HOW PROFESSIONAL CLIENTS OBTAIN DESIGN

An explorative survey into design procurement systems

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1. Introduction

Nowadays only very few clients construct their own built facilities. In the whole of the construction industry "construction" has become a separate profession. When a client needs a building, contracting out of manufacturing is in general inevitably. As a result many of the known procurement systems focus on the client-contractor relation.

The division between knowledge and profession is clear as far as construction is concerned, but is not so clear for design. Many professional clients still have their own design department and make their own designs.

In the past decade many management positions are taken up by lawyers and economists. This trend also occurred in organizations of "professional clients". This development often brings about a financial radioscopy of the organization. Questions are studied such as: "What should the organization do itself, and what should be procured from suppliers?" The answer regarding construction work is clear, but what about design activities? Should professional clients do their own design work or should the design be procured outside the company? This question puzzles many professional clients. Often the lawyers and the economists act in a rigid manner. Design is no "core-business" and should be disposed of.

This paper questions such practice.

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1 This paper is written by André Dorée for the CIB W92 working commission meeting held in Las Palmas on the 2nd and 3rd of December 1991. The author is post graduate student at the department of civil engineering of the faculty of public administration and public policy, University Twente in the Netherlands.
2. A general description of the situation

In the Netherlands much of design and engineering of public facilities is traditionally carried out by the local and (sub)national public authorities themselves. Up till now the most apployed procurement method is the general contractor approach. At this moment however, due to budgetary problems of the national and local administrations, politicians promote and stimulate reduction of the (national and local) governmental apparatus. This results in experiments with other types of procurement methods, such as design/construct and contracting out design work\(^2\) to independent design firms. The mayor reason for adopting this new approach is economizing in public expenses. The main tendency is towards more and more contracting out of design activities, which is supposed to lead to savings on the total sum of designers salaries.

The prime supposition is that public agencies are operating less efficient than private firms. A design acquired from the market is perceived as less expensive as a design acquired in house. Since public agencies tend to be more bureaucratic than privately owned firms the former statement is commonly accepted\(^3\). Subsequently many see the contracting out of design activities as a positive contribution in the reduction of public expenses.

It may be however that the above mentioned reasoning is a little short sighted. It will be argued in this paper that when all design skills are disposed of, in the long run the public expenses will raise more then there is gained on designers salaries. If that is indeed the fact then the political measures taken will turn out to be contra effective.

But it would be short sighted too to state that all design has to be carried out by the public agencies only. Neither one of the two extremes is expected to deliver the optimal result concerning economy.

3. The perceived problem

If economizing on public expenses is the main purpose, the question arises whether design should still be carried out "in house" whether it should be partially or completely be commissioned out. The main problem can be stated as:

*Regarding the point of efficiency, when should the design be produced in house and when should the production of the design be contracted out?*

Or stated in terms of transaction cost economics: When should unified governance structures (in house production) and when should market governance structures (contracting out) be applied?

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\(^2\) In the context of this paper engineering is seen as a design activity too. So when the verb 'design' is used design/engineering is meant. With the exception of the times when the substantive 'design' is used.

\(^3\) Williamson [1985] argues that internal production lacks competition. Internal production needs another incentive structure. This alternative incentive structure is less effective as the outside competition incentive. As a result internal production has to be less efficient (c.p.). Bokkes [1989] supplies this argument. He states that public production has more than just a strait forward financial objective. In pursuit of this multiform objectives concessions on efficiency have to be made.
4. What literature says about the problem

When we look for answers in the established procurement systems literature, especially to those books and essays which compare different procurement systems, the next insights do emerge.

Franks [1984] compares six types of management systems and uses five performance requirements. Although contracting out of design activities is obvious in case of package deal and design/construct, none of six described management systems refers to in house design. Furthermore Franks only uses one financial criterium called "economy", which should be interpreted as project costs.

The EDC publication "thinking about building" compares nine alternative procurement systems (in four classes) and uses nine criteria. Also no distinctive difference is given concerning the design procurement system, and one financial criterium "price certainty". The questionnaire makes notice of "controllable variation". When variation is not controllable they advice not to use design and construct.

The NEDO publication [1974] describes both the consultant approach and the design and construct approach. Little attention is given to in house design acquisition.

Walker [1984] states in his book that in analyzing and designing organizational structures relationships of people in the organization are of importance. Furthermore he mentions the roles of the people the decisions to (are allowed to) take, and their relations in arriving at decisions. When we agree that the design process is a decision making process, than the points Walker addresses underline the importance of evaluating the distinction between "in house design" and "contracting out".

Rougvie [1987] also makes no distinction between in house design acquisition and contracting out to independent design firms. He compares nine procurement systems on seven criteria. Again design and construct score best on the lowest overall cost (project costs) and scores worst on flexibility.

Singh [1990] presented a paper on the last CIB W92 meeting which showed a selection tool for procurement systems developed on the basis of an elegant research project. Nine procurement systems are compared on eight criteria. But he also does not distinguish between in house design acquisition and design from a independent design firm.

Bennett [1985] distinguishes three types of organization: programmed, professional and problem-solving. These types are respectively suited for standard constructions, traditional constructions and innovative constructions. Although he does not differentiate regarding in house versus contracting out of design activities, he emphasises the role of the client and the decisions the client has to make. "When the client does not carry them out {ad: the essential aspects of his role}, another team within the project organization will do so but not necessarily, or indeed not even probably {emphasis added}, in the way which meets client's needs".

This overview shows it is hard to find answers to the stated question. Most of the literature refers to procurement systems without distinguishing between in house design acquisition and acquisition of design from independent design firms. The authors often implicitly suppose the participation of independent design consultants. Furthermore seldom is looked beyond the horizon of the project. Most criteria used to evaluate the different procurement systems concern the project itself. Although we probably all know the proof of the pudding is in the eating, little attention is given to the use aspects of the building (value as well as
5. Working towards an answer

Since literature gives no direct answers a more theoretical approach is needed. In general, selecting among alternatives cannot be done without measuring relevant aspects of the individual alternatives, and comparing the individual scores per alternative with specified targets. This approach will also be adopted for the stated problem concerning the contracting out of design activities.

Comparing in house design with contracting out, in the context of efficiency of public expenses, has several aspects\(^4\). The fundamental layer of comparison is production efficiency: which is more efficient, in house production or the production of the supplier. But it would be wrong to decide on the basis of production efficiency only. Above the layer of production costs is a layer of transaction costs. Contracting out will save on production costs, but additional costs have to be made, such as the costs of finding and selecting a suitable contract partner, negotiating, drafting the contract, and last but not least monitoring and assuring the progress and the result of the design. These costs of contracting out have to be included in the evaluation of the different design procurement systems.

The mentioned two financial aspects are mostly considered, but one aspect is often omitted. When the financial effects of contracting out are analyzed consideration has to be given also to opportunity costs and opportunity losses. Comparing unified and market governance should not be limited to production costs and transaction costs only. The expected costs and value parameters of the building (when realized) that is designed, in the alternative design procurement situations, should be included in the consideration.

Thus for the choice between in house design versus contracting out the design, three financial aspects have to be considered:
- design production efficiency.
- costs of the contracting out transaction.
- opportunity costs and losses concerning the building\(^5\) (as it is used).

In this paper also the effect of the designers and of the design procurement systems on these financial aspects will be investigated as is expressed by the following questions:
- how do the designers influence these financial parameters of the building and the building process?
- how do the different procurement systems, as being the organizational context of the designers, influence the decisions of the designers concerning the three mentioned financial aspects (production efficiency, transaction costs, opportunity costs/losses)?

So first we will look at the contribution of the designers in the building development process and the effects it has on the cost and value parameters of the building (in use). It

\(^{4}\)Although this paper concentrates on public client organisations, the argumentation also goes for private professional client organisations.

\(^{5}\)I use the word "building" for all types and categories of artifacts produced by the building/construction industry; houses and office buildings as well as bridges, roads etc.
concentrates on the decisions the designers make on behalf of the client/user. Secondly we will look at the effects of the "organisational setting" of the designer on the outcome of the delegated decisions. Three fundamental modes of design acquisition will be described and compared.

5.1 The role of the designers

Designers play a crucial role in the building development process. They operate in between the client and the manufacturer. Designers combine two specific sets of knowledge: (1) knowledge of the way building characteristics support certain client-processes and (2) knowledge of constructing buildings. Each time they make a design they do it for a specific situation. The specific situation is described by the client in a program of requirements and wishes, supplemented with constraints on time and money. For designers this document describes the design-problem. During design (intermediate) solutions are sought and the problem is restated, all in a cyclical manner. Alternative solutions will be generated, and will be evaluated and selected regarding the stated program [various authors].

The main function of the designers is to translate client's requirements and wishes into a buildable and even more important a usable design. In doing so they determine several value and cost parameters which can be attributed to the building:

1. Designers determine the characteristics of the building.
   In doing so they determine:
   . the costs of construction, which is the main part of the total project costs (often referred to as investment costs).
   . the potential use-ability and the potential value of the building.
   . the operational characteristics of the building, and thus the use-costs (operation, heating, maintenance, security etc.).

2. Designers have to be paid, so their activities directly influence the costs of the project.
3. Designers are part of an organisation. Parts of the bureau costs may be attributed to the operational costs of the "mother"-organization.

Category one contains the product costs (in the literature often referred to as life cycle costs). Categories two and three are the production costs of the design. The categories are interrelated. Ultimately category two costs flow into category one. The relations between the several costs are illustrated in the figure 1. For the sake of the simplicity the figure shows a simple in-house design situation.

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6 referring to the project management literature which promotes the control parameters: Money, Time, Quality, Organisation and Information [various authors].

7 see also Flanagan cs 1989.

8 category two "design costs" financed out of project budget, are part of the investment in the building and will subsequently be part of the life cycle cost (as depreciation and interest).
If the design process is regarded as a production process it is obvious that management is necessary. For executing effective management a explicit objective is a necessary condition\(^9\). In governing the design activities the three financial objectives are usually considered:

1. project costs.
2. building costs.
3. design efficiency.

These three objectives have a strong resemblance with the three aspects of contracting out which are mentioned earlier in the paper. The three last mentioned objectives are not complementary. During the design process trade-offs between the objectives have to be made (e.g. more investment during the project versus the life cycle costs of the building). Because the objectives are semi-competitive, priority of the individual objective has to be stated\(^10\). Otherwise, due to the unclear objective, effective steering of the design activities will be impossible.

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\(^9\) According to de Leeuw (1988) six conditions have to be fulfilled before effective steering of a system is possible. The first condition concerns a stated objective; A model of the production process is needed; Information about state of the system and information out of the environment are needed; furthermore the management should have sufficient steering variability and information processing capacity.

\(^10\) Ideally object efficiency should have the highest priority. Up till now seldom a financial utility function is given in a building development project.
When the design process is regarded as a process of decision making, it seems plausible that different priorities regarding the financial objectives imply different decisions during the design process, and thus leading to different designs and buildings.

When we accept that the priorities regarding financial objectives are correlated with the organizational context of the design production team it seems plausible too that different procurement systems, in this case different types of design acquisition, lead to different priorities concerning financial objectives.

Given the two statements above it is plausible is that different procurement systems lead to different designs and buildings (even when the designers are completely the same).

### 5.2 Comparison of design acquisition options

The analysis will be restricted to three principal modes of design acquisition. The former introduced dichotomy in house versus contracting out is elaborated through dividing the last in contracting out to an independent design firm, and contracting out to a construction firm. The three modes taken into consideration are:

- acquisition of the design in house.
- acquisition of the design as part of a design/construct scheme.
- acquisition of the design from an independent design firm.

The key-question is:

_How do the three modes of design acquisition differ regarding the pursued financial objectives, and how does the difference in priority declaration effect the cost and value parameters of the building._

### DESIGN ACQUISITION IN HOUSE

The design is made by a specialized department of the client organization. In house design acquisition often leads to the traditional project organization. This is general contractor or separate trades with ex-ante competition, contracts preferably lump sum, otherwise unit rate, seldom cost plus.

The internal design department has the potential for the best integration of use-, operation- and maintenance data into the design. Its relation with the client organization creates a strong learning potential through feedback of user experience to the designers.

The advantages of this structure are: maximum flexibility during design, insight in the client organization, and insight in the requirements and wishes of the client/users.

The mayor complaint about this structure is that the internal design department tends to bureaucratization, tends to risk avoidance, and forces design details into the design which are "over-done" and subsequently to expensive (hobby-horses).

In day to day practice the design department often is responsible for delivering a project on budget. This leads to emphasis on the project costs objective for steering the design activities. But through the intensive relation with the client organization to much emphasis on project costs at the costs of higher life cycle costs is often anticipated.

Conclusion: Although the design efficiency is not as high as in the other types of design acquisition, the "inside" knowledge of internal design department, and the long term relation with the client/user secures that use-value and use-costs are taken into consideration during design activities.
DESIGN ACQUISITION THROUGH DESIGN AND CONSTRUCT

Design and construction are executed by one organization. The client formulates a program of requirements, wishes and constraints. This document is the basis for design/construct contracts. These contracts may be obtained by negotiation as well as by competition. The pay structure may be lump sum, unit price, or a combination of both. The advantage concerning the process is the clear division of responsibilities between client and contractor. The advantage concerning the product is the integration of construction technology knowledge into the design phase. The potential improvement of buildability may lead to substantial project costs savings. As disadvantage is mentioned that through strong emphasis on price fixing, project costs savings may pursued at the cost of life cycle costs. The designers are aware that their relation to the client is a temporary one. They are more concerned in saving regarding their chance of getting the construction contract then in savings regarding the expenses of the client. Another consequence of this temporary relation is the limited knowledge the designers have concerning the client organization and the use aspects of the contemplated use-process. This makes it more difficult to design a building for typical use aspects. Another disadvantage is the lack of flexibility which is experienced by the client. The client has often no opportunities, or at high expenses, to influence the design activities. This causes severe problems in complex projects which are carried out in a political context. Conclusion: Through the emphasis on project costs, design and construct offers an opportunity for extending buildability efforts, and may lead to savings on project costs. But through the distance in the relation between user/client and designers less use-value and/or more use-costs may be the consequences.

DESIGN ACQUISITION FROM A INDEPENDENT DESIGN FIRM

The client drafts a program of requirements, wishes and constraints. The independent design firm designs the building. A contractor constructs the building. As far as the terminology of procurement systems concerns this scheme looks very much like the in house design department situation. But there are three fundamental differences.

Independent design firms combine limited client specific knowledge on use-aspects of the building with limited specific knowledge on construction technology. Furthermore they seldom receive feedback from the use phase. Also they often exclude quality guarantees and they limit their liability, which transfers risks to other project participants.

Acquisition of design from an independent design firm implies introducing a third party into the project. The clients has a contract with the designers, and has a contract with the construction contractors, but for the flow of work between design and construction no formal contract is drafted. In case of imperfect or incomplete drawings often conflicts arise between client, designers and contractor over who is to blame and who has to pay the damage.

The design firm is often a commercial enterprise which has to make a profit. In order to do

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11 This can partially be countered by extending the design/construct schema to an design/construct and operate scheme. Although it is expected that this results in giving more consideration to use-aspects of the building, this scheme up till now is rarely used.

12 When the life cycle costs consist mainly of capital costs, and a clear and complete requirements program can be formulated, design/construct may be a considerable alternative for the traditional procurement systems.
so it will pursue savings on design costs. The ultimate goal is to deliver more designs with less costs made, in stead of delivering better designs (measured in terms of life cycle costs and use-value)\(^1\).

There are two typical situations for contracting out design to independent design firms. One is when the own capacity of the client is temporary insufficient. The other is when the independent design firm has specific expertise which the client lacks.

Conclusion: Independent design firms tend to emphasize design effort efficiency. They will settle for a design which is acceptable for the client in stead of a design which is optimal for the client (in terms of use-value and life cycle costs).

6. A tentative answer

Now back to our central problem. There are three fundamental modes in obtaining designs, which is best regarding savings on public expenses:

- acquisition of design in house.
- acquisition of design through design/construct.
- acquisition of design from independent design firms.

As shown in the previous paragraphs there is no consistent theoretical framework which explains the effects of different procurement systems on use and cost parameters of the building. This makes it difficult to give strait answers in the matter of design procurement systems, so the best that can be done is stating some tentative answers and indulge in some speculation.

Some tentative answers:

- In house design gives the client maximum flexibility for change orders during the design process, and gives the client maximum possibility for integration of use related data in design. Although design departments tend to be less efficient internally, they seem to offer the best opportunities for controlling and steering on use value and life cycle costs of the building.
- Design and construct offers the least in flexibility towards the client, but offers the most concerning buildability and project costs control. Design and construct makes it possible to integrate specific construction technology knowledge and information into the design. Design and construct seems to offer the best in project cost control.
- Maximum use of design and construct advantages requires clear, complete and stable programs of requirements. Furthermore it must be possible for the client to measure and evaluate the life cycle cost before construction starts. When the share of capital costs in the total of life cycle costs increases the favour for design and construct increases.
- Independent design firms probably do best in design efficiency, but they tend to opt for proven design. They have no direct short cut to information of the client or the construction contractor. Given the intention to save on public expenses, there are no arguments supporting design acquisition from independent design firms.

What may happen in the future regarding acquisition of design; A speculation on possible developments (supposing saving on the public expenses is the aim):

\(^1\)Unless they anticipate that delivering better designs may result in obtaining more orders/contracts, which is a condition for continuity in the long run.
The public apparatus still is responsible for making their own designs. Especially when it is
difficult to make a clear, complete and stable program of requirements the best solutions
seems to be the traditional way; in house design.
But when it is possible to draft a clear and complete program of (measurable) require-
ments, and their are expected little amendments on that program, design and construct
may be a good alternative (when set up in competition).
The independent design firms are hired more by the contractors than by the clients. The
clients hire people from independent design firms only for advise on specific
 technological matters and for temporary enlargement of their own apparatus. The public
design agencies have reorganized their internal process. They employ high educated
technicians and operate at a higher efficiency level than up till to day.
In case of complex buildings, or building processes in complex (political) environment, the
client will take care of the design. In more standard situations design and construct offers
good opportunities.
Some cautious experiments will be executed with the most far reaching form of contracting
out, design/construct and operate.

7. Conclusions
Looking back at the arguments used to support more contracting out of design activities, we
can conclude that promoting contracting out on the basis of design production efficiency is
indeed defendable. But it is not enough to look at production efficiency only. Contracting
out results in transaction costs. The more difficult it is to draw up a contract and to live up
to it, the more transaction costs have to be expected. And last but not least delegating
design activities to other organisations may result in designs where opportunities to make
them better, more value or lower life cycle costs, are set aside.
Up till now there is no theoretical frame work which describes and predicts the effects of
contracting out design activities on the cost- and value parameters of the building in a valid
way. In this paper I presented some parameters which have to be regarded when contracting
out of design is considered. I made some tentative remarks, comparing three fundamental
design procurement systems: in house, through design/construct and from independent
design firm. These remarks are open for discussion. I hope that within a couple of years the
theoretical frame work which I referred to will be developed.

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