Seeking Value with the Performance Approach

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Summary

The successful project definition phase is the corner stone in realising satisfying end products. Regrettably, in this phase there is a lot to improve in the building construction domain. Rushing into the technical solutions is the modus operandi at the moment. Typically, the architect's first proposal for the building layout acts as the baseline for the decision-making. Too often the analysis of the end user objectives is just asking for comments on the proposed technical solutions. This can easily lead to a loss of value and can cause problems during the use of the building.

It is widely recognized that human and organisational questions need more attention than technical solutions in the early phases of the process. The performance approach has been presented as one potential catalyst for change in this area. The performance approach is concerned with what the building is required to do, not with describing the technical solutions i.e. how it is constructed. The driver for the performance approach implementation in Finland has been a tool called EcoProP. This is a software tool for the systematic management of building project requirements.

In this paper, the current problems in the project definition phase are presented first. Next, the performance approach is introduced. Then, barriers to implementing the performance approach are discussed. Further, the EcoProP tool is illustrated with one implementation case. In conclusion, the use of EcoProP in various countries is discussed.

Performance approach, culture, EcoProP, requirements management, project definition

1. Introduction

The inability to study and consider a clients' needs and aspirations during the early stages of a construction project is widely acknowledged in the literature [1, 2]. Also the importance of fulfilling customer expectations to attain a satisfactory end product is known [3, 4]. Still the problems of the briefing are mainly the same as they were thirty years ago [5]. The current practice has many deficiencies [6, 7, 8, 9, 10]; the brief consists of unclear or conflicting objectives, original requirements are not documented in the brief, transformation lacks creativeness and flexibility, selection of the contractor is based only on the price of the production and the construction phase is full of communication problems and 'corner-cutting' causing the loss of essential requirements. The process is mainly production-driven instead of being customer-driven. Kamara et al. [11] state four deficiencies of the briefing process:

1. often no formal or structured procedure in the evaluation of the brief is applied
2. horizontal integration among stakeholders is inadequate (communication problem)
3. lack of information technology support causes problems when chances to requirements occur
4. traceability of design decisions to client requirements is inadequate

The decisions in the building construction process are based on the investment costs. When the life-cycle costs of an office space are calculated, it can easily be concluded that at the end of the day, the investment cost is not that important [12, 13]. Salaries of the workers are a vastly bigger issue than the investment cost (Figure 1). Increasing worker satisfaction and productivity by providing a well performing space is much more important than saving money in the design and construction phase. It is evident that a more thorough analysis of users' needs and ultimately, behaviour and increased productivity, is potentially more beneficial [12]. As proved this information has been available at least from 1971, yet still, the decisions are based purely on the investment cost.

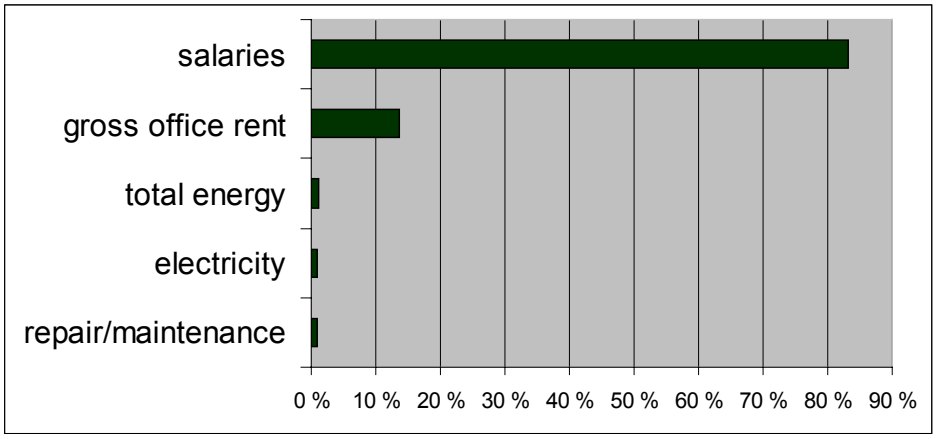

Figure 1 - Share of costs [13]

Research shows that during the project definition phase, the human and organisational questions are more important and need more attention than technical aspects, and that the analysis of the client's needs is the most important during the earliest stages of the process [3]. To reach the best result it is vital that project parties have a means to communicate their requirements to the design team [4].

2. Performance approach

2.1 Performance approach in theory

The performance approach is the practice of thinking and working in terms of ends rather than means [14]. It is about describing what the building is expected to do, and not prescribing how it is to be realized [14]. Performance specification should include statements about [15]:

1. Performance requirements (expressed as ranges of values and grades) for buildings or their parts under specified conditions and referring to
    a. related user requirements
    b. agents relevant to building performance, such as climate, site conditions, occupancy characteristics or design consequences
2. Methods of assessing each performance characteristics, including performance over time referring to the requirements and agents, as in 1.

The first step of the performance requirements management is to recognize the users. By user, in this context, we mean relevant stakeholders of the project, such as occupants, owners, managers and financiers of the building [14]. It is also vital to know the activities taking place in the building (use of building). The user requirements are often qualitative statements [16]. Based on user requirements and the surrounding conditions (climate, existing buildings etc.), the quantitative performance requirements are set [17]. The technical solutions proposed during the design phase are verified against the set performance requirements. If they match, then the proposed technical solution may be approved. In addition to verification during design phase it is also important to verify that the desired performance is reached also during operation [18]. This summary of performance requirements management is outlined in Figure 2.

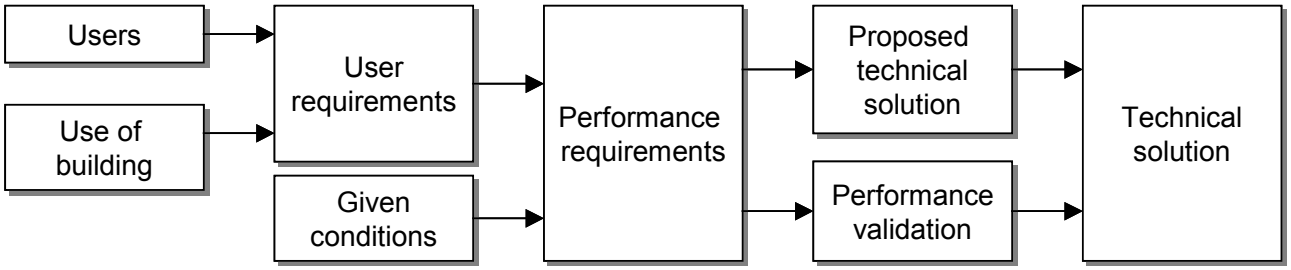

Figure 2 - Performance management process [17]

In addition to the essential aspects described above, there is also other important information which can help implementing the performance approach in building construction project [16]:

1. Commentary => Background and rationale behind the performance requirement
2. Deemed to satisfy documents => Examples of technical solutions that fulfil the requirement
3. Quality control manuals => Documents that describe the quality procedures during project
4. Post-occupancy evaluation => Evaluation of the actual performance of the building providing feedback for future work

2.2 Implementation barriers

Based on Hens [19], there are also inherent barriers in implementing the performance concept:

1. Disintegration of design, engineering and construction
2. The fragmentation of the design and the construction side
3. The guilds mentality
4. Too strict market approach of the manufacturing industry
5. The low level of R&D investments in the construction industry.

With the new performance based procurement practice we are able at least partly remove the first two and possibly third barriers. It is assumed that when: i) architects and engineers exploit their core knowledge to create the overall technical solutions that fulfil the set performance requirements; and ii) construction companies have the opportunity to take long-term responsibility for building parts developed together with architects, engineers and product suppliers; the quality of

the end product improves.

Based on the authors' experience there are also other major problems of implementing performance approach:

1. The client does not trust the construction companies to provide the quality that is expected unless the technical solutions are described in detail.
2. There are no tools in wide use that would support the implementation of the performance approach.
3. There is not enough knowledge (or understanding) of the performance approach in the construction industry.
4. There is a common concern among practioners that performance approach requires a lot of effort, uses a lot of time and generates information that is not precise.
5. A lack of agreed quantitative performance criteria for key requirements

2.3 Performance approach in practice

VTT Building and Transport has developed a tool called EcoProP based on the VTT ProP® - classification of performance properties. EcoProP is a software tool for the systematic management of building project requirements. The EcoProP software helps to fulfil customer requirements and expectations by describing the properties of the final product using a hierarchy of performance requirements and different performance 'levels'. The technical solutions can then be designed based on the specified performance requirements. EcoProP can also estimate life-cycle costs associated with different scenarios, based on the environmental 'costs' which result from the construction and operation of the building. Eco-ProP has been used in various projects including office buildings, schools, nurseries, residential developments and shopping centres.

Recently, the authors have developed a tailored version of the EcoProP for two Finnish companies. One of these companies is the owner and operator of the vocational education facilities of the Jyvaskyla region (JKKK). The other is a consultant company (Controlteam) that provides project management services for JKKK. They have worked together for several years successfully using the traditional practice: JKKK collects the user requirements for a new building from the educational unit that will use the building. Based on this information, Controlteam manages the design phase and arranges the request for tenders with near-final versions of the design and drawings. Since JKKK is a publicly owned company, the cheapest offer is selected. JKKK people have recognized that this does not lead to the best possible performance and life-cycle cost of the facilities. They feel that the buildings they operate should have a long, well performing life cycle and small operating costs. At the beginning of the project, the JKKK people assisted by Controlteam will set the performance and environmental requirements together with the users. These requirements act as a brief. Then the cost effects of the requirements are analysed. The investment cost analysis is not supported by the performance approach. It is not the performance requirement that drives the investment costs but the corresponding technical solution. In this sense the process is iterative. The effect on investment costs for particular technical solutions have to be analysed and if necessary, changes must be made to the performance requirement. The goal of tool is to give a rough level estimate of the annual cost based on the current performance and environmental requirements and expected life cycle with certain interest rate. Hence it is possible for JKKK to show to the company decision makers that it pays back to select an alternative that might be a bit more expensive at the construction phase.

EcoProP can be used in a team session or one user can set requirements. EcoProP in a team session improves the quality of the selected targets and goals of the project since participants challenge each other's ideas and selections. Also the commitment of the project team members increases. EcoProP has proven to be a valuable aid in implementing the performance approach in Finland because the users are 'forced' to think their objectives through, before jumping into the technical solutions haystack. It has been shown that EcoProP requires a lot of **less** effort, uses a lot **less** time and generates information that **is more** precise than the practioners originally suspected.

3. Discussion

EcoProP was developed, and is successful, in Finland. When using EcoProP outside Finland, the potential influence of national culture can be recognised. In particular, it can affect what attributes of EcoProP are considered to be most important by users.

Research suggests that national culture can have a strong influence in certain circumstances. Two leading researchers in cross-cultural study both categorize nations in terms of cultural clusters. Fons Trompenaars has suggested that there are four categories of corporate culture that arise from national values [20]. He has called these: Family, Guided Missile, Incubator and Eiffel Tower (no prizes for guessing which category he put French companies into – yes that's right: Family). Within these categories he identifies common characteristics, or more specifically, ways of thinking. For example, German corporate culture is said to value logical, analytical and rationally efficient thinking. This attribution of characteristics is broadly consistent with the findings of Geert Hofstede [21]. Also, it is similar to the anecdotal evidence put forward by requirements management experts in the United States [22].

Clearly, the systematic approach offered by EcoProP is highly compatible with analytical thinking. However, in other national cultures other types of thinking are more valued. For example, it has been suggested that Russians have excellent analysis skills and little tolerance for mistakes. On the other hand, it has also been argued that they do not have such a ready inclination to interact with customers. In this type of cultural setting, the structured approach which EcoProP provides for improved customer interaction can be highly valuable. Japan perhaps offers the perfect implementation environment for EcoProP. This is because the Japanese are familiar with advanced methods for analysing customer priorities. As a result, they understand the iterative nature of requirements management. Nevertheless, when Japanese companies work overseas they can find themselves dealing with one-off clients with less knowledge of the construction process than their Japanese counterparts. In this type of situation, EcoProP provides a robust tool which offers a universal and standardised set of procedures. It goes a long way towards filling gaps that can be caused by expert contractors assuming that customers are as familiar with requirements as they are.

Other benefits of EcoProP may be valued more in the "Anglo" cultures of Australia, Britain and the United States. It has been reported that this type of culture is characterized by impatience with delays, acceptance of mistakes, the urge to improvise and bias towards assumptions [23]. Clearly, these types of situations make a structured requirements management system all the more important. Yet, they can make implementation quite challenging. Hence, counter actions may be required. For example, users could develop simulations to validate high risk requirements. The requirements engineering phase could be occasionally turned into an improvisation exercise by anticipating the potential future problems [20]. Overall, national culture can have an influence on what users value most (or not) about EcoProP. This can be particularly interesting when a user works globally.

4. Conclusions

Incorporation of different stakeholders needs and aspirations, and setting of clear performance requirements at the earliest possible stage in a construction project leads to a vastly improved end product. The authors' experience has shown that through intelligent performance requirements management, this can be achieved with **less** effort, in **less** time, and with improved precision, than through more traditional approaches.

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