adaptive reuse projects (Vafaie *et al.*, 2023). This study evaluates a real project that has been recognized as successful by various stakeholders, assessing it based on success factors identified in the literature.

In the Netherlands, due to the financial incentives, supportive legislation, and participatory policy programs, adaptive reuse has emerged as the most viable option for spatial development in response to economic challenges (Kaya *et al.*, 2021). Fenix I was chosen as a case study to apply the success factors derived from literature on industrial heritage adaptive reuse projects. This research aims to uncover and discuss the challenges involved in decision making for stakeholders engaged in the adaptive reuse of (heritage) buildings and assess the practical applicability of success factors derived from literature through a case study of the Fenix I. Therefore, this paper aims to answer the research question, “How do the success factors identified by literature contribute to the success of a real-world adaptive reuse project?”

2. Literature review

2.1 Success factors of adaptive reuse

Successful adaptive reuse projects encompass several factors across different categorizations. Based on the research by Vafaie *et al.* (2023) which the results are drawn from a systematic literature review of relevant sources, a comprehensive success factors of adaptive reuse in ten categories, is presented in Table 1. Although there is no certain and definitive answer to the success of any project, whether adaptive reuse or otherwise, this study seeks to investigate and assess the success factors identified in the literature but this time through a case study.

2.2 Adaptive reuse and decision makers

Adaptive reuse is viewed as a transformative process that begins with a period of disuse and neglect (Lanz and Pendlebury, 2022). It is also defined as a strategic approach aimed at extending the physical and functional lifespan of a building by (re)defining its purpose within the existing structure, while preserving its historical significance (Wilkinson *et al.*, 2009; Conejos *et al.*, 2016). Adaptive reuse differs from other building adaptation practices, such as refurbishment, renovation, and restoration, as its primary focus is on repurposing a building for a new use, rather than simply extending its functional lifespan for its original purpose (Shahi *et al.*, 2020). According to Kurul (2003), compared to new construction projects, the importance of team assembly in adaptive reuse projects is more noticeable due to the specialized knowledge and input required. Therefore, it is crucial to identify and recognize the key stakeholders who play vital roles during the decision-making process. Mason (2002) divides stakeholders involved in conservation and adaptive reuse into three categories: Insiders, who are actively engaged in decision-making and influence the final decisions; outsiders who have limited leverage or little impact on the process; and constituencies, who may have potential impacts or future interests. In this research, the focus is limited to the

Table 1. The summary of success factors and their classifications

Architectural-physical	Structural-technical	Socio-Cultural	Economic	Environmental
1. Minimum intervention 2. Potential of reversibility 3. Explicitness of alterations 4. Architectural harmony and Visual compatibility 5. Analysis and assessment of structural layout 6. Upgrading physical characteristics around 7. Creativity 8. Age value of materials 9. Building usability 10. Material durability	1. Predicting seismic resilience 2. Extension in building's life 3. Renewable technologies 4. New technical systems and artworks 5. Load-bearing structure 6. Choice of materials 7. Technological innovations 8. Orientation and solar access 9. Flexibility of components	1. Shared cultural identity 2. Attachment and sense to place 3. Maintaining the heritage and cultural significance 4. The interest of the community 5. Practical social amenities 6. The quality of life, and user's need 7. Community participation in reuse 8. Raising public awareness 9. Social Inclusion and Combat social issues	1. Property value enhancement 2. Saving construction cost 3. Saving construction time 4. Attractive location 5. Increasing job opportunities 6. Earning from Tourism 7. Return on investment 8. Self-sustaining	1. Accessibility 2. Liveability of the historic district 3. saving natural/ local resources 4. Participation in urban regeneration 5. Material life cycle 6. Using open and green spaces 7. Scenic/ contextual value
Energy	Authenticity	Legal	Management	Functional
1. Analysis of the current condition 2. Adequate construction/ energy efficient measures 3. Establishing energy management 4. Applying energy-efficient systems 5. Thermal protection of envelope elements 6. Reading of the building (Energy) 7. The light and air quality	1. Aesthetic contribution to the historical streetscape 2. Architectural history 3. The importance of the historic site 4. Assessing the authenticity aspects 5. Reliability of the data 6. Considering cultural diversity 7. Attention to valuable and fragile heritage features 8. Reflecting building's life in the past 9. Prioritizing the building's parts	1. Compatibility with the building code requirements 2. Respecting the preservation rules and provisions 3. Compatibility with zoning and (urban) planning requirements 4. Direct democratic governance 5. Public-private partnerships 6. Research, Identification and Historic Analysis	1. Making decision (common) steps 2. Management conservation plan 3. The "right" partnership of stakeholders 4. Various knowledgeable experts 5. Indispensable data for decision making 6. Recording the management process 7. Needs of the region 8. Stakeholders' satisfaction 9. Management policies	1. The new functional compatibility with the old use 2. Compatibility of new use to the original building 3. Engagement of humans and heritage building 4. People's activities in new use 5. Usefulness of spaces 6. Temporary function

Source(s): Vafaie et al. (2023)

insiders, who play the most significant roles in the decision-making process as key decision makers.

2.3 Adaptive reuse of industrial heritage buildings

In recent years, experts and government officials have focused on developing adaptive reuse plans for abandoned buildings, particularly industrial structures with cultural heritage

significance. This approach is effectively important as it repurposes these buildings to address broader sustainability concerns (Vardopoulos, 2022). The adaptive reuse of industrial buildings typically involves projects initiated by both public actors, driven by social interests, and private entrepreneurs, seeking personal profit (Grecchi, 2022). Industrial heritage buildings can act as catalysts in urban master plans, enhancing the character and identity of a place. When abandoned factories are left unattended, they can negatively affect the surrounding areas, contributing to urban decay and increased social and safety issues (Grecchi, 2022). However, reusing these industrial sites can transform them into vibrant spaces that contribute to the regeneration of the city, neighborhood and community, addressing these challenges.

2.4 Adaptive reuse of (heritage) buildings in the Netherlands

During the 1990s, several European countries recognized the need to shift from control-based conservation approaches to more flexible and dynamic heritage management strategies (Fairclough and Rippon, 2002). However, policies, rules and regulations, risk-taking permissions, and the required levels of flexibility, based on the heritage value, varies from country to country. Among European nations, the Netherlands, England, and Sweden stand out as countries where conservation planning is particularly professional and supportive for adaptive heritage reuse of listed and non-listed heritage buildings. In these countries, policy development actively encourages and facilitates adaptive reuse by adopting a 'care for' approach to heritage rather than a 'protect from' perspective (Mérail *et al.*, 2022). The Netherlands stands as a proper model with advancements in administrative, regulatory, and economic structures that promote adaptive reuse practices aligning with circular principles (Kaya *et al.*, 2021).

3. Methods

Case study is a well-suited research approach when the research questions start with “how” or “why” questions (Yin, 2009) and is commonly used in adaptive reuse studies, such as those by Scadden *et al.* (2001), Henehan and Woodson (2004), Bullen and Love (2009). According to Yin (2009), “case study investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used”. Notably, even an in-depth single case study conducted at the appropriate level can provide a foundation for developing a theoretical explanation of a broader phenomenon (Eisenhardt, 1989). Eisenhardt (1989) argues that conducting an extensive literature review at the start of the research is essential. This allows for the development of a theoretical framework, which can then be validated and refined through empirical case study data. In this article, the results of a systematic literature review study by Vafaie *et al.* (2023) are applied in an in-depth analysis of Fenix I.

3.1 Case selection criteria

The case study selection criteria comprised five main standards, emphasizing the availability of literature and direct access to sources. Key considerations included assessing the quality of archives, data, plans, and photos of the building's history, as well as the potential for direct communication with decision-makers through interviews. Field observation accessibility and authorization for data capture, analysis, and publication were also crucial. The criteria also included: (1) the original building's construction year should not be much earlier than the Industrial Revolution; (2) the building must have undergone both functional and physical alterations within an agreed-upon scale; (3) the case study should be located in the Netherlands to facilitate direct observation and fieldwork; and (4) the case must represent a successful adaptive reuse project. Thus, the five main criteria—including the availability and validity of sources, the potential for direct communication, authorization for data collection, and the other

sub-criteria mentioned—were applied to the case study. It is noteworthy that although the case study is situated in the Netherlands, the success factors applied are drawn from international literature and are not limited to any specific context or country.

3.2 Qualitative research interviews

Semi-structured interviews were chosen as the inquiry technique for this study to allow participants to freely express their views within a structured framework aligned with the main research question and study objectives. The interviewees, including experts from the architecture firm, real estate development company, and municipality, were selected among various professionals within their organizations based on their roles and their awareness and involvement in the decision-making process throughout the project's development stages. The three interviews began with an introduction, followed by questions regarding the decision-makers' roles, their experiences with adaptive reuse projects, motivations for participation, and their views on the project's achievements, challenges, and benefits. To gather comprehensive information aligned with the research objectives, the main section was dedicated to open-ended questions. This allowed interviewees to independently express their perspectives, free from any preconceived notions, thereby contributing new knowledge to the existing literature.

3.2.1 Sampling method. Focusing on the success of adaptive reuse strategies, it was crucial to include specialized participants who are professional, experienced, and actively involved as key decision-makers in the adaptive reuse process. Therefore, purposive sampling was selected for the interviews. [Given \(2008\)](#) defines purposive sampling as a method for obtaining information and insights from those especially knowledgeable about a topic. As the goal of qualitative sampling is to select participants who can provide rich data for understanding the studied case ([Hennink et al., 2019](#)), this research specifically targeted individuals and key decision makers with sufficient knowledge of the process to provide relevant data and answers to the questions. The primary consideration during data collection was to conduct interviews with key decision-makers and experts directly involved in the project, who represented their sector, company, or party, and played a pivotal role by actively participating in the decision-making process. Accordingly, the sample size of three interviews was deemed sufficient due to the depth and quality of the data provided by these experts, who were deeply knowledgeable about the decision-making process and fully aware of all relevant details. In qualitative research, the focus is on data saturation rather than sample size. [Hennink and Kaiser \(2022\)](#) define data saturation as the point when no new themes or information emerge from further interviews. After conducting the interviews, it became clear that the key themes relevant to the research had been thoroughly explored, and additional interviews would likely not have provided new insights. From the public sector and municipality, an expert of urban redevelopment projects was selected; from the architecture firm, a project manager experienced in the reuse and transformation of existing/heritage buildings was chosen; and from the real estate development company, an experienced regional manager was included. All interviewees have more than 20 years of experience in their respective fields of expertise.

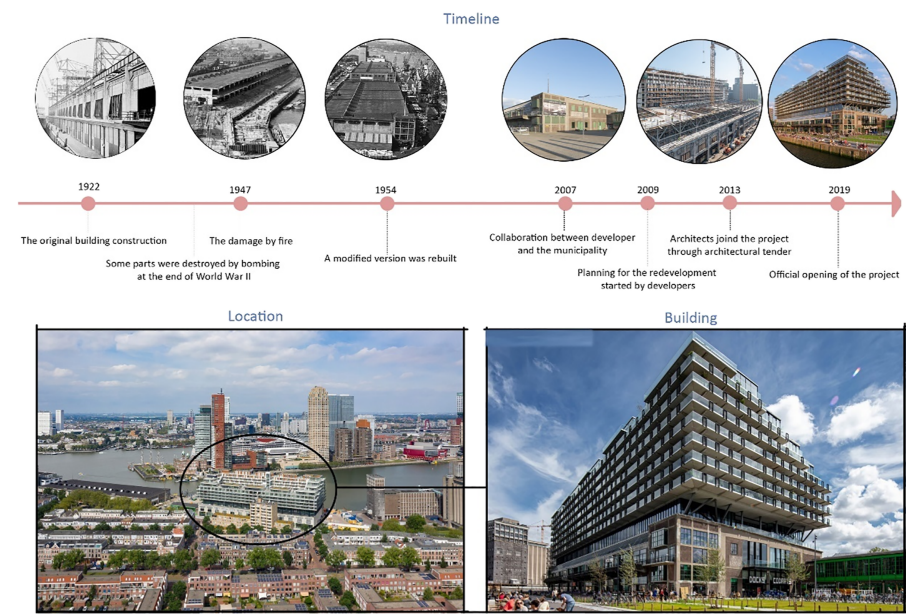
3.2.2 Deductive approach and coding. After transcribing all interviews word by word, a thorough coding process was conducted using the ATLAS.ti program. In general, the process of coding aims to categorize and sort all of the data, to make a possibility of comparing systematically with other parts of the data set ([Gale et al., 2013](#)). Deductive reasoning is a theory-testing process that relies on an established theory or generalization and follows a procedure to determine if the theory is applicable to specific instances or cases ([Hyde, 2000](#)). In a deductive approach, all the codes and themes are preselected based on prior literature, existing theories, assumptions, or the specific research question ([Gale et al., 2013](#)). In this research, the codes are the pre-defined key terms, words and descriptions that are used to analyze and identify relevant information in order to provide a logical and meaningful response to the main research question. The ten different categories of success factors were

systematically organized into code groups, with each relevant factor being saved as a subcategory. This approach facilitated the complete list of all success factors discussed in the interviews, offering easy access to relevant quotations. The author’s knowledge about success factors known from literature was important for the coding process.

3.3 Case description

3.3.1 Location: Katendrecht, Rotterdam. In the last decade, Rotterdam has seen a significant rise in visitors and has developed a reputation as a progressive city, particularly in waterfront development (Nientied and Toto, 2020). Katendrecht, a peninsula largely surrounded by water, was initially a lively harbor area in the late 19th century, home to many dockworkers. However, the neighborhood faced a decline in the 1960s when the harbor moved shifted westward. This shift resulted in decreased facilities, a deteriorating community, abandoned buildings, rising criminal activity, and an overall negative community image (Eshuis and Edwards, 2012). Initiated by the city, the urban regeneration of Katendrecht has been a collaborative effort involving municipal urban planners and various key stakeholders. This collaborative and communicative approach in spatial planning exemplifies a more inclusive model for urban regeneration in the Netherlands (Vandenbussche, 2018).

3.3.2 Fenix I. The San Francisco warehouse, constructed in 1922 by the Holland-America Line as an important part of the history of Katendrecht, was the world’s largest transshipment warehouse during its time. However, much of the warehouse was destroyed during the bombing of Rotterdam in World War II. In 1947, a fire ruined the remaining operational sections of the San Francisco warehouse. In 1954, a modified version of the warehouse was rebuilt, as shown in Figure 1, and it is this version that the name “Fenix” refers to. Notably, the reconstruction did not restore the warehouse’s full original dimensions; only two sections were rebuilt, resulting in Fenix I which is the focus of this study and Fenix II. These buildings stopped serving their harbor function by the late 1990s. Regarding stakeholders, the



Source(s): Created by authors

Figure 1. The timeline of the Fenix I changes, its location and the latest version

municipality of Rotterdam initially owned Fenix I and II, planning to demolish and build new houses as part of urban regeneration. However, recognizing the historical significance, the municipality sought a partner to preserve the buildings. Despite initial lack of interest from other parties, a company of developers submitted a proposal to retain Fenix I, building a large number of dwellings on top. The municipality supported this idea, leading to a collaboration between the developers and the municipality. Fenix I was eventually sold to the developer company with the condition of preserving its cultural function. After all, they were responsible for architecture firm selection and the architects joined the redevelopment process afterward.

The design of Fenix I creates a coherent relationship between old and new (Walsh, 2019), which in a short period of time has garnered international recognition. It is now considered as one of the most awarded transformation projects nationally and internationally in recent years (Prosdocimo, 2020). The awards such as the American Architecture MasterPrize 2020 (Winner Heritage Architecture), the Dutch Architectenweb Awards 2020 (Residential building winner of the Year), the German Iconic Awards 2020 (Best of Best Innovative Architecture) and Design Award 2021 (Special mention Excellent Architecture, among others.

4. Results

This section presents the results of the interview analysis. The identified success factors were matched with key terms in the interviews. The factors that were discovered to impact the success of the project are highlighted in quotation marks throughout the text, such as “upgrading of the physical characteristics of the surroundings”.

4.1 Architectural

“Creativity” is one of the important factors when merging old with the new in an adaptive reuse project. The municipality of Rotterdam emphasized that the Fenix I apartments distinguish themselves from other apartment buildings. The architects used the term of Blending and Blurring to define the integration of identity, context, and existing changes within the Fenix I. They highlighted the significance of achieving a harmonious balance between the old and the new, describing it as “architectural harmony and visual compatibility,” a success factor which was also stated by the developer company. Despite the necessity for harmony in alterations, the “Explicitness of alterations” also plays a pivotal role in Fenix I, as noted by the municipality. Besides, the intentional use of different materials and careful consideration of their integration in the project was mentioned. The preference of the municipality to not merely replicate the existing structure on the upper floors was described during the interview. It was also added that the important role of Fenix I project as a pivotal moment in the development of Katendrecht, contributing to the “upgrading of the physical characteristics of around” in the area. Regarding architectural considerations, the designer underscored the importance of conducting a thorough “analysis and assessment of the structural layout” of the building’s physical state before initiating the adaptive reuse process, marking another success factor in this category. This was also taken into account for the ground and landscape of the building for safety reason due to supposition of explosives from the second world war.

4.2 Socio-cultural

The adaptive reuse of Fenix I is seen as a gift to emphasize Katendrecht’s identity, noted by the architect, and is linked to its historical narrative, mentioned by the developer as contributing to the “shared cultural identity” factor. The project was able to promote a feeling of belonging, “attachment and sense of place” to make locals proud of the heritage of the area, highlighted by the municipality personnel. Additionally, the planned temporary programming for Fenix I emphasizes the success factor of attracting public interest in the socio-cultural context,

aligning with the success factor of “the interest of the community” in socio cultural categorization. On the other hand, the importance of “community participation in reuse” especially for the end users was not underestimated by the stakeholders during ongoing discussions, reflecting an understanding of their preferences. This approach also contributed to “raising public awareness” of the reuse process, facilitated by on-site information and illustrations. The municipality highlighted the ability of the project to provide “the practical social amenity” where people could visit, engage in community activities, and spend time, thereby enhancing the public’s connection to the space. One of the key success factors in the socio-cultural category, is the effective “combating of social issues” and criminal activities, which was addressed collectively by stakeholders. The municipality and developer mentioned the neighborhood as an isolated area where a lot of criminal activities took place and after the redevelopment, the area reached the safety level where people want to live there and enjoy its public spaces. This transformation significantly improved “the quality of people’s daily life in the area and answering the user’s needs”.

4.3 Authenticity

In the context of preserving authenticity in the adaptive reuse of Fenix I, the architect described the importance of analyzing the cultural heritage of the (physical) building, its historical background, and the evolving meanings and scenes associated with it over time. This emphasizes the “assessment of authenticity aspects” as another success factor in maintaining the authenticity of Fenix I. The project developer highlighted this notion by stating “you can only respect the past if you know the past”. The developer also noted the need to consider the history of the area and what remains, stressing “the importance of the historic site” as a noticeable factor for adaptive reuse. In addition, the municipality revealed the reason behind the preservation of the open spaces (in the ground floor) to “reflect building’s life in the past”. The architect supported this view, pointing to their effort to convey past events, memories, and the original building’s story through the design. An illustrative example is the integration of design elements that preserve the original building’s old arcades and enhance the “readability of the information,” such as the historical use of the building where freight trains once entered through the arches. Despite the fact that Fenix I is a historically listed building, “Prioritizing the building’s part” for maintenance was taken into account during the design process. The municipal employee further explained that the “architectural history” and the building’s ability to narrate the past and add character were central to the decision for adaptive reuse.

4.4 Management

Literature highlights that decision-making in the adaptive reuse of historic or existing buildings must consider key management parameters. In the case of Fenix I, all stakeholders agreed that the “right partnership of stakeholders” was one of the most critical success factors. Additionally, the presence of “knowledgeable experts” was emphasized as another crucial factor in all the interviews. In this context, all stakeholders demonstrated experience and expertise in adaptive reuse projects. For example, the architects have established a dedicated department focused on building transformations and adaptive reuse, enabling them to successfully redesign both listed and non-listed buildings. The “satisfaction of stakeholders”, was another factor which was noted by all the interviewees, underscoring its significance during the decision-making process. Accordingly, the expert from the municipality introduced the idea of constant dialogue, emphasizing its role in ensuring that the project met the needs of everyone involved. This collaborative approach extended beyond stakeholders, incorporating “the needs in the region” as a pivotal factor in the decision-making process of Fenix I. Despite the building not being formally listed, the “decision-making steps” — from evaluating the original structure to determining the scope of work — were still carefully considered.

4.5 Structural

In the adaptive reuse of (heritage) buildings, it is essential to incorporate new layers and components in ways that allow for future physical and functional alterations. This principle was partially realized in the new section of the building and on the upper floors. The possibility of removing or shifting of walls within the apartments reflects, to some extent, the success factor of “flexibility of the components”. The architect also pointed out their efforts to integrate “new technical systems” in certain parts of the project to enhance the adaptive reuse outcomes and incorporate “technical innovations” in addressing energy grids. The developer emphasized “extension in the building’s life” by at least 100 years as a significant success factor, attributing this extension to the adaptive reuse of the building.

4.6 Environmental

The success factors related to the environmental aspects of the project, particularly concerning its surrounding area, were partially mentioned by the interviewees. Given the project’s role in the urban redevelopment of the Katendrecht and the surrounding neighborhoods, it inherently aligns with the success factor of “participating significantly in urban regeneration” and providing benefits to the area. Additionally, the project has effectively contributed to “the liveability of the historic district” by promoting interaction among both existing residents and incoming population, as highlighted by the municipality. Regarding environmental success factors, the project took into account “utilizing open and green spaces” to enhance both environmental quality and users satisfaction. This was achieved through the incorporation of features such as green roofs, aesthetically pleasing paving, and surrounding elements, described by all the interviewees.

4.7 Energy

Even though the project’s inception for adaptive reuse dates back to 2014, and the significance of energy considerations has evolved over time, the design process incorporated some factors related to this aspect. The building integrates a mechanical ventilation system with high-efficiency heat recovery, coupled with the utilization of heat and cold storage for regulating the building’s temperature. Described by the architect as an energy grid system, this approach enables the visibility of energy consumption, emphasizing the importance of an “energy-efficient system.” Additionally, the project prioritized the enhancement of natural lighting through its design, aligning with the factor of “light and air quality” in the context of adaptive reuse. Addressing energy consumption considerations, it was also noted that adapting the old building to current standards necessitated increased energy efficiency—emphasizing the importance of “adequate energy-efficient measures.”

4.8 Functional

One of the most significant factors within the functional category is “the compatibility of the new function with the old function”. Given that the building was previously a warehouse, the opportunity and necessity to consider its former function when defining the new function were relatively limited. Therefore, the aforementioned factor was only partially taken into account. Not only within the socio-cultural categorization, one of the main reasons of adaptive reuse was to transform the neighborhood into a safer, more liveable and community-oriented environment, but also functionally it was essential to propose new functions that would support this goal. Consequently, all proposed functions in the ground floor of the original building have been designed as public and social gathering spaces for different purposes. This approach also reflects “human engagement with the old building” through the defined functions, as another functional success factor of Fenix I. Within the socio-cultural category, considering the interests and needs of local residents at various stages of programming, design, and decision-making was directly linked to the new functions of the building and how these

functions addressed those needs. For example, the municipality personnel noted that, despite the already high ceilings on the ground floor, there was potential to remove a floor to accommodate a circus (dance) school, effectively addressing specific community needs. This example illustrates the importance of aligning the requirements and expectations of the new use, and related to “people’s activities in new use” and “usefulness of spaces” factors to a certain extent. The incorporation of a “temporary function” in the adaptive reuse process was also a deliberate decision. While this choice wasn’t primarily aimed at reducing expenses, it was intended to bridge the time gap during the redevelopment process, adding value to the project and attracting local residents and visitors.

4.9 Legal

Decisions regarding adaptive reuse and its associated strategies must comply with legal framework. The municipality highlighted the significance of aligning the project with current regulations, emphasizing “compatibility with the building code.” Besides, the importance of legal regulations (Bouwbesluit), governing installations, safety, and building codes, along with specific municipal guidelines, particularly from a design quality perspective were also noted. For instance, the municipality discussed about the importance of differentiating materials between the old and new elements, stressing the interface as a representation of “compatibility and respect for national provisions” on a municipal scale. As the project is a part of urban regeneration and city development, it also had to comply with the urban master plan and zoning, “compatibility with zoning and urban planning requirements”. According to the interviews, it is evident that the true collaboration of developers as a private party and municipality as the public party, played a significant role for the success of adaptive reuse in Fenix I. It indicates the factor of “public-private partnership” as a fundamental element for the overall success of the project.

4.10 Economic

Although the project was not economically successful from the developer’s perspective and faced challenges due to economic crises, a number of factors demonstrated the economic benefits of the adaptive reuse of Fenix I for both the project itself and its surrounding area. While adaptive reuse typically contributes to “saving construction time and cost”, the Fenix I project experienced extended timelines due to the economic conditions at the time. Nevertheless, considering other factors, the adaptive reuse of Fenix I significantly impacted the “property value enhancement” of the buildings around. Furthermore, it contributed to an “increase in the number of jobs” in the area. Additionally, the project also attracted people from all over the city and beyond to visit there and enjoy their time. As the municipality mentioned, ‘this interesting building attracts people not only from the neighborhood but from a broader area, from the entire city, and even visitors from outside of Rotterdam.’ This also indicates the potential for “earning from tourism in the area through the adaptive reuse of Fenix I.

4.11 Debateable results

Consistent with expectations, the historical significance of buildings are subject to distinct sets of requirements and varying levels of importance. For example, since Fenix I is not a listed building, certain decision-making parameters and success factors were not mentioned during the interviews or they weren’t at the center of concern and attention. This doesn’t conclusively indicate their absence but shows that they are less important compared to other abovementioned factors. The factors such as: “providing a detailed heritage management conservation plan” from the management categorization, and from architectural/physical factors, “potential of reversibility of new installations” and “minimum interventions” particularly in the original building were not taken into consideration. This phenomenon is also

observed within authenticity category where the factor of “attention to valuable and fragile heritage features” did not receive attention.

Table 2 shows the comprehensive report of the interviews focusing on the success factors of adaptive reuse based.

5. Discussion

5.1 Listed or non-listed building

While the systematic literature review conducted by Vafaie et al. (2023) encompassed all factors applicable to both listed and non-listed buildings, this study reveals the differences in factors influencing decision-making and design processes between these two classifications. For the integration of old and new elements within building structures, Brooker and Stone (2016) classified three approaches: “installation,” “insertion,” and “intervention.” The “installation” approach keeps old and new elements independent and they are not directly overlapped, suitable for conservatively preserving listed and highly protected structures. “Insertion” involves closer integration, striking a middle ground and edge to edge of new and old layers, while “intervention” integrates new layers with existing structures, suitable for buildings requiring external support or more flexibility for changes. Based on the description provided, the Fenix I adopted the “intervention” approach in its structure. This involved integrating new layers and structural elements with the existing structure, serving as the foundation for upper residential floors, rather than maintaining them as separate entities. Hence, the consideration of factors such as the “potential of reversibility” (pertaining to new installations that must not harm the building) from the architectural category and the “Flexibility of components” (for accommodating necessary future functional and physical changes) from the structural group varies based on whether the approach involves installation, insertion, or intervention of new and old elements. In the case of Fenix I, achieving potential reversibility for the new columns that serve as the foundation of the upper floor within the old building is not feasible.

5.2 Interrelations among the factors (architectural, structural, authenticity and legal)

In the process of identifying and analyzing success factors, it became evident that the architectural, structural, authenticity, and legal factors play crucial roles in the adaptive reuse of Fenix I. Moreover, these categories exhibit the interrelationships between some factors that manifest differently depending on whether the building is listed or not, also with different level of importance. It appears that “minimum intervention” and “potential of reversibility” within the architectural factors, “determining the impact of new technical system on artworks” and “flexibility of components for future changes” from structural category, “attention to valuable fragile heritage features” and “prioritizing the heritage buildings part” within authenticity factors, and “respecting to the preservation rules” within legal factors, are the tangible success factors related to the structure and material of the original building. These factors make substantial contributes to the reuse of (listed) heritage buildings compared to others. As a result, given that the Fenix I was not a listed building, the consideration of the aforementioned factors was not as prominent or imperative compared to other success factors. For example, in Fenix I certain modifications were undertaken to accommodate gym facilities for users and to provide adequate parking garage spaces, leading to the removal of sections of the building, including void and columns. This fact does not precisely align with the principle of “minimum intervention”; however, it can be interpreted that user needs and satisfaction, identified as another success factor, took precedence over the principle of minimum intervention in preserving the original building’s structural integrity. Alternatively, economic crises may have necessitated a more moderated approach in the final decision-making process.

Table 2. A summary of success factors identified and extracted through coding from the conducted interviews

	Factors	Municipality	Developers	Architects
Management	Closely collaboration of (right) partnership	✓	✓	✓
	Knowledge of expert/decision makers	✓	✓	✓
	Making decision common steps	✓		
	Recognizing the needs of the local and find parties by temporary use	✓		
	Management agreements and Consideration of stakeholders satisfactions and benefits	✓	✓	✓
Authenticity	Management policies for the new functions	✓		
	Attachment/sense to the area and place by locals	✓	✓	
	Readability of the data sources about the value/history			✓
	The importance of historic site of the area	✓	✓	✓
	The importance of the architectural History of the original building and narration behind that	✓	✓	✓
	Reflecting buildings life in the past considered in design stage	✓		✓
	Aesthetic contribution and height levels to the historic streetscape	✓		
	Prioritizing the building's parts within the existing building and new layers	✓	✓	✓
	Assessment of the authenticity aspects, meanings of the heritage building and vital sceneries was done	✓	✓	✓
	Participation in urban regeneration of the area and brining benefits for that	✓	✓	✓
Environmental	Contribution to the liveability of the area and people's relation with the building	✓	✓	
	Using of some green features and nice paving around	✓	✓	✓
	The importance of material life cycle			✓
	Accessibility to the metro and public transport	✓		
Legal	Research, Identification, historic Analysis of the area/building	✓	✓	✓
	Compatibility with zoning and urban planning requirements	✓	✓	
	The project is compatible with the current building codes, Bouwbesluit regulations	✓	✓	✓
	Trying to respect the (conservative) guidelines from the municipality for historic preservation of the building	✓		✓
	Public-private partnerships	✓	✓	✓
Socio-Cultural	Maintenance of the heritage and cultural significance	✓	✓	✓
	The building works as a practical social amenities in the neighborhood	✓		✓
	The quality of life and considering building user's needs	✓	✓	
	Combating criminal activities and social issues	✓	✓	✓
	Attracting public interest of community for reuse by temporary programming	✓	✓	
	Raising of public awareness about the redevelopment plans	✓		
	Shared cultural identity of the building and history behind that (bombing during the second world war)	✓	✓	✓
	Users/community participation in the planning		✓	✓
	Attachment and sense of the people to place/feeling of belonging	✓	✓	

(continued)

Table 2. Continued

				Built Environment Project and Asset Management
	Factors	Municipality	Developers	Architects
Functional	Defining temporary use for adding value	✓	✓	
	Compatibility of new use to the characteristics of the original building	✓		✓
	Considering user's activities in new use and changes for them	✓	✓	✓
	Trying to use the potential of different spaces	✓		✓
Economic	<i>human engagement with the old building</i>	✓		
	Attraction of the building/location for visitors and tourism from the whole city and beyond	✓	✓	✓
	Earning from tourism		✓	
	The project added a lot of work potential development and job opportunities	✓	✓	✓
Architectural	Property value of the Katendrecht neighborhood enhanced	✓	✓	✓
	Self-sustaining and potential market of the new uses	✓		
	Creativity and differences in architectural design of the building and apartments, natural lighting	✓	✓	✓
	Consideration of "Age value" of the materials and aesthetic qualities		✓	✓
	The physical characteristics of surroundings were upgraded	✓		
	The alterations and additional new layers are explicit and distinguishable	✓	✓	
	Building usability and the importance of suitable infrastructure for future changes			✓
	Architectural harmony and the contrast of new and old materials and colors were considered	✓	✓	
Structural	Analysis and assessment of structural layout was implemented besides cultural value assessment		✓	✓
	Flexibility of added components and spaces in the new parts of the of project	✓		✓
	The building's life span was extended to more 100 years	✓	✓	✓
	Consideration of new techniques on old materials and artworks			✓
Energy	Load bearing structure		✓	
	Technical innovation		✓	✓
	Adequate construction and energy efficient standards tried to be considered	✓	✓	✓
	Applying energy efficient systems		✓	
	Natural lighting were maximized by newly architectural design	✓		✓

Source(s): Created by authors

5.3 Interrelations among the management and legal factors

In the adaptive reuse of Fenix I, the developer company played a significant role from the early stages of the project, not only financially but also by contributing to the design phase to ensure the project would fulfill its final purpose. Subsequently, the municipality's role was notable during the decision-making steps and the management plan. Legally, they were responsible for checking the "compatibility of the project with building code requirements", "compatibility with urban master plan" and respecting the necessary historic features. Successful adaptive reuse projects require the "right partnership of the stakeholders", a fundamental factor identified in the management categorization and emphasized by the interviewees. There appears to be a connection between the 'right partnership of stakeholders' and 'stakeholder satisfaction' within

the management categorization, as both were mentioned by all stakeholders. The crucial management factor of “public-private partnership” between the developer (the private party) and the municipality (the public party) from the early stages of the project, led to the effective decision making steps, contributing to “stakeholders satisfactions” and the establishment of “right partnership among the stakeholders” (from management category). The governmental approach, based on the regulations they implement, plays a noticeable role in these projects. When government and authority approaches shift from conservative to more collaborative models, there is greater opportunity for open discussions regarding both listed and non-listed heritage buildings, allowing for the prioritization of project purposes while adhering to applicable regulations. Within the context of Dutch policies, it’s essential to note that local authorities in the Netherlands have largely transitioned from being direct investors in architectural and urban development projects to becoming facilitators and drivers of development. They actively promote innovative approaches to public-private financing and partnerships (Veldpaus *et al.*, 2019)

5.4 *The socio-cultural and authenticity as the significant factors in Fenix I*

Socio cultural: Among the various categorization of success factors, the socio-cultural factors play remarkable roles in the adaptive reuse process of Fenix I and its success. Nearly all the success factors identified in prior research (Vafaie *et al.*, 2023), as summarized in Table 1, were repeated by the interviewees. The factors such as the building’s role as a practical social amenity in the neighborhood, involving user participation in design and planning, addressing their needs and improving their quality of life, addressing security and combating social issues in the area, as well as fostering a sense of place and emotional attachment among residents, which were cited as primary motivations for the reuse of Fenix I. The municipality and other stakeholders could not overlook the building’s history and the community’s connection to it. Besides, all the stakeholders concurred on the significance of enhancing the quality of life in the area through adaptive reuse. It is important to note that “the Katendrecht neighbourhood used to be a very criminal and very isolated area, so there were a lot of problems there. Then the municipality said all this must be over.” described by developers. Therefore, from the very early stage of the project, one of the fundamental reasons for adaptive reuse was combating social exclusion, issues, and criminal activity. Consequently, many initiatives leading to the adaptive reuse approach for Fenix I fall under the socio-cultural categorization. While the project addressed a majority of socio-cultural success factors, the municipality expressed the belief that greater consideration could have been given to the local community and the existing residents of the Katendrecht neighborhood. This represents the importance of incorporating social inclusion and fostering social cohesion which was mentioned as another success factor in the decision-making processes of adaptive reuse projects (Table 1).

Authenticity: It has been observed that authenticity factors can generally be categorized into two types: tangible factors, which pertain to the building’s physical structure, and intangible factors, which relate to the meaning and history behind the building. Despite the fact that Fenix I is not a listed building, then what led to a significant number of codes related to authenticity success factors during interviews with stakeholders? The answer lies in the significance of intangible authenticity factors, such as history, character, narration, memory, and the building’s past life, outweighing tangible parameters. For instance, among the authenticity factors, there wasn’t a significant focus on “attention to valuable and fragile heritage features” as a tangible factor. Instead, a notable focus was placed on efforts to “reflect the building’s life in the past” during the design process as an intangible factor. The municipality emphasized that although the building is not a listed building, it holds cultural value. The findings indicate that the role of authenticity can be significant even for non-listed buildings that hold cultural heritage value.

5.5 *Economic issues*

In accordance with prior research (Vafaie *et al.*, 2023), several factors contribute to economic success in adaptive reuse, such as cost savings through implementation of adaptive reuse

strategies and achieving a return on investment where project financial gains outweigh the adaptive reuse costs. However, it is noteworthy that, generally neither of these factors materialized in the case of the Fenix project, considering it as an economically expensive adaptive reuse project. The developers, who also acted as contractors for the project, acknowledged that the financial outcomes were less favorable, stating, “If you look only at financial profits, it wasn’t that good for us.” Besides, one of the architects also added, “I think there’s kind of zero balance in the end “. Nevertheless, they believe that the project’s overall profits are not only limited to the financial profits, as it has provided them various advantages and enhanced their visibility within the community. In other words, “the total balance is more important” mentioned by the developer of the project.

6. Conclusion

This study aimed to assess how success factors identified in existing literature, as reviewed systematically by [Vafaie et al. \(2023\)](#), apply in practice, using the Fenix I project as a case study. The goal was to understand how these factors influence decision-making in a successful adaptive reuse project, offering insights for similar projects in the future. The results indicate that most success factors identified in the literature are indeed applied in a real-world successful case study. Notably, while the case study is situated in the Netherlands, the success factors applied are derived from international literature and are not limited to any specific context or country.

This research demonstrates that the heritage background of a building, whether listed or non-listed, directly influences the prioritization of decision-making steps, factors, and their categories from the early stages of a project. Accordingly, this study emphasizes that the interrelationships among success factors vary depending on the building’s status. Such variations lead to differing levels of importance among each factor within a category and between categories overall. For instance, the factor of “minimal intervention to the original building” is typically prioritized in the context of listed buildings; however, this was not the case for Fenix I, thereby impacting related categories such as architecture and authenticity and their factors. However, it is important to note that despite the project not being classified as a listed building, the significance of intangible authenticity and socio-cultural factors emerged as effective drivers for its adaptive reuse. This reflects that even when a project is not legally in the heritage list, the importance of socio-cultural factors and the intangible authenticity of the building can serve as motivating forces for adaptive reuse and the preservation of its historical background. Additionally, other parameters, including the architectural approach to adaptive reuse (i.e. installation, insertion, or intervention), the definition and type of new function, the primary purpose of redevelopment, and whether the building is publicly or privately owned, can also influence the consideration, significance, and relative weight of various factors, potentially rendering some factors less relevant.

Besides, this study indicates the significant influence of management and public-private collaboration from the initial stages of decision-making through to project implementation. In the case of Fenix I, the collaboration between developers and the municipality from the early stage proved highly effective. When approaches shift from conservative to more collaborative, and when governance and policy frameworks encourage adaptive reuse beyond simple preservation, opportunities for open discussion are created, enhancing project success. Furthermore, this study shows that a project can still be considered successful overall, even if the total financial profits for developers and beneficiaries are not sufficiently adequate. As observed in the case of Fenix I, “the total balance is more important.” However, it is important to determine when economic considerations take precedence over other categories in adaptive reuse projects, whether for listed or non-listed buildings.

This research facilitates the decision-making process for adaptive reuse, aiding decision-makers in implementing projects more effectively in practice. It reveals the potential for varying levels of importance of the factors based on the background and characteristics of the

buildings, as well as the heritage context. Furthermore, it highlights how these factors and categorizations may influence one another and are directly or indirectly related during the decision-making process. Additionally, the study shows the necessity of reaching consensus among decision-makers from diverse backgrounds to ensure successful outcomes.

Based on the above conclusions, future research should prioritize investigating the varying degrees of significance of each factor across different alternatives, as well as exploring the sequences and hierarchy of these factors during the decision-making process. Additionally, proposing a decision-making model based on a comprehensive review of these investigated success factors would offer valuable avenues for further exploration and recommendations.

While this research aimed to follow a structured format for analyzing interviews, it encountered challenges related to coding qualitative data and the potential for diverse interpretations arising from varying definitions of success and well-implemented adaptive reuse projects from individuals' points of view. A deeper understanding of these complexities will contribute to more effective decision-making frameworks in future studies.

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Corresponding author

Fatemeh Vafaie can be contacted at: f.vafaie@tudelft.nl