TAKING CARE OF CARETAKING

Kristian Kristiansen

Technical University of Denmark, Institute for Planning, Innovation and Management, Building 424, 2800 Lyngby, Denmark

It has been put forward in recent years that facilities management considerations should be better integrated into planning, design and construction of new buildings. It is difficult to disagree with the idea that it would good to establish a feedback mechanism from buildings in use to the production of new buildings, but is it possible? And are there obstacles? This paper will through examples from construction management literature and some cases outline issues related to this integration of facilities management. It is the intention to improve the understanding of the complexities in the integration of FM considerations by linking to a more general debate in construction management. It is demonstrated that it is not as easy as it may seem to create such a learning loop. There is an important and seemingly neglected link to the discussion on fragmentation of the construction industry. A feedback mechanism cannot simply be engineered into construction. A demand from up front in the construction process for knowledge about existing buildings will be needed, as well as mechanisms for passing on the knowledge through the construction process.

Keywords: change, facilities management, fragmentation.

INTRODUCTION

The economic importance of Facilities Management is growing. Outsourcing of Facilities Management services in integrated packages is said to be increasing and the market for Facilities Management services is estimated to be huge (Jensen, 2009a). In PPP projects facilities management companies are included in the Special Purpose Vehicles in charge of the projects. In Denmark, a Research Centre for Facilities Management has been established.

The Building Research Establishment has published a report (BRE, 2001) that strongly advocates the inclusion of FM personnel in the design process in order to create a number of advantages: buildings that are less costly and easier to operate and maintain; more attractive buildings; a smoother running design process; improved buildability; and buildings performing better for end users. Similar arguments have been put forward in Danish reports. According to a report from University of Southern Denmark, not using FM expertise has led to faulty dimensioning of ventilation systems; glazing causing inconveniencies; details that cannot be cleaned properly thus affecting the indoor climate; as well as other faults in the detailed design. (Damgaard 2009). Jensen suggests that experienced FM people should be included in the design teams, and that clients should force designers to accept that FM professionals control of design proposals as part of a programme for continuous improvement (Jensen, 2009).

Kristiansen, K (2010) Taking care of caretaking. *In:* Egbu, C. (Ed) *Procs 26th Annual ARCOM Conference,* 6-8 September 2010, Leeds, UK, Association of Researchers in Construction Management, 715-723.

This might be seen as the FM professionals making claims for being moved from the back seat to the front seat of the construction process. On the other hand, to improve the learning feedback from buildings in use to a new construction process is obviously important and the claim from the facilities management profession should be discussed.

However, is it possible simply to improve the integration of FM considerations in the planning, design and construction of new buildings? Do obstacles exist and if so: what is the nature of these obstacles? In the following, it will be argued based on construction management literature that establishing such a learning feedback is far more difficult than the FM professionals seem to imagine.

POST OCCUPANCY EVALUATIONS

Post Occupancy Evaluations are – like integration of FM considerations – about transferring experiences from buildings in use back to influence decisions about new buildings.However, implementing POE´s has proved to be difficult.

Post Occupancy Evaluations were launched in the 1960´s, but their importance are still being neglected (Cooper 2001). Royal Institute of British Architects took at that time an initiative to counteract what was felt to be a diminishing influence of the architects through making the design of buildings more scientific. However, the attempts to make POE something architects could charge a fee for failed. Later the upcoming of environmental psychology meant that a science on use of buildings was established, but in spite of that, the idea of evaluating buildings and using the knowledge to improve design of new buildings was never successful. The term "the feed-back misconception" was coined to understand the phenomenon (Cooper 2001).

Some authors argue that a bit of success has been reached: some POE´s have been made and some public clients are making use of POE´s on a regular basis (Zimmermann, 2001). Bordass (2005a) on the other hand believes that nobody in the construction industry – neither clients nor designers nor contractors – are particularly interested in how the buildings they are responsible for actually perform.

POE´s are not alone on the market for evaluations of buildings. In Denmark, The Danish Building Research Institute developed a system that included both objective criteria for performance and subjective criteria based on interviews. This system has not been used much neither (Haugboelle 2003).

However, why is it difficult for construction industry to evaluate buildings and use the information for better buildings? Some explanations are given in the literature on POE. One factor is said to be that it is unclear who benefits from better buildings and who should pay for making the evaluations (Cooper, 2001). In addition, the primary responsibility for a project is handed over from one party to another throughout the construction process. The designers have nothing much to do with their buildings after these have been taken into use. Not much is spend on research and development in construction industry. The industry is fragmented: many actors are involved in a construction project; they are all specialists with their own intentions and they all have their own culture and language. In addition, the developer who initiated the project will probably not end up owning the building, the owner will be different from the investor and both might not have much in common with the organizations using the buildings (Zimmermann 2001.

The experience from the attempts to implement POE implies that is not all that easy for construction industry to learn from buildings in use. There are obstacles related to

the way the construction process is organized and the way the building is owned and used. Construction projects are typically not performed by a team. Several professionals and various firms work together on the project and the responsibility for the project is handed over several times during production. A building is not a product in the usual sense, but a bit of physical infrastructure that is often owned, used and taken care of by a group of stakeholders.

In the following it will be attempted to describe some of these obstacles for establishing feedback a bit closer.

OBSTACLES FOR FEEDBACK

Integrated Logistic Support is a management system that aims at directing all elements in the system towards the demand of the customer and at optimizing the operation and maintenance of the building from a whole-life perspective. In the construction industry, ILS can be used for the service systems – heating, communication, safety etc. John (2005) reports on two case studies on implementing ILS in the construction industry. One is about an elevator system and the other about maintenance of 18 buildings. The conclusion was that it is very difficult to implement ILS: A building service system is not procured as such. The actors in a construction project do not work together as a team. In addition, the participants in a construction project are not selected because of their qualifications.

The ILS experiment demonstrates an obstacle for learning from buildings. Lessons learned from the use of service systems in buildings cannot be translated in to better service systems as long as these are not procured, installed and improved as systems. A demand for for instance noise less ventilation would need to have the ventilation system installed by a team working together on solving unforeseen problems, for the supplier of the ventilation system to be able to get an appropriate price and to request for necessary amendments in the structural design of the building – say: space for bigger ventilation channels.

The Tavistock Institute had a pilot project in 1997 on implementing target costing. Target costing attempts to reduce cost on the basis of whole life considerations. In target costing a likely cost for a product is estimated and from that, ways of reducing costs and still get the same function is analysed. This proved difficult in the construction industry: Reliable data on durability and maintenance cost were missing. Worse: a construction project starts with the specifications and costs come next. Costs are not known precisely, neither is what a competitive price could be. Instead, price is determined as what the next link in the chain is considered willing to pay. Target costing needs an environment, where it is possible to know the exact prices, but construction industry is geared towards controlling risks rather than costs. (Nicolini, 2000).

The pilot project on target costing demonstrated that pricing mechanisms in construction projects tend to create obstacles for finding a cost effective solution to a need.

By some, it has been argued that the construction industry has difficulties in changing towards delivering added value to the customer through integration of product and services. Leiringer (2009) reports on three case studies of construction companies adapting to PFI projects. In PFI projects both a building and related services are delivered in a lasting relationship to the public part. Success of integrated product-service systems depends on the ability to put together hitherto separated subsystems

into a well functioning whole. However, the results from the case studies implied that it was very difficult to change deeply rooted company cultures. Furthermore, the construction companies had an interest in still being able to work in non-PFI markets and be able to adjust to new situations on the market for public buildings. What the companies appeared to do were to establish separate departments for the PFI projects and the related rhetoric and avoid profound changes. (Leiringer, 2009).

This demonstrates that creating a demand for knowledge about existing buildings through more permanent relationships between "user and producer" might be complicated: Construction companies have to be able to function at several submarkets and this limits their potential for adapting to change in one submarket.

REENGINEERING THE CONSTRUCTION PROCESS

Many efforts of construction management over the years have been on developing remedies for weaknesses in the construction process: partnering, supply chain management, relationship management, target costing, lean construction etc. etc. However, if the context of the construction industry is not taken into account the reform proposals are what Stuart Green and Graham Winch have criticized as reengineering.

Mohamed (1996) describes how Business Process Reengineering should change construction industry: The brief should be improved to really cover the client´s needs, maybe through establishment of a partnering arrangement between clients and design teams. Then value management might be applied for providing better value for the client. The brief should not solely be between the client and the architect, but preferably also include other members of the project team. Contractors should be selected on basis of their merits, not just the price. Risks should not be transferred to others, but shared in a project team working towards shared goals. Design should be improved through use of methods like "quality function deployment", through making a "constructability analysis" and using "concurrent engineering" to integrate the phases in the construction process. In the construction phase, the many small work packages should be replaced by larger in order to reduce the amount of subcontractors and facilitate the coordination on the site. Team building and trust should be developed between the contractor and the subcontractors. Instead of control of the products, quality should be designed into the products. Just-in-time principles, information technology, prefabrication etc. should be used.

Graham Winch argues that the reengineering thinking takes its ideals from the auto industry or other production systems without not much in common with construction industry. He suggests that the construction industry have much more in common with the so called "complex system industries" delivering large technical systems such as railways or turbines for electricity production than with the "mass production industries". Winch believes that house production might be an exemption to that, but writes that many construction projects will be of the "concept to order" kind, where the client and the designer starts from scratch. An alternative is the "design to order" where design to some extent is predetermined through a system of modules. Or the "making to order" based on mass customization, which Winch suggests, might be of interest for repeat clients like McDonald. (Winch, 2003).

Stuart Green takes a very critical position against the whole movement for changing the construction industry through various management instruments like partnering or lean construction imported from other contexts. He names this "reengineering" and

labels it as to a large extent rhetorical. Its success comes from its alignment to neoliberalism. It serves to cover up the real changes that have taken place in the construction industry, such as the worsening conditions for the labour force. Stuart Green warns against the instrumental thinking of reengineering that focuses on technical efficiency and looks at construction as if it was a machine. (Green, 2003).

Construction industry cannot simply be reengineered. The construction process exists in a context. Following that way of thinking, to develop a feedback from existing buildings to the very start of the construction process for new buildings needs to consider the context.

ON THE CONTEXT FOR FEEDBACK

Just a few remarks can be made here.

Turin (2003) has described the typical one-off production in construction through a simple model. Basically, there are five actors: the user, the client, the professions, the contractor and the manufacturer. The construction process can be divided into a number of phases. Turin chooses: definition of user requirements, the brief, the product design, the building design, production information, production, assembly and consumption. He then marks who is active and who is leading in the various phases and thus demonstrates how the responsibility for the project is passed on through the process.

".. it is apparent that the effective headship of the team moves along the ladder and passes from the client to the professions, down to the manufacturer and contractor, to revert back to the user who in the case of repetitive work, is both the last link in one cycle of the process and the first link in the next cycle … " (Turin, 2003: 182).

Turin is well aware that this is a simplification and also that the one-off process is far from being the only one in the construction industry, but the model allows for some observations. Firstly, one-of production means that the product is sold before it is produced, which means that rules to make sure the producer – or rather the group of producing firms – will respect the conditions for the deal needs to be set up. These rules will be complicated. Secondly, the actors will not willingly accept changes in the rules or changes in the set up of the process that will deprive them of their possibilities for exercising their rights to manage and coordinate. Thirdly that there only is a link from the end of one production cycle to the start of a new cycle, if the user is the same. So one-off production will challenge the creation of a feedback mechanism in two ways: in general, the user/buyer/owner of one building will not be ordering the next and the building is not seen in its entirety but in the light of various professionals as it passes through design and production.

Maybe it should be noted that Turin is not arguing that construction industry should begin to behave as a proper manufacturing industry. Rather is he trying to catch the essentials of construction industry to give a foundation for understanding the roles of the participants and the conditions for change.

Another perspective is offered by Dubois (2002) using a system theory approach. Instead of wishing to change construction industry to be more like manufacturing industry, she argues that construction is handling the complexity and uncertainty that come from production on site in individual projects. The industry uses standardized parts, which are adjusted when assembled on the site. This call for decentralization and it is said to be superior to a solution with customized products that would need to be coordinated with many other products. Tendering is used to make it possible to

organize production without caring much for the relational aspects of transactions. The firms have often several roles they can perform depending on the context.

This leads to describing construction industry as a loosely coupled system. A loose coupling between firms mean that they can act rather independently of each other. The firms in construction have tight couplings in the project and loose couplings outside the project. This gives flexibility in the production system. The parts can be put together in many ways and the system can adapt to new conditions and changing circumstances. The tight couplings between the firms in the project mean that consequences of changes are difficult to overview; for instance, when one firm is delayed it has consequences for many other firms and the whole production. In general, there are loose couplings in the supply chain, except from the project to those suppliers that deliver on short notice. The tight couplings in the projects are made possible by the existence of a strong community of practice: government regulations play an important role, tendering procedures are standardized as well as contract formulas, generic roles for the actors are prescribed etc.

Creating a feedback mechanism in construction industry and thus install learning is not simply a matter of a change in management, it is a restructuring of a whole system. The backside of the flexibility is according to Dubois weakened ability to learn and innovate in the sense that new ideas coming up in one project have great difficulties in spreading to other projects.

Dorée (2004) suggests a modification of this understanding. Based on a case study it is found that innovation in the construction industry can be furthered through tightening of the couplings inside the firms between the projects and tightening the couplings between the firms in the project, particularly between design and construction.

Putting the pieces together it can be said that since – in general – there is not a mass market for buildings, many construction projects "are designed to order" or one of a kind production. To ensure that the buyer will get what he has ordered, rules and regulations are needed. The relationships between the actors in the production also have to be highly regulated in order to allow a production process to be set up for just one project. The actors have roles that allow them to regroup in new projects repeatedly. Therefore, the responsibility for the project is handed over several times during the construction process. The whole industry is loosely coupled to make it possible to establish the tight couplings in the projects. This is a context that should be considered in the discussions of integration of Facilities Management in the construction process.

TWO CASES

Two examples from a Danish context will be mentioned here. The social housing company KAB has procured 2.000 prefabricated apartments through three separate tenders. In order to keep the costs down, whole life calculations were made. It was decided that the buildings and their surroundings should be designed to allow the tenants to take care of the maintenance without professional assistance. To accomplish this a study was made on experiences with maintenance over the years in KAB. All three tenders have been won by alliances between architects and manufacturers of prefabricated buildings. The result seems to be affordable, flexible, low energy buildings of good architectural standard. (www.kab-bolig.dk).

The example is not intended to demonstrate that mass production should be the norm. It shows that is possible to allow for a regrouping of the actors into a constellation where considerations of maintenance and user values can be integrated. The client and owner are the same. The team behind the construction process can work seamlessly together and can by winning a next tender profit from having developed the product and the process.

The contractor MTHoejgaard has developed a concept for apartment buildings. Three varieties for three different target groups are offered. The buildings are predesigned, but certain modifications can be made. A supply chain is more or less in place. The client will know what he gets and the price can be set in advance. This so called "Bolig-konceptet" would be what Winch has called "design to order" or maybe "make to order" (Winch, 2003) The concept has not sold very well, but it demonstrates a way of changing the construction process, where the contractor control the supply chain, have an interest in improving the performance of the buildings, because he is selling products at a market. The motivation for MTHoejgaard to start the Boligkonceptet was to reduce risk, which they had experienced to be too high when tendering for housing projects. (www.mthojgaard.dk).

More examples from Denmark could be mentioned, and similar cases must exist in other countries as well. While one-off production is necessary for huge and specialized buildings like opera houses, other production forms might be realized within the logic of the construction industry. Forms that offer improved conditions for integration of FM considerations throughout the construction process. Winch writes about "design to order" or make to order". Turin has similar concepts. The examples demonstrate that changes in the construction process that allow for continuous improvement also might lead to changes in the roles of the actors in the construction process.

CONCLUSIONS

In general a feedback mechanism for FM knowledge will depend on the following.

- That the knowledge exists, i.e. that knowledge on FM experience is collected, verified and made transferable.
- That the knowledge can be integrated with other types of relevant knowledge. Not all knowledge necessary for new buildings can be had from existing buildings.
- That the knowledge is in demand (from somebody) up front in the construction process.
- That the knowledge can be passed on and survive through the construction process so that the intended outcome is realized.

The first two bullets have not been dealt with here. POE is an example of a system for systematic evaluation of buildings, and it is evident that is possible to gain knowledge about buildings in use. It might be more difficult to fulfil the demand in the second bullet and develop a holistic view of the various types of buildings and integrate the various types of knowledge necessary in the design.

It has been argued that it will be difficult for the FM interest groups to succeed in establishing a learning process in construction industry. The POE movement were not successful. It will be a challenge to create a demand up front in the construction

process for knowledge on buildings in use. The construction process is organized in a way that can make it a challenge to deliver to end-users what was intended in the design. Since the construction process cannot simply be reengineered, the FM interest groups face serious challenges in their endeavour. There are obstacles to learning from existing buildings.

It was the intention of this paper to discuss the claim from Facilities Managers that they should and could integrate FM considerations in the construction process. It was shown that this is far from being easy. And there is a link to existing knowledge in construction management, which only could be dealt with superficially in this short paper. Never the less: Taking better care of caretaking is an important challenge for the construction industry and should be taken seriously.

REFERENCES

Boardass B, Leaman A, Ruyssevelt P (2001) Assessing building performance in use 5: conclusions and implications, *Building Research and Information*, **29**(2).

Boardass B and Leamann A (2005) Making feedback and post-occupancy evaluation routine 1: A portfolio of feedback techniques, *Building Research and Information*, **33**(4).

BRE (2001) Construction Process: Innovation in facilities management, BRE Output/milestone 77952.

Cooper I (2001) Post-occupancy evaluation – where are you? *Building Research and Information*, **29**(2).

Damgaard T og Erichsen P B: Implementering af drift i byggeriet, Syddansk Universitet, februar 2009.

Dubois A and Gadde (2002) Construction industry as a loosely coupled system: Implications for productivity and innovation, *Construction Management and Economics*, **20**(7).

Dorée, A G and Holmen E (2004) Achieving the unlikely: Innovating in the loosely coupled construction system, *Construction Management and Economics*, 22.

Eley J (2001) How do post-occupancy evaluation and the facilities manager meet?, *Building Research and Information*, **29**(2).

Green S D and May S C (2003) Reengineering construction: going against the grain, *Building Research and Information*, **31** (2).

Haugbølle K, Beim A, and Eriksen L. (2003). Erfaringer med evaluering af standard og kvalitet. København: Økonomi- og Erhvervsministeriet, Erhvervs- og Boligstyrelsen.

Jensen P A (2009) Design Integration of facilities management: A challenge of knowledge transfer, *Architectural Engineering and Design Management* **5**.

Jensen P A (2009a) *The Market for Facilities Management in Denmark*. Centre for Facilities Management, Technical University of Denmark.

John G A and Clements-Croome D J (2005) Contextual Prerequisites for the application of ILS principles to the building services industry, *Engineering Construction and Architectural Management*, **12**(4).

Leiringer R, Green S D, Raja J Z (2009) Living up the value agenda: the empirical realities of through-life value creation in construction, *Construction Management and Economics*, **27**.

Mohamed S (1996) Options for applying BPR in the Australian construction industry, *International Journal of Project Management* **14**(6).

Nicolini D, Tomkins C, Holti R, Oldman A, Smalley M (2000) Can target costing and whole life costing be applied in the construction industry? Evidence from two case studies. *British Journal of Management*, **11**.

Turin D A (2003) Building as a process, *Building Research and Information*, **31**(2).

Winch GM (2003) Models of manufacturing and the construction process: the genesis of reengineering construction, *Building Research and Information*, **31**(2).

Zimmerman A and Martin M (2001) Post-occupancy evaluations: benefits and barriers, *Building Research and Information*, **29**(2).