

Viability: A Fundamental Aspect of Value Creation in Hospital Projects

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Abstract - Increased population growth, demographic change and technological advancements are some of the challenges facing the healthcare sector in the near future. As new Norwegian hospitals are planned with a lifespan of 50 years, it is crucial that these hospitals both satisfy present and future demands of users and owners. This paper suggests that building viable hospitals is an important step in satisfying these demands. Therefore, the paper will address *what viable hospitals are and how to ensure viable hospitals through the early phase of hospital planning.*

A comprehensive literature study as well as case studies of three Norwegian hospitals constitute the main sources of data in this paper. The case studies consist of both interviews and document studies. In total, 12 professionals involved in the planning or operations of hospitals have been interviewed. This paper focuses on issues associated with viability that occur early in the planning phase, and presents factors that are important to consider to achieve viable hospitals.

The findings indicate that viability is a fundamental aspect of value creation in hospitals. Three factors are identified as being especially important for viable hospitals in the early phase: **aligning goals and ambitions with users' and owners' needs; focusing on life-cycle planning; and involving users in a strategic way.**

Keywords: *hospitals; viability; early phase; value creation; adaptability*

I. INTRODUCTION

Healthcare requirements are changing rapidly, and there is also a pressure to reduce costs and create more specialized hospital buildings [1]. In addition to this, hospitals must deal with drivers of medical, scientific and technological change. Demographic change will also affect the healthcare sector in the coming years [2]. The Norwegian population is expected to increase by 1 million people by the end of 2030 [3], equivalent to 20% of current population figures. At the same time, the number of people aged over 70 will likely double. Norway has approximately one square meter of hospital building space per capita, meaning that the country will need an additional one

million square meters by 2030 if this practice is continued [4]. In addition to this, only 50% of existing hospital areas are reported as adequate or good based on the buildings' technical and structural conditions [5]. This indicates a need to build efficient new hospitals and improve existing ones.

A hospital building's ability to function efficiently and with sufficient quality of services is of high societal value, and this requires facilities suited for both present and future needs [6]. The present paper suggests that building viable hospitals is an important step in meeting both present and future demands, and focuses on how we can ensure viable hospital buildings through early phase planning.

II. METHODOLOGY

This paper is based on a qualitative research method where a process of triangulation is applied. Triangulation is a research method where multiple sources of evidence are used [7]. These include a literature review and case studies of three Norwegian hospitals. The studied hospitals are all large hospitals either in use or in the planning phase.

The above-mentioned case studies consist of document studies and semi-structured interviews. The document studies were based on project-specific reports, such as evaluation reports and preliminary engineering reports. Twelve professionals were interviewed; see Table I for an overview of their roles and affiliation. The three hospitals studied were Rikshospitalet, St. Olav's Hospital and the Tønsberg project (not yet built). Findings presented in chapter IV are not linked to the different hospitals due to privacy considerations.

Interviews conducted varied in length, ranging from 30 to 90 minutes. In addition to interviewing people involved with the three case hospitals, employees from Sykehusbygg HF were interviewed. This organization aims to be a competence platform for hospital development in Norway [8]. The interviews focused on hospital planning or operations, depending on the interviewee's area of expertise. Semi-structured interviews were carried out as guided conversations rather than structured queries, which is in accordance with guidelines outlined by Yin [7].

TABLE I. INTERVIEWEES AND THEIR ROLES.

Case	Role
Tønsberg project	Project director
Tønsberg project	Design team leader
Tønsberg project	Lead architect
Tønsberg project	Main safety representative
Tønsberg project	Head of property management and development
Rikshospitalet	Head of heating, ventilation and air conditioning (HVAC) division
Rikshospitalet	Department manager, HVAC
St. Olav's Hospital	Energy consultant
Sykehusbygg HF	Deputy managing director
Sykehusbygg HF	Head of planning and development
Sykehusbygg HF	Specialist in advanced rooms
Sykehusbygg HF	Consultant, medicine

All interviews were recorded, transcribed and later analyzed by the author.

III. THEORETICAL BACKGROUND

The purpose of this chapter is to define viability in the context of hospital planning. The paper aims to explain how viability contributes to value creation and explore elements that are important in ensuring viability during the early stages of hospital planning.

A. Viability and Value creation

The term viability is often associated with sustainability, and these two terms have much in common [9]. However, Lædre et al. [9] suggest that sustainability is more associated with social development on a macro level, and that viability is easier to grasp from a project management perspective. According to Lædre et al. [9], an assessment of both sustainability and viability is often based on the social, environmental and economic effects of the project. However, the authors suggest that viability seems to focus less on environmental aspects than sustainability. Both terms are essentially about the continuation of benefits from a development perspective, and includes the probability of experiencing long-term benefits [10].

Larssen et al. [11] suggest that an assessment of the building's usability and adaptability is an important contribution when considering the building's viability. Usability expresses how well the building is suited for its purpose, while adaptability is how well the building can adapt to future demands. Good usability in buildings will lead to better effectivity for the core business, as well as satisfied users [12]. Adaptability is a key factor in handling change in demands and technology [6]. Sufficient adaptability can, for instance,

contribute to shorter reconstruction periods, longer lifespan of the building and reduced costs in the long run [13]. Adaptability is therefore associated with satisfying the owners' needs, and making sure that the building can satisfy users' needs throughout the building's life-cycle. As value is created when existing or undiscovered needs are satisfied [14], both usability and adaptability are important factors in the value creation for users and owners. This is supported by Dewulf and Wright [15], who suggest that the value of a building should be based on the building's ability to be adaptable and support the building's core activities. Viability can be expressed as a function of adaptability and usability [12], and thus viability becomes a fundamental aspect of value creation.

B. Adaptability

Adaptability is widely discussed as an essential design factor in creating hospitals that will continue to meet the demands of users and owners throughout the building's life-cycle [2, 6, 16, 17]. Adaptability can be divided into flexibility, generality and elasticity [18]: flexibility expresses the possibility of changing the space distribution in the building; generality is defined as the possibility a building has for changing functions within the building; and elasticity expresses the possibility of changing volume. Different building types acquire different degrees of adaptability [12]. Hospitals are among those building types that demand a high level of adaptability, mainly due to rapid changes in factors affecting hospital services [12]. However, 30% of Norwegian hospitals have low adaptability [19]. Furthermore, research has found that adaptable solutions are often omitted due to cost-related issues [20].

One can distinguish between areas in hospitals that demand different levels of adaptability. Venhoven CS [21] put forward an award-winning approach for designing hospitals of the future called 'Core Hospitals'. By asking which functions must be located in the main hospital (the core building) and which could be located elsewhere, they found that only around 50% of the traditional floor area was necessary in the core building. These areas were closely related to intensive care facilities, so-called 'hot floor' areas. Hot floors demand a high level of adaptability, whereas, for example, office areas and hotel facilities demand less adaptability [18].

C. User Involvement

In order to create value for end-users of buildings, it is essential to understand what the end-users' needs are both at present and in near future [22]. According to Kaya [23], involving users in the design stage will not only lead to satisfied users, but also users who are less critical. User involvement may create more realistic expectations, as users become aware of the physical and financial constraints of the project [15].

Pemsel et al. [22] argue that end-user satisfaction is not only based on the outcome, but also on the way it is achieved. This highlights the importance of organizing the user involvement process in a good way. Dewulf and van Meel [24] point out that there is agreement on the need for user involvement; however, the real question is *how* users should be

involved. According to Dewulf and van Meel, users should be involved in the whole construction process, not just the initial phase.

User involvement may not only benefit users, but also the design team [15]. The design team usually provide the project with technical skills and knowledge, while users can provide an understanding about how the hospital building works. By working together, the design team may learn how to create ‘usable buildings’ by involving users.

D. Life-Cycle Planning

Life-cycle planning is about planning a building for its entire life-cycle, for instance by taking adaptability and life-cycle economics into consideration. According to Bjørberg and Verweij [18], there is little awareness about concepts such as life-cycle economics within the field of hospital planning. As the operational costs at hospital buildings often consume the equivalent of the investment costs every two to three years [25], there is huge potential for long-term savings associated with focusing on life-cycle costs. This emphasizes the need for life-cycle planning.

IV. FINDINGS AND DISCUSSION

Through the research conducted, three factors were identified as being especially important in ensuring viable hospitals: setting realistic goals and ambitions that are aligned with users’ and owners’ requirements and needs; focusing on life-cycle planning; and ensuring strategic user involvement as illustrated in Fig. 1.

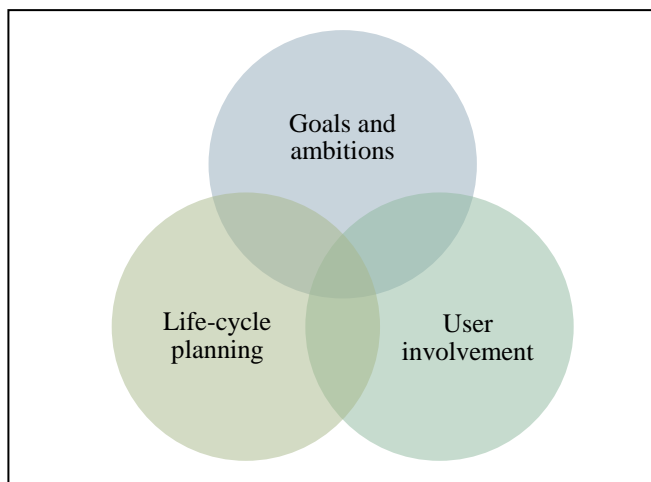


Fig. 1. Important factors to consider to ensure viable hospitals.

These three factors influence each other and are partly overlapping. Therefore, they must be considered together. Adaptability is also found to be an important factor in ensuring viable hospitals, but is here considered under ‘life-cycle planning’. These factors will be discussed in the following sections.

A. Goals and Ambitions

Through the literature review, it was found that setting ambitious goals stimulates better performance, but overly ambitious goals can lead to declining performance [26]. However, the line between ambitious goals and overly ambitious goals is difficult to define. According to Næss et al. [27], goals must be sufficiently ambitious to motivate people involved with the project, but goals should be realistic from the long-term perspective. Others argue that realistic goals are not challenging enough for a world in constant change [28]. However, findings from the case studies indicate that goals must be realistic in order to motivate people involved with the project and create a common understanding of the chosen goals.

As value in a building context is created by satisfying users’ and owners’ needs [14], aligning goals with these stakeholders’ needs is extremely important. However, based on results from the case studies, it seems as if goals are seldom sufficiently aligned with users’ needs. There is often a focus on low investment costs and short construction periods, which seems to be of little importance to users. Findings indicate that users tend to focus more on the quality and usability of the hospital building.

Furthermore, high ambitions associated with the use of innovative tools can take the focus away from the project goals. Several interviewees from one of the hospital projects mentioned that it seems as if the use of such tools has become more important than reaching the project’s goals. The importance of allowing a sufficient amount of time to educate employees on new tools before these are introduced in the project should be emphasized more.

B. Life-Cycle Planning

Findings from both the literature review and case studies highlight the importance of focusing on life-cycle planning. In the literature review, a lack of focus on life-cycle planning in the healthcare sector was identified [18]. Focusing on life-cycle planning is found to be a prerequisite for achieving adaptable hospital buildings. However, based on experiences from the cases studies, there seems to be a lack of competence associated with how life-cycle planning should be implemented. There is also a lack of competence related to the potential for savings.

Lack of knowledge regarding the effects of life-cycle planning is pointed out as one of the reasons why life-cycle planning is not sufficiently prioritized. It is regarded as difficult to prove the economic gain of focusing on life-cycle costs rather than investment costs. However, in one of the case studies, there seemed to be a focus on life-cycle planning during the early stages of the planning process. As the project gradually progressed, this focus seemed to decrease. This affected the planned level of adaptability in the building. Experiences from one of the other case studies indicate that adaptable solutions are often omitted to cut costs. This supports the findings of Valen and Larssen [20].

One of the hospitals studied has experienced decreasing focus on life-cycle planning. Investing in high-quality equipment was a bigger priority when the building was constructed compared to now, 17 years later. For instance, they

invested in an expensive central operating system and high-quality technical equipment. Normally the write-down period for such equipment is around 10 years. However, as a result of investing in high-quality equipment, the hospital has experienced that the actual lifetime of the equipment is up to 20 years. Now, the focus is mainly on purchasing items and services at the lowest price, which often results in poor quality.

One of the issues associated with life-cycle planning is that it is difficult to prove the effect of investing in solutions that might be beneficial in the future. An example of this is the use of interstitial floors at hospitals. Interstitial floors are defined as ‘intermediate service floors inserted between primary floors’ [29]. These floors allow easier access to technical and mechanical equipment without disturbing clinical hospital activities. The concept increases the adaptability of the hospital and reduces operational costs due to simplified maintenance and repair. Interstitial space can also facilitate future change at hospitals. Experiences from several Norwegian hospitals indicate that there is huge potential for long-term savings associated with this concept [13]. However, this is not well documented, and hospital planners find it hard to argue for such solutions. Updated cost-benefit analysis of such solutions is therefore required.

C. Strategic User Involvement

A hospital building should enable effective delivery of healthcare services. Findings from both the literature study and case studies indicate that strategic user involvement is essential to ensure effective and efficient hospital buildings. Clear communication and well-organized processes are among the factors considered important by interviewees.

In this paper, the term ‘users’ includes patient groups, dependents and employees at the hospital. As mentioned in the theoretical background, how users should be involved in the process is a central question. According to Dewulf and van Meel [24], users should be involved through the entire planning and construction process. However, one of the users interviewed in this research pointed out that it was difficult to contribute in a constructive manner during the initial stages of the project’s early phase. She argued that this became easier as soon as the project was more defined. This underlines the challenges in defining strategic user involvement in a way that is both constructive and resource-efficient.

The user involvement process during the early phase at one of the hospitals studied was regarded as unstructured and confusing. Neither users nor employees from the project organization were satisfied with how the process was carried out. Employees from the project organization found it disturbing to have users in and out of the project at all times, and stated that the level of involvement was too high. Users reported finding it difficult to have an overview of the project, and it was not always clear who they should contact when questions arose.

Despite this, both users and employees in the project organization expressed that there was a well-organized user involvement process in the beginning of the early phase. This initial stage of user involvement included gathering users and

employees from the project organization at a hotel over a couple of days. Here, the user processes were carried out by organizing users into focus groups. Design solutions were discussed within the groups, and people from the design team observed and took notes. All interviewees were satisfied with this process. However, the user involvement was not carried out in a systematic way after this. Interviewees stated that it became difficult to keep track of when and where decisions were made, and who to contact if something was unclear.

We also found that it is sometimes beneficial to involve people at lower levels in the organization. For instance, when dealing with logistics at hospitals, porters should be involved instead of surgeons. Furthermore, interviewees expressed that some of the employees at hospitals, for instance nurses, have a great understanding of what creates value for patients and their dependents. Such employees may sometimes understand more about patient needs than the patients themselves, as they work in the patient environment and observe patients’ immediate reactions and comments. This indicates that different types of user should be involved in the process at different stages in the project.

We also found that involving users too early can be challenging. One of the interviewees said that it can be difficult for users to contribute in a constructive manner before the project is properly defined. Involving the right people at the right time is therefore crucial.

Results from the research indicate that user involvement in hospital projects is a time-consuming process. According to interviewees from Sykehusbygg HF, it should be possible to reduce the amount of time spent on user involvement and simplify the process. In order to do so, it is important to ensure a systematic approach to user involvement. This includes setting clear guidelines for how users should be involved and involving the right people at the right time. The user representative suggested that one person within the project organization is responsible for communicating with users as this will make it easier for users to know who to contact if questions arise. Sending out monthly newsletters on the project’s status to users involved was suggested by some interviewees as a way of keeping users up to date on the project. It might therefore not be necessary to arrange meetings to provide status updates.

Organizing users in groups can be a good approach for achieving systematic user involvement. However, this has not been properly explored in this study. Further research on how users should be involved in a strategic way is necessary. As mentioned in the theoretical background, end-user satisfaction is not only based on outcome, but also on the way it is achieved. Therefore, it is important to maintain a positive relationship with users, and make sure that they feel involved and appreciated. This can be approached in many ways and new technology platforms can be a good aid for communication in such processes.

V. CONCLUSION

A viable hospital is a hospital with sufficient usability and adaptability that will continue to satisfy the needs of both users

and owners throughout the building's life-cycle. Value in construction projects is created when existing or undiscovered needs are fulfilled [30]. In this way, viability becomes essential in creating long-lasting value for owners and users of hospitals.

Through this study, three factors have been identified as especially important in ensuring viable hospitals: aligning project goals with users' and owners' needs; focusing on life-cycle planning; and involving users in a strategic way. Setting ambitious goals is important in order to motivate users, but the research conducted has revealed that goals must be realistic in order to motivate people involved with the project. Overly ambitious goals can affect the usability and adaptability of the project, and in this way also affect the project's viability.

We also found that focusing on life-cycle planning is important. It is often seen that investment costs are prioritized over life-cycle costs. Life-cycle planning is also found to be a prerequisite for choosing adaptable solutions at hospitals. Insufficient focus on life-cycle planning can therefore compromise the building's ability to meet future demands. One of the reasons why life-cycle planning is not prioritized enough in hospital projects seems to be challenges regarding documentation and proof of achieving benefits when choosing adaptable solutions. Further studies related to proving the benefits of life-cycle planning are therefore recommended.

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