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Impact of Economic Cycles on the Use of Alternative Procurement Methods in Construction

ABSTRACT

An appropriate procurement method is a key means of helping achieve the specific goals of a building project. The goals may be, for instance, quick implementation of the project or low acquisition price. On the other hand, the significance of the speed of implementation and the profit expectations of contractors vary according to economic cycles. Thus, it would be natural to favour different procurement methods in different phases of the cycles.

The goal of this study was to assess the impact of economic cycles on the use of various procurement methods. Changes in the use of different procurement methods, which are independent of economic cycles, were also examined. The study is based, for instance, on the shares of procurement methods used in Finland over a ten-year period. The method involved calculation of partial correlations which eliminates the impact of other contributing factors irrelevant to the study.

The results indicate that Design-build and Management-type procurement, and to some extent also Separate contracts, increase their share as the economic outlook improves. The traditional Comprehensive contract, again, assumes a larger role as economic trends weaken. The development trend independent of economic cycles also indicates that use of the Comprehensive contract decreases as the other procurement methods mentioned above are used more.

Keywords: construction, economic cycles, Finland, procurement systems, trends

471

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1. INTRODUCTION

The project procurement method – which determines the division of labour and contractual and operational relations between the major players – is an organizational means of creating preconditions for the successful implementation of a building project. The appropriate procurement method may be a means of avoiding problems and a key to attaining project-specific goals. Such goals are, for instance, quick completion of a project or low acquisition price. Risk minimization or proper assignment of risk between the parties, the owner's desire to influence the details of the design solution, and the amount of work done by the owner may also be central factors in selection. The aims and valuations of the owner as well as the type and size of the building in question also have an impact on the selection of the right procurement method.

Tools based on the valuations of the decision maker and already defined relative values of properties for different procurement methods have been developed to assist the owner in the selection of a procurement method, see e.g. Skitmore & Marsden (1988) and Chan (1995). These methods assume an equilibrium between demand and supply, which means that up till now it has not been possible to take into account the change in the operating environment and its possible impact on the effectiveness of the chosen procurement route.

Yet, it is probable that as economic situations fluctuate, the relative merits/dismerits of procurement methods are also affected. The eagerness of contractors to submit tenders, their profit expectations, and the significance of the speed of implementation vary. Similarly, over- and underemployment are a dilemma for the owner's project organization as well as construction sector companies. Consequently, it would be logical to expect that explainable changes take place in the use of various procurement methods.

The aim of this paper is to assess the influence of economic cycles on the use of different procurement methods. The applied method is analysis of the shares of procurement methods used in Finland over a 10-year period. Economic changes during the period were strong which provides a sound basis for examining the suitability of various procurement methods in different situations on the basis of empirical material.

2. APPLICABILITY OF PROCUREMENT METHODS TO VARIOUS ECONOMIC SITUATIONS

Procurement methods and selection

The implementation of a building project involves the cooperation of many parties: the owner, various designers, contractors and suppliers. There are numerous procurement (or project delivery) methods for establishing the division of labour between the parties, contractual rela-

tions, and the ground rules to be followed. In this study the breakdown of methods (as explained more thoroughly in Lahdenperä 2000) is the following:

- Management-type procurement (MT), where a separate project management organization (consultant or risk-bearing contractor) manages the overall project and implementation is generally realized through numerous partial contracts.
- In-house construction (IH), where the owner designs or commissions the design, supervises site works and possibly performs part of the technical construction work.
- Design-build (DB), where a contractor under contract to the owner is responsible for the project's design and implementation as a whole.
- Comprehensive contract (CC), where the owner assumes responsibility for design and the project is implemented on the basis of a single contract; no subsidiary contracts are used.
- Separate contracts (SC), where the owner assumes responsibility for design; and construction is implemented on the basis of at least two – generally more – parallel contracts.

Two distinct phases can be distinguished in the selection of a procurement method (Fig. 1):

- In the early phase, decisions are made primarily about organization and supervision of design.
- Later on, if separate design has been selected, a decision on possible contracting out and division of construction work is made.

Identification of the phases is crucial, since the time of entering into a contract is significant from the viewpoint of the economic situation as the arguments concerning the use of procurement methods will prove later on.

Decision to organize design

At least two factors dependent on the economic situation influence the selection of the procurement method when organizing design: which modes of action serve the project's schedule-related goals best, and how can an advantageous contract price be secured by a timely invitation to tender and drawing up of a contract.

According to Koskela et al. (1997), during a macroeconomic upswing owners place emphasis on quick implementation of a building as economic activity is brisk and the construction of facilities is considered revenue-generating. The quickest completions are generally achieved by Management-type and Design-build procurement (e.g. Peltonen & Kiiras 1998, Skitmore & Marsden 1988, Pernu 1989).
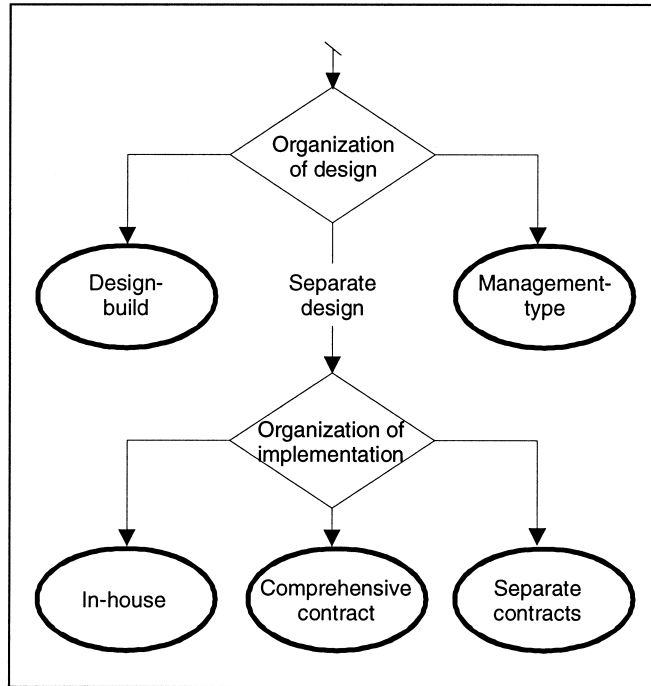
FIGURE 1. Basic sequence followed in selecting procurement method. The figure is a simplified version of the original by Nykänen (1997). Later on, Peltonen & Kiiras (1998) have presented a similar sequence.

In Design-build, it is also possible to fix the costs of an entire building project quickly which should be of significance to the public sector especially in periods of economic boom and/or inflation. Nykänen (1997) again, considers the involvement of the contractor in design necessary for successful project implementation. Nykänen says that it is difficult to see any other benefit to be gained from involving the contractor at the latest possible stage than that it may allow the owner to obtain an even lower offer from the markets in a downturn.

Pernu (1989, 1998) also ponders the significance of the time of concluding a contract from the viewpoint of the risk of changing cost levels, willingness to submit tenders, and re-serves for risks, but the conclusions are ambiguous from the viewpoint of this study. Another issue raised by Pernu (1998) is the owner's shortage of staff – perhaps due to a boom – when a contract including design allows transferring project management tasks to the contractor.

Overall, the message is clear: Design-build and Management-type implementation are, above all, procurement methods for times of expansion whereas design by the owner is the choice especially in an economic downturn.

474

Decision to divide contracts

Orkoneva (1991) presented a comparison which indicates that it is more advantageous in a boom to divide a project than to enter into a comprehensive contract. The high price of a comprehensive contract is likely due to the higher risk involved, and contractors are not always even interested in it. In a recession, again, comprehensive contracts are offered at such cheap prices that Separate contracts is not worth considering; in a recession builders want to employ as much of their own capacity as possible even at lower prices.

This idea is also supported by Pernu (1989) who states that in a boom contractors have plenty of work and are not keen on employing resources without being able to achieve a good profit. Pernu also reminds that the Separate contracts method allows using different forms of contract for the main contract and the subsidiary contracts which, especially in a boom, creates more competition.

Thus, it can be justifiably assumed that the division of a project into several contracts is generally advantageous in a boom. Separate contracts and Management-type implementation as well as In-house construction are forms for times of economic expansion while the Comprehensive contract is the choice in a recession.

In practice, In-house construction is largely connected to residential developments by construction companies (for further information see Lahdenperä 2000) which are implemented when the economic outlook is good, but which decrease in a downturn. Thus, this procurement method cannot be considered a true alternative from the viewpoint of this study.

Hypotheses

The advantageousness of various procurement methods in different economic situations is not clear-cut. There are several factors influencing decision making which can be contradictory as shown above. Initially, separate design, and consequently also Separate contracts, was considered a mode for recession as it delayed the time of drawing up contracts. Then, Separate contracts was – at least compared to the Comprehensive contract – found to be a procurement method for an economic upswing.

On the other hand, there are variations of the procurement methods, which means that applicability based on certain simplified grounds becomes fuzzy. For instance, Design-build can be implemented by negotiated contract or by an inclusive competition involving design, which certainly causes major differences in the eagerness to submit tenders and resulting costs. Similarly, the ability of the alternatives to provide fast implementation varies a lot. Also the fact, that the Comprehensive and Separate contracts are typically based on a lump sum agreement while the other systems may also use more flexible pricing arrangements (e.g. cost-plus, guaranteed maximum price), confuses the drawing of conclusions. Moreover, economic out-

look is only one of a number of factors affecting the selection of the procurement method.

Nevertheless, considering the special status of In-house work, the following hypotheses may be presented for further study:

H1 The share of the Comprehensive contract diminishes the more, the better the economic outlook.

H2 The share of Design-build, as well as that of Management-type procurement, increases the more, the better the economic outlook.

H3 The share of Separate contracts in relation to the share of the Comprehensive contract increases the more, the better the economic outlook.

H4 The combined share of Design-build and Management-type contracts in relation to the combined share of the Comprehensive contract and Separate contracts increases the more, the better the economic outlook.

3 IMPLEMENTATION OF THE EMPIRICAL STUDY

Shares of procurement methods

Data on the use and shares of procurement methods are based on a project database (Rakennusfakta 1998) which includes data on numerous building construction projects in Finland. The study focused on new building construction, but all single-family houses (also as a multi-house project), vacation homes and small agricultural buildings have been excluded. All projects worth less than FIM 1 million were also eliminated so as to better be able to describe actual professional construction practice (1 MFIM is equal to about 168,000 EUR).

The material has been presented and evaluated in detail by Lahdenperä (2000); it contains annual building projects according to the year their construction started. There are a total of 20,050 projects distributed quite evenly over the target period consistent with economic trends. Table 1 presents the number of projects by building types. Figure 2 shows the situation on the level of total new building construction.

Cyclical fluctuations in construction

The dominant feature of Finnish new building construction in the early 1990s, following a period of strong growth, was the drop in the value of annual construction (a fall of over 50 percent in three years) – relatively the largest, at least in Europe (Euroconstruct 1995). Subsequently, volumes have increased again (Fig. 3).

The input prices of construction have generally risen somewhat, as construction volumes have increased, and stayed relatively stable as volumes have dropped. Contract prices, on the

476

TABLE 1. Use of various procurement methods for new projects started in each year [no.].

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
					Residential buildings					
Separate contracts	339	335	293	219	128	99	160	169	232	239
Compreh. contract	515	552	584	514	378	292	226	186	188	172
Design-build	158	111	52	47	74	99	64	143	195	187
In-house	1517	830	465	293	204	187	209	132	223	481
Management-type	0	0	0	0	0	1	2	0	3	1
					Industrial buildings					
Separate contracts	232	239	134	71	50	89	115	109	119	191
Compreh. contract	35	24	25	16	17	19	16	20	22	21
Design-build	59	52	26	11	12	9	16	10	20	31
In-house	146	138	80	41	24	21	25	29	23	45
Management-type	0	0	0	0	0	3	2	3	1	10
					Business premises					
Separate contracts	233	163	136	69	41	36	48	50	45	99
Compreh. contract	34	26	19	16	11	5	11	14	10	9
Design-build	72	45	34	27	16	8	9	13	12	25
In-house	134	105	80	58	20	6	9	15	7	23
Management-type	0	0	0	0	0	1	4	4	9	11
					Other buildings					
Separate contracts	345	442	388	313	226	165	170	229	192	255
Compreh. contract	62	89	91	72	62	44	40	37	41	43
Design-build	76	51	39	29	17	10	26	19	19	31
In-house	137	113	127	76	50	40	51	31	28	33
Management-type	0	0	0	0	0	5	1	3	3	8

other hand, have followed the changes in construction volumes to a significant degree. To be sure, the fierce competition due to the slump slashed contract prices to an unreasonable level before resources could adapt to the new economic situation.

Used methods

In the first phase of the study, the impact of economic cycles on the use of various procurement methods was evaluated by correlation analysis. The calculations used *Pearson's* so-called *product moment coefficient*, generally symbolized by *r* – its value can be calculated from the following formula (e.g. Mauranen & Puntila 1995):

(1)　　　$r = \dfrac{n\Sigma x_i y_i - \Sigma x_i \cdot \Sigma y_i}{\sqrt{[n\Sigma x_i^2 - (\Sigma x_i)^2] \cdot [n\Sigma y_i^2 - (\Sigma y_i)^2]}}$

The value of the derived correlation coefficient ranges from –1 to +1 depending on how closely the statistical relationship between two variables resembles linear correlation. Thus,
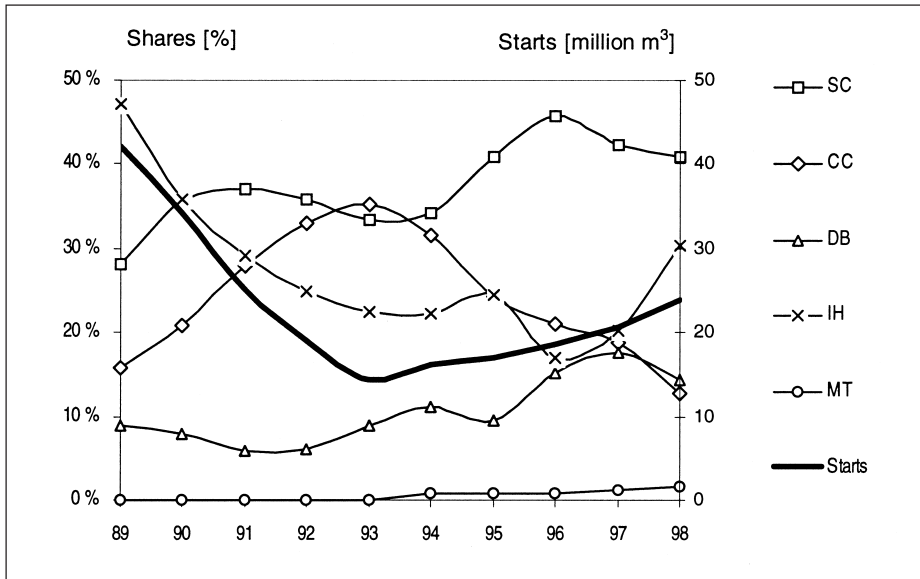
FIGURE 2. Shares of procurement methods used in total new building construction and total Finnish starts subject to delimitations of study.
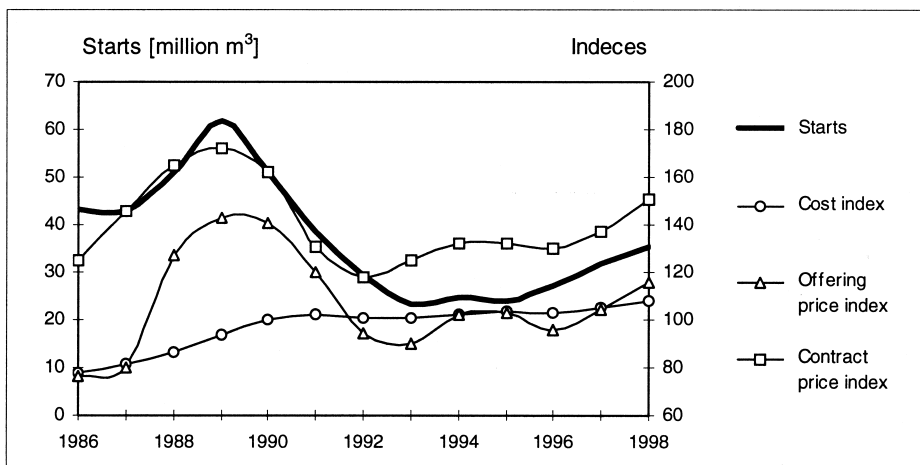

FIGURE 3. New-building-construction starts (Statistics Finland 1998) and various indices depicting construction costs: the cost index representing construction's input prices, i.e. price levels of labour, materials, etc. (Statistics Finland 1998) and the approximate offering (Rakli 1999) and contract (Haahtela & Kiiras 1997 and 1999) price indices describing mainly project-level costs.
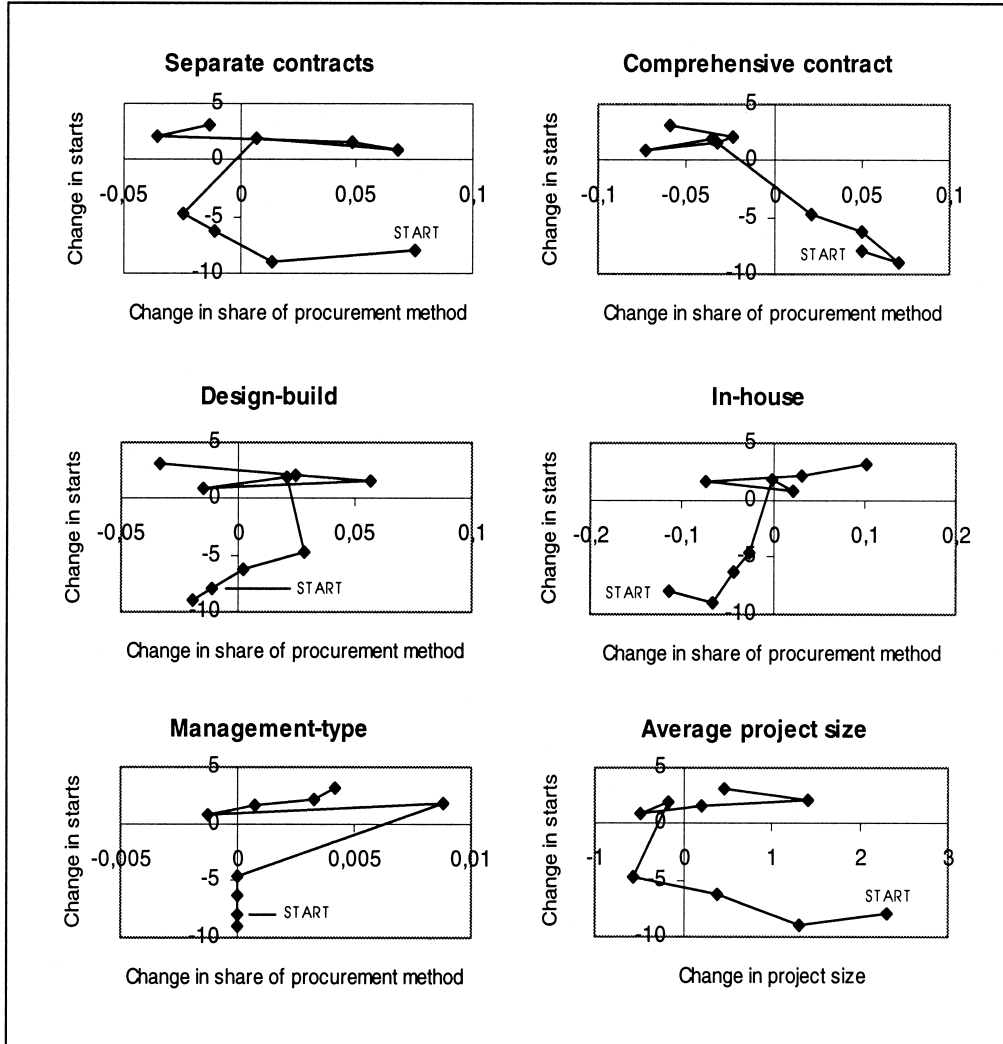
FIGURE 4. *Relationship between annual changes in starts and annual changes in procurement methods based on entire material. Bottom right diagram shows change in average project size since shares of procurement methods are real and the impact of project size could not be taken into account in the diagrams.*

for instance, in the case of total positive correlation, the coefficient gets the value +1.0. Curvilinear correlation, again, can be observed only by drawing a scatter diagram; that is why examination of Figure 4 was also included. It does not, however, introduce any added value to the study, especially since project size is poorly accounted for (cf. Formula 2 below).

479

When the correlation coefficient is raised to the second power (r^2), we arrive at the so-called *coefficient of determination.* It is often presented as a percentage and can be interpreted so that the variable in question determines the variation in the dependent variable to the extent of the coefficient of determination. The rest can be explained by other contributing factors and random variation.

An effort can be also made to eliminate the impact of these other contributing factors as was done in this study in the case of project size since it is also of major importance in the selection of the procurement system (cf. Lahdenperä 2000). This was accomplished by calculating the so-called partial correlation as follows (Vahervuo & Kalimo 1975):

$$(2) \qquad r_{12 \cdot 3} = \frac{r_{12} - r_{13}r_{23}}{\sqrt{1 - r_{13}^2} \cdot \sqrt{1 - r_{23}^2}}$$

The subscripts of correlation coefficients indicate the variables whose mutual correlation is in question; the first order partial correlation, $r_{12 \cdot 3}$, again, refers to correlation between variables 1 and 2 as the influence of variable 3, here the impact of project size, has been eliminated.

In the second phase of the study, an attempt was made to determine whether any trend in the use of various procurement methods could be observed that was independent of economic development. For that purpose, second order partial correlations were calculated where the impact of both economic developments and project size were eliminated. Said partial correlation can be derived, following the same subscript-logic as above, from the formula:

$$(3) \qquad r_{12 \cdot 34} = \frac{r_{12 \cdot 3} - r_{14 \cdot 3}r_{24 \cdot 3}}{\sqrt{1 - r_{14 \cdot 3}^2} \cdot \sqrt{1 - r_{24 \cdot 3}^2}}$$

Performance of the calculations

The calculations were made with a view to economic situations and the shares of different procurement methods (Table 1), for new building construction as a whole, and the key groups of building types. Economic conditions are depicted by the volumes of starts in each year (Table 2, Statistics Finland 1998) as they are the best available statistics illustrating the selection situations for procurement methods.

The material used for formulating hypotheses also dealt with economic outlook although the cost angle was most often stressed in decision-making concerning the procurement method. Thus, the correlation between economic situation and prices was already built into propositions and the inclusion of the numbers of starts was justified. On the other hand, Akintoye et al. (1998), among others, have demonstrated that changes in construction volumes are one of

TABLE 2. New-building-construction starts subject to delimitations of study [mill.m³].

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Total new construction	42.15	34.24	25.19	18.96	14.32	16.17	17.01	18.59	20.73	23.9

the leading indicators of construction contract prices which was also supported by Figure 3 above.

Annual changes were selected as the numerical values to represent an economic situation since the direction and relative size of change are more important predictors than absolute values from the viewpoint of decision making. Similarly, annual changes in the shares of procurement methods were used in calculations. The shares of procurement methods were determined on the basis of the number of projects implemented by each method.

In the case of building type-specific calculations, total volumes of starts were also used since production capacity adjusts flexibly to different building types and total volume shapes the economic boundary conditions to a larger extent than building type-specific construction volumes.

In calculations concerning the relationship between shares of procurement methods and the economic situation, average project sizes of the target years (Table 3) were factored in as previously stated so as to eliminate their confusing impact. Since it was a question of annual changes with respect to all three variables, the change in procurement-method use over time (independent of business cycles and project size) could not be taken into account. Therefore, this general change in the preference for procurement methods was examined separately in the second phase of the study by using absolute values (instead of annual changes) for time and shares of procurement methods as well as economic cycles and project size – the impact of the last two was eliminated from the result.

TABLE 3. Average project size based on research material [MFIM].

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Residential buildings	5.30	6.70	7.53	8.32	9.76	9.08	9.11	9.35	10.39	10.10
Industrial buildings	6.83	15.90	14.04	13.40	14.74	16.05	11.54	10.90	11.74	8.51
Business premises	15.71	17.00	22.44	25.07	14.56	13.96	16.09	12.56	23.89	26.00
Other buildings	9.43	9.52	12.17	12.43	10.80	10.77	9.79	11.19	12.09	15.04
Altogether	7.30	9.60	10.92	11.30	10.74	10.57	10.09	10.30	11.72	12.19

Results of calculations

In the first part of the study, which evaluates the impact of economic cycles, In-house implementation was found to have the highest positive correlation with them based on the entire material (Table 4). This is particularly due to its popularity in housing construction (0.61), where In-house projects are for the most part speculative developments realized by construction companies. In order to avoid any change in the market structure of this individual building-type group from hindering the primary task of examining the decision making of owners in general, the reference figures were calculated excluding In-house projects (see Table 5). However, in non-residential construction, the In-house category includes many projects implemented by actual owners.

The differences in calculation methods had a significant effect only in the case of Design-build and Separate contracts projects. Calculations based on the total material (covering all procurement methods) did not produce any significant figures with regard to Separate contracts with the possible exception of industrial construction (0.42). The survey of actual owner projects, again, revised the correlation of housing construction in the positive direction, and as a result the correlation value for material including all building types was 0.48.

TABLE 4. *First order correlation coefficients for economic cycles and procurement methods (left) and second order correlations for procurement methods and time (right).*

	Relation to economic cycles					Development over time				
	Res.	Ind.	Bus.	Other	All	Res.	Ind.	Bus.	Other	All
Separate contracts	−0.14	0.42	0.26	−0.08	−0.10	0.41	0.78	0.63	0.51	0.64
Compreh. contract	−0.95	−0.57	−0.42	−0.61	−0.93	−0.94	−0.49	0.21	−0.61	−0.98
Design-build	0.19	0.03	−0.11	0.49	0.16	0.51	−0.01	−0.20	0.50	0.90
In-house	0.61	−0.18	−0.12	0.06	0.67	0.08	−0.81	−0.87	−0.71	−0.30
Management-type	0.19	0.33	0.14	0.30	0.57	0.25	0.67	0.88	0.66	0.94

TABLE 5. *Values corresponding to correlation coefficients of Table 4 when calculations exclude In-house projects.*

	Relation to economic cycles					Development over time				
	Res.	Ind.	Bus.	Other	All	Res.	Ind.	Bus.	Other	All
Separate contracts	0.30	0.41	0.28	−0.11	0.48	0.56	0.53	−0.12	0.10	0.69
Compreh. contract	−0.81	−0.63	−0.44	−0.59	−0.88	−0.90	−0.68	−0.22	−0.73	−0.98
Design-build	0.44	0.04	−0.15	0.47	0.46	0.65	−0.30	−0.63	0.37	0.93
Management-type	0.19	0.32	0.17	0.28	0.60	0.29	0.66	0.90	0.64	0.93

With respect to Design-build projects, the total material indicated economic correlation higher than that of Separate contracts, but the result based on owner projects (0.46) is similar to that of Separate contracts. A significant factor is, however, the preference given to various procurement methods in relation to different groups of building types: Separate contracts increases it share as the economy improves primarily in industrial construction, while Design-build contracts' share increases in housing construction and the group of other buildings.

Unquestionably the clearest indication provided by the results was the increasing share of the traditional Comprehensive contract in a slump; the correlation between economic fluctuations and changes in use of the procurement method is –0.93 based on the total material and a survey excluding In-house projects brings hardly any change. The highest negative correlation falls on housing construction, but for business premises the figure is only –0.42.

As regards Management-type procurement, growth in the number of starts seems to correlate closest with the use of this procurement method in industrial construction (0.33) and the group of other buildings (0.30). Correlations are positive also with other groups of building types while calculations based on the entire material produce the value 0.57. The value of the observation is, however, limited because Management-type procurement has been hardly used at all.

The calculations proved the first hypotheses of the study (H1 & H2) true: the share of the Comprehensive contract diminishes and that of Design-build contracts – and Management-type contracts with certain reservations – increases the more, the more favourable the economic development. If In-house projects are excluded, Separate contracts also correlates positively with the economic situation. Moreover, as anticipated by hypotheses (H3), the share of Separate contracts increases in relation to the Comprehensive contract the more, the more favourable the economic development – the correlation is 0.78.

Based on the above, it is also quite clear that the calculations also support the correctness of the last hypothesis (H4): the combined share of Design-build and Management-type contracts in relation to the combined share of Comprehensive contract and Separate contracts increases the more, the more favourable the economic development (0.53). Correlation by building types is positive except for business premises. In that group, the zero result can probably be explained by the popularity of Separate contracts.

If instead of economic cycles, we examine the development of the use of different procurement methods over the target period (second phase of study), it also seems to indicate a clear drop in the use of the Comprehensive contract (–0.98). In the case of In-house construction, it is interesting also that its use decreased with all other building types apart from housing, where no change could be observed due to contractor's property development. Otherwise, the drop was smallest in the other buildings group, but even there correlation was –0.71.

Other procurement methods would seem to have increased their share in the target period. The figures calculated for Design-build and Management-type contracts based on material covering all building types came to at least 0.90, independent of the inclusion or exclusion of In-house projects, whereas the correlation between Separate contracts and time was a few decimals smaller. Yet, the building type-specific fluctuations are surprising especially as concerns Design-build contracts.

4. ASSESSMENT AND COMPARISON WITH OTHER STUDIES

Performance of the study

The research material includes over 20,000 building projects covering a period of ten years or nearly a third of the target group projects. The target group, again, covers about 70 percent of the entire new building construction volume in Finland. The remainder consists mainly of small building projects, often implemented by private home-builders themselves (e.g. single-family houses and vacation homes). Thus, the material should represent well Finnish professional construction.

The breadth of the material and the annual key figures calculated based on it also ensure the validity of the result although the theory of correlation analysis states that a small group of value combinations (consisting of key figures only) in itself constitutes a constraint. The step-wise calculation method also explains the absence of Probability Values (p values) which are generally intended to assess the significance of correlations. Time increments shorter than a year were also considered undesirable since, for climatic reasons, there is considerable seasonal variation in construction starts in Finland (cf. Statistics Finland 1998). For this reason, the numbers of starts used in calculations would have fluctuated excessively within each year while they would not have had any real effect on prices in the long-term project markets. The fluctuations are also the same year after year.

A ten-year target period is not actually very long, but in this case it included economic situations of various types. It is, however, true that from the viewpoint of generalizability of results, the period should also include recurrence of similar economic situations. On the other hand, the study period included an exceptionally hard recession which poses the question of whether the results can be generalized across all or minor economic fluctuations. There are, however, no clear signs speaking against the general validity of the study results.

An effort was also made to assess the distribution of the material in relation to different building types. Due to the delimitations of the study, accurate statistics were not available, but on the basis of various calculations it was concluded that the distribution of the projects of the research material into various building types does not fully correspond to the situation in the

484

markets. For the most part the differences are small. The most significant difference is in the share of residential buildings which therefore distorts the results of the study on the level of the material covering all the building types. In the data set, the share of residential buildings varies from 50 to 60 percent while the more correct figure in the markets is 40 to 50 percent. Yet, in the calculation of combined shares, various building types were not weighted specifically due to the lack of accurate values.

Results of the research

The study showed that economic cycles have some impact on the selection of a procurement method. However, the outcome was not entirely unambiguous since, although the correlation values seem to be quite significant and logical in many instances, the changes in the shares of procurement methods are relatively small with the exception of residential construction. As concerns said building type group, it is apparent enough that the changes include also changes due to the market structure. When the production volumes fell in the early part of the examined period, the relative share of state-subsidized residential construction grew and, apparently, a major share became concentrated in the hands of so-called public non-profit developer companies who favour the traditional Comprehensive contract. It can be determined on the basis of other building types that this phenomenon in housing construction is nevertheless not crucial when drawing conclusions.

Also, the dependence of certain procurement methods on economic conditions varied significantly across building types. Thus, there is reason to believe – although the coefficients of determination calculated on the basis of correlation values do in many cases yield very high values – that the impact of economic cycles on the selection of a procurement method is quite small compared to other factors, or that it influences only a relatively small and enlightened group of decision makers. This is also supported by the study of attitudes by Pernu (1989) based on a questionnaire which led her to conclude that building owners are not willing to deviate from the beaten path fearing all the extra effort it would require.

Moreover, Pernu (1989) reported that owners often regard contractors as adversaries which also serves to explain the large share of Comprehensive and Separate contracts. Partially for the same reason, the popularity of Design-build contracts has been low, although a change may be coming. Wider adoption of Design-build would therefore resemble the stated international development to some extent (e.g. Bowen 1996, Young 1999).

The discovered increase in Design-build as the economy improves is also interesting. In reference to the UK, Dowd (1996) has stated that "the popularity of Design-build has generally been inversely proportional to activity levels in the construction industry although there has been a very strong underlying trend of increased usage since its establishment". Otherwise, no

485

reliable reference data on the impact of economic cycles on the use of procurement methods is available.

The forecasting of changes in economic trends and the operation of the markets, in general, is also problematic. A good example is housing development where volumes, in principle, follow economic cycles closely but the correlation value was only 0.61. This, for its part, provides a good basis for evaluating the significance of other correlation values.

5. CONCLUSIONS

The results indicate that the use of Design-build increases in an economic upturn, for instance, due to the fast implementation it offers. When the economy expands, owners emphasize quick implementation. A partial reason is also the owners' desire to fix costs in a situation where considerable price increases are threatening.

The same factors also reduce the share of the traditional Comprehensive contract as an economy recovers: it is slow and delayed conclusion of the contract may result in higher costs as the willingness to submit a tender decreases and profit targets go up although the setting for extreme price competition is favourable with the traditional contract. Correspondingly, the popularity of the Comprehensive contract in a recession is based, among other things, on people waiting for prices to fall when selection of the contractor is delayed.

The results also show that in an upswing Separate contracts gains share from the Comprehensive contract since owners wish to ensure tough competition and an advantageous implementation price. On the other hand, in a recession (at least in a severe one) traditional comprehensive contracts are offered at such low prices that division of a contract is not worthwhile. Then, building contractors want to book a maximum number of orders, even at lower prices while they believe that subcontracting prices will also fall.

In practice, the selection of a procurement method is affected by so many factors that thorough investigation of the matter would also require studying other factors influencing decisions along with the impact of economic cycles. Economic fluctuations may, at best, explain only a part of the changes in the use of various procurement methods. It may even be that the changes in the use of different procurements systems over time, also the subject of this paper, are, in general, more meaningful than the impact of economic cycles. This might be the case especially since the studied economic recession was exceptionally hard and cannot be considered to represent a normal situation. In this regard, residential In-house construction is, however, an exception.

As to the development over time, the inclusion of the implementer in design, either by a Management-type or a Design-build contract, seems to have gained ground in the examined

10-year period. To be sure, the share of Management-type contracts is continually very small, and the trend in Design-build contracts varies with different building types. On the other hand, in cases where the owner commissions the design himself (or a consultant does it for him), an effort has been made to increase competition compared to the '80s by using Separate contracts more and more instead of the Comprehensive contract.

The share of In-house construction in housing construction depends mainly on the economic situation. Property development by construction companies constitutes the lion's share of the volume and no change is in sight. In the case of other building types, where In-house projects include a significant number of projects implemented by actual owners, its share has been diminishing. This would seem to lend subtle support to the general claim that owners are focusing on their core competence and outsourcing construction-related activities. ■

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