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Determinants of Building Design Performance – Some Thoughts

**Facteurs influençant la performance dans la conception du bâtiment –
quelques réflexions**

Einige Gedanken zur Zusammenarbeit bei der Planung von Gebäuden

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SUMMARY

This paper puts forward a model which analyses the factors which influence the performance of the design team. The factors suggested are the characteristics of the client, the characteristics of the project, the design team itself, and the way the design team is managed.

RÉSUMÉ

Cette communication présente un modèle de l'analyse des facteurs qui influencent la performance de l'équipe de projet. Les facteurs proposés sont les caractéristiques du client, les caractéristiques du projet, l'équipe de projet elle-même, et la façon dont l'équipe de projet est dirigée.

ZUSAMMENFASSUNG

Diese Arbeit stellt die Ergebnisse einer umfassenden Analyse der beeinflussenden Faktoren bezüglich der Ideenfindung und der Zusammenarbeit von Projektierungsteams dar. Als relevante Einflüsse haben sich herauskristallisiert: die Eigenart des Bauherrn; die Eigenschaften des Projektes; die Zusammensetzung und Motivation des Projektierungsteams; und die Art und Weise des Team-Managements.



1. Introduction

The concept of design performance is an elusive one yet the demand for the metrology of performance in all areas of the construction process is relentless. The pressure for measurement of performance comes from clients who are looking for value for money from designers (particularly in the more open market associated with the abandonment of fixed fees for design work) and design practices who are increasingly seeing themselves as commercial as well as professional organizations.

So, if design performance is important enough to be measured, what are we measuring? Moreover, what are the factors that have to be incorporated if the measurement is to be of use? Stone (1983) is helpful in directing us to some answers:- "the function of the design team is to design a building or works which will enable the functions to be performed in the building to be carried out with the maximum efficiency and in the most economic manner throughout the life of the building and at the same time provide a building pleasing both internally and externally, and in harmony with other buildings in the area".

Stone further defines the role of the designer:- "his contribution lies in meeting the needs of the client with a solution economic to construct and operate".

Three components for evaluating design performance are thus identified:-

1. client satisfaction - "meeting the needs of the client"
2. buildability - "economic to construct"
3. user satisfaction - "economic to operate".

These three factors are taken as a synthesis of design performance. This then answers what we are measuring but design performance as such is not defined - it is postulated as a function of the things which happen leading up to the design, the conduct of the design process and the way the design is communicated to the client.

2. Determinants of design performance

Stone (1983) identifies the skills and knowledge required by the design teams to fulfil their function:- "... economic design demands a wide and detailed knowledge of aesthetics, of the way buildings are used, of the functioning of materials and structures, of the problems of site erection, and of the costs of construction and running buildings".

This view is reinforced by Wood (1975) and NEDO (1978) both of whom note that the knowledge and skill of the design team are key factors in design performance. So we may identify a key aspect to determining design performance - the design team itself.

The literature available may be used to identify further contributors. Notably the RIBA (1963) report on architectural practice, "The Architect in his Office" pioneered the study of design management and design team patterns and the influence of these factors on design performance. Subsequent research by Ward et al (1973), Hodgkinson (1975), Mackinder & Martin (1981) confirmed the RIBA findings. Thus, a second factor may be seen to influence design performance - the design management.

Other factors relating to the client have also been given by Wood (1975), NEDO (1978) and NEDO (1983). These publications seek to relate the characteristics of the client and its knowledge of the clients' role with project success. More particularly, the degree of client involvement and the clarity in which

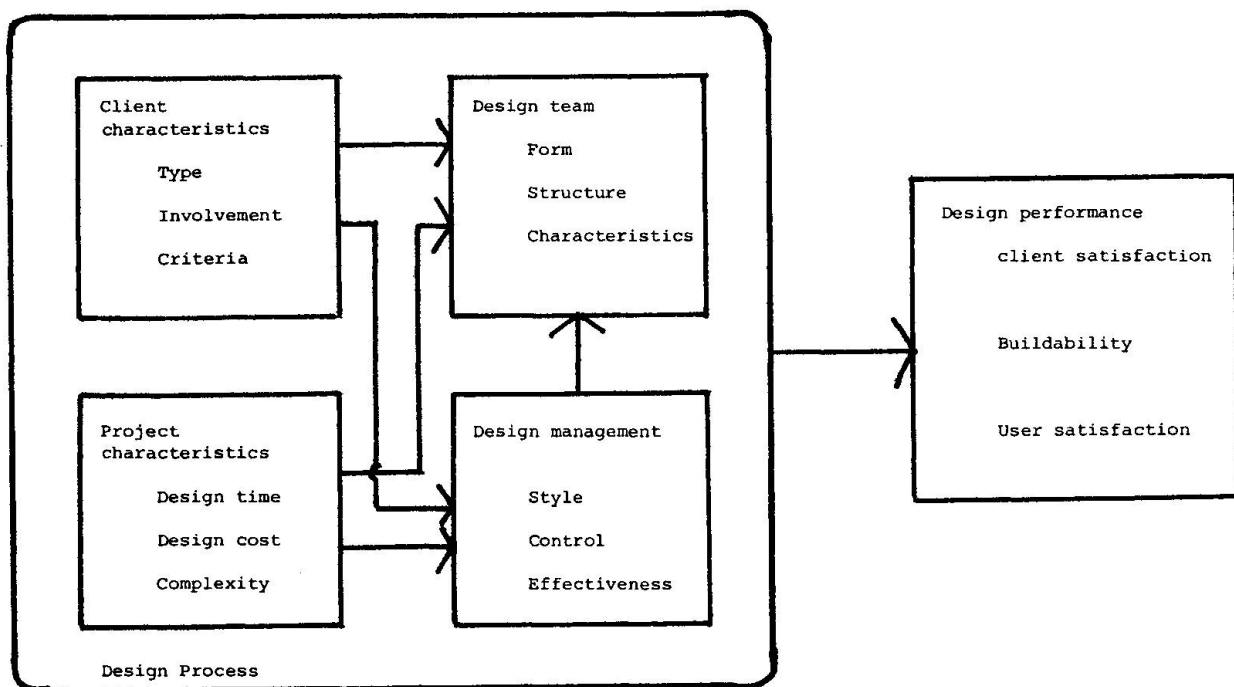
the client set its criteria are determinants of project success. In short, client characteristics are an important influence.

Finally, the related aspect of project characteristics, e.g. design time and cost, complexity etc., and the matching of the design team approach to these characteristics is also seen as vital to project success. Thus the project characteristics are an important variable.

From the above four determinants of design performance have been identified. Each will interact to synthesise a design. It is hypothesised that the model shown on Section 3 is a representation of how they integrate to produce a design.

Each one of the determinants is discussed in fuller detail in Sections 4, 5, 6 and 7.

3. The Model



The Research Model



4. The Design Team

Since the publication by the RIBA of the seminal study "The Architect in his Office" (1963) the necessity of sound management in design has been recognized. The sample chosen for the 1963 RIBA study was predominantly single discipline architectural practices and departments. The effects of management style and organizational structure on the performance of the practices were significant findings which had a strong impact on the industry at the time (Rimmer 1979). With any emergent idea 'experimentation' is the pattern of development and since the early 1970's the construction industry in the U.K. has seen experimentation with various systems for the management of the design process. Illustrations of these experiments have been the multidisciplinary design teams, fast-tracking the design, preparation of scope drawings, etc. Such developing patterns of design procedures have imposed new demands upon design managers. Indeed the traditional idea of the architect being the design manager has been questioned and clients are increasingly seeking other professionals to manage the design process. If then experimentation is seen as the watchword in terms of design management, what experimental models have been experienced?

Two polar forms of design practice may be commonly used by clients.

- a) traditional or fragmented - where organizationally autonomous professional firms, architects, quantity surveyors and engineers form a temporary design team, each with separate contracts with the client but co-ordinated by a team leader, usually the architect. Some professional firms find it convenient to work together on a regular basis whilst maintaining organizational autonomy.
- b) multidisciplinary or integrated - where all the professions are within one firm and offer a multidisciplinary service to the client through a single contract.

Within these poles there will be other variations with varying contractor involvement in the design, but these two have been used to illustrate how the organization of the design team may influence project performance. The manner in which the professionals are brought together is the main difference and consequently any difference in performance may be seen as a function of the organizational form of the design team.

As has been said, such design team organizations have been subject to experiment but only now are we likely to have enough data for comparison to take place. For whilst there have been individual studies of the management of building design, e.g. Hodgkinson (1975), Akpan (1982), published reports (NEDO 1976) and numerous journal articles in the professional press, there has been no rigorous or systematic attempt to compare the performance of these two disparate forms of design team organization. If we do not know the results of experiments there is little point in setting them up.

Naturally intervening variables such as the qualifications, experience, status and mix of disciplines incorporated in the design teams would have to be taken into account when comparing the different organizational forms.

5. The Design Management

Management is about people. But whilst this statement must override all else it must be recognized that managers in a design context have to make technical as well as managerial decisions. This fusion of skills may create conflict within the design team with a consequent impact upon performance. As Stevens (1977) has noted "management as a discipline in isolation is not regarded with much respect by designers who, by and large, consider the activity an intrusion into more important considerations of design". Additionally, design organizations

have become increasingly aware of the necessity to become more commercial in their approach to the management of design.

This conflict between the creativity associated with design and the control necessary in a commercial setting is often vexing to the design team and the individual design manager.

Successful reconciliation of these conflicts may lay in the management style adopted. Stevens (1977) notes that good design managers must "lead by example and persuasion rather than pre-empt. Management by authority is unlikely to succeed for very long in a good design team atmosphere".

The difficulty is to exercise control to ensure that time, cost and quality targets are met within the design. Thus the fusion of human and technical management seeks to develop effectiveness in the design team. The question is, are more of the qualities of sound design management to be found in one method of design team organization or another? This would involve establishing objective measures of management efficiency in design teams. This could be a metaphor for the quantity and quality of communication or level of co-ordination between the design specialists. Again no hard data is available and this paper seeks to stimulate research in this area.

6. Client Characteristics

One of the axioms of construction over the last decade is that clients have become more involved in the process of construction. Here it is postulated that several factors within the client's organisation will influence the organizational form for the design team and the style in which the design team is managed. The variables for the client may be identified thus:-

client type - the business of the client is likely to shape the design team and the way it is managed. For example, a public sector client is likely to commission different types of design teams than to, say, a private developer. Rowlinson (1985) sought to typify the characteristics of clients by identifying the criteria that subsets of clients would seek. He found that high technology companies sought comprehensive development of the building, involvement in all phases, capacity to make changes throughout the life of the project and distributive industries required accurate cost estimates, speed of construction and a strongly functional approach. Mass and batch production industries needed low running costs, functional buildings and accurate time and cost estimates. Finally, private developers sought accurate time and cost estimates and sound communications with the design team. It is the last part which is pertinent in this paper for in an overall ranking of the criteria clients saw "communications with the designer" as a critical issue.

In short the characteristics of the client, the industry in which he operates, his experience with the building process etc., shape the criteria for the project and the way in which that design team manages the client's involvement in the project.

7. Project characteristics

It is thought that the type of project under consideration will be an important variable in shaping the organization of the design team and consequently the performance. At the simplest, size and complexity are important factors which will influence the organization of the design team. Smaller, simpler projects may need less communication between the design participants and therefore less managerial intervention. Conversely, larger projects may need longer design time with a more trenchant managerial approach to the design.



8. Design Performance

The foregoing discussion has hypothesised the variables influencing design performance but to understand how these influence performance there must be some measure of performance. It is this area that is potentially the most difficult aspect of the relationships. In this call for research it is important to identify appropriate methodology for the conduct of the work. It is thought that an appropriate research methodology is to 'triangulate' the data by using a mixture of subjective and objective measures. Within this methodological framework three criteria of performance could be measured.

a) client satisfaction - this could be measured by using non-parametric scales to assess the degree of satisfaction experienced by clients in respect of quality, function, form, time and cost of the building. Naturally a benchmark of the client's initial expectations needs to be established to compare ultimate satisfaction. The experienced satisfaction may not be uniform and during the course of the project the client may have revised expectations and may have been prepared to 'trade in' certain initial expectations for better performance in others. Here one may allude to the constant tussle between time, cost and quality.

b) Building user satisfaction - increasingly building users may be different from building clients. Retail and banking services are perfect examples of this separation.

It is felt that the people who use the buildings for work, leisure or other human activity can make a valuable input to the design evaluation process. The data gathered here would need to be based around standard user appraisal documentation.

c) buildability - many contractors have frequently been critical of designs claiming that designs do not respect the need for the contractor to build the project with an efficiency of resources. If technical efficiency of design is to be considered it seems proper that contractors should be drawn into the evaluation process. An expert panel of contractors would be used to evaluate the buildability of the designs.

9. A focus for research

The foregoing has postulated a framework for considering how to evaluate design performance. What is required to test such thoughts is a programme of research. The aims of such work could be to:-

a) establish objective measures of design performance, e.g. quality of design, technical efficiency etc.

b) establish objective measures of organizational performance in design organizations, e.g. productivity, profitability, etc.

c) establish objective measures of management efficiency, e.g. quality and quantity of communications, co-ordination achieved, etc.

The focus of these aims could be to compare different organizational forms for conducting design work. Just taking the two forms noted in Section 4 as an example certain hypotheses may be formed, viz:-

multidisciplinary practices produce building designs of superior quality to those produced by traditional teams,

and

traditional forms of organization achieve higher levels of profitability and productivity,

and

multidisciplinary practices manage the design of building projects more efficiently.

After many years experience of different patterns of design management the experiments are due for evaluation. Funding this area of research in different European countries could help us understand how the design process may be best managed for improved satisfaction to all the participants and improved financial performance by design organizations.

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