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Validating the Specialist Task Organization (STO) Route through the Organization Theories and Empirical Studies

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Abstract
This paper examines the validity of the STO delivery approach based on theoretical development and empirical studies. The organisational theory is assessed from structural, functional, conflict management and organisation contingency perspectives in relation to project organisation. The empirical studies measured different project delivery performance factors in comparative terms along the variables of time, cost, quality, contracting methods, among others. The analysis shows that there are different forms of organisations in relation to procurement routes: formal, informal, centralised, decentralised, specialised, differentiated, etc. The structure and performance of an organisation depends on: the contingency factors, the project specific variables, and the organisation design and implementation. The result shows that the core of the STO organisational structure (from a supply chain perspective) falls under formal/specialised/differentiated through decentralised formats via the owner (demand chain perspective) centralised management systems. This form of organisation eliminates the duplication of activities in project execution/management, while it increases dynamism and efficiency via specialisation.

Keywords: specialisation, project, management, contingency, centralisation.

1. Introduction

A construction project comprises different items of works that in turn combine to form activities. Combinations of activities form a trade, a group of trades form an element, and a series of elements form a task. Because of the diverse nature of project stakeholders both in the demand and the supply chains, there is a need for an adequate organisation monitoring, coordination and control through a formal legal framework. Different types of procurement methods have been developed to set out a legal, financial, organisational and procedural framework for executing of a project (Oyegoke 2001, Akintoye 1996, Masterman 2002, Haltenhoff 1999). Some of these methods attempt to address supply chain management via an integrated whole, novation or bridging, or as fragmented parts in different dimensions (traditional and management contract forms).

Oyegoke (2004) suggests a delivery approach based on specialisation of the stakeholder through major task classifications. This approach is based on the principles guiding construction management contracts, which is used to suggest a more differentiated approach based on specialisation of key project tasks/products through task/product integration (design-to-procure-to-construct). In this approach, the owner's team delineates the overall dimensions and specifications (technical and performance) to produces the overall project design. The detailed design, manufacture (optional), installation and construction, and maintenance (optional) of a facility are carried out via a different task organisation in the form of procurement break down packages.

The project is divided into 7 grouped tasks plus host of other specialists as the project may dictate, e.g. an artist. The specialised task organisations comprise firms that provide 1) sub-structural services, 2) frame construction, 3) wall and cladding, 4) electrical and mechanical services, 5) furnishing, fitting, doors and windows, 6) roofing, 7) site services and external works plus 8) other specialist work, e.g. artwork. This approach is more suitable for projects where standardised elements and materials are used as well as projects of high magnitude. Each STO constructs or installs work within its segment and bears the overall responsibilities and risks, resulting in fragmentation in project execution. Many STOs are selected after which they enter into an agreement with the owner to construct a facility in accordance with the overall plans and specifications.

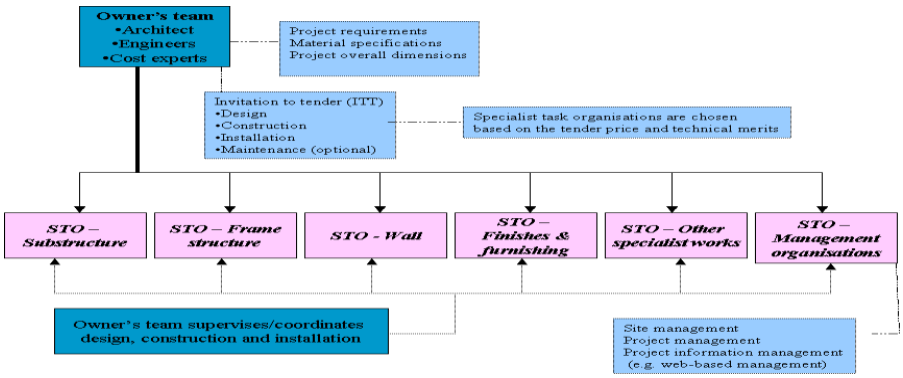

Figure 1 The contractual arrangement of STO

The STO route allows the client to decide on the level of involvement of external markets in terms of developing the solution to a client's requirements, integrating a solution with other specialist task organisations, and managing the implementation of construction activities through robust management systems. The operational model of a STO begins with the owner choosing a team of advisers the task of which is to guide him through the preliminary stage. The aim of this study is to validate the STO approach via organisation theory and empirical studies since project procurement correlates with project organisation. This paper covers organisational concepts in relation to procurement methods, most especially in the execution phase and limited to a construction project.

1.1 Research method

The study is carried out via a literature review through theoretical analysis of organisation structure and empirical studies. According to Donaldson (1999), qualitative and historical studies add a valuable contribution to research, while comparative and quantitative studies provide a distinct, complementary addition to knowledge. The STO organisational concepts are based on a logical, practical, and theoretical framework of organisation theories especially in terms of goals, systems, and structures in order to attain project objectives.

The empirical study is carried out via a questionnaire to probe some recent cases of different procurement routes and to make an assessment of project performance as a whole. A self-completion questionnaire is used to collect both qualitative and quantitative data from industry practitioners. This is to obtain both factual and attitudinal information and understanding from different players. The questionnaires are divided into six parts: the respondent's general information, the general project information, the allocation and distribution of responsibilities and risks, the project schedule in relation to tasks, their involvement in engineering design and their contractual relationships, the level of relationships between the parties and an evaluation of the project performance variables via rating system.

41 questionnaires were distributed to the participants, of which 32 responses were received before the official closing date. Due to insufficient data, 6 questionnaires were discarded in the analysis. In all, 26

project cases i.e. about 63% of the distributed questionnaires were used for this analysis. The cases were generated through questionnaires, follow up interviews, and further verification through separate interviews.

2. Project organisation

There are varieties of procurement routes that spell out how a project organisation is set up and run. Procurement routes can be categorised based on the division of work and (performance) responsibility, i.e. either as an integrated whole (design and build) or as fragmented parts (traditional or management route). Fragmentation signifies that there are many multiple points of (performance) responsibilities among the players along the supply chain. Risks and responsibilities are shared between the players as in the traditional and management routes (Oyegoke 2004).

The process is linear, a situation where each party performs its duties and then passes relevant information and responsibilities on to the next participant. This form of contract usually incorporates traditional contracts or management-for-fee where there is a boundary of responsibility between consultants, contractors, nominated subcontractors and suppliers. According to its critics, the major weaknesses of this route lie in time consumption a reduction of integration of expert knowledge among the various parties.

Conversely, integration means that there is a single point of (performance) responsibility for project coordination in all stages. In the traditional design and build approach, the single point of responsibility allows for a single source of non-performance risk to the owner.

3. Organisation theory

According to Galbraith (1973) organisation theory deals with uncertainty that involves psychological concepts such as information processing capacity and decision-making. Donaldson (1999) refers to organisation as a system of interlocking roles, and a role is based on a set of expectations focusing on a particular position. Some of these roles are codified, formalised, autonomous, and participatory based on rules, regulations, and standard procedures.

The distinctive characteristics of an organisation is its goal/objective-oriented attainment, boundaries (legal, formal or informal), coordination (people, firm in different levels, etc.) and associated factors, e.g. the degree of separation/differentiation and that of integration/concentration mechanisms, the degree of centralisation, the extent of power (decision making) and authority of the stakeholders, the flow of information/communication, and the conflict resolution procedures in terms of roles, responsibilities and risks.

Organisation structure is an important organizational characteristic. According to Donaldson (2001), there are two contrasting contingency theories of organizational structure: (i) the organic theory (mechanistic i.e. hierarchical) or organic (i.e. participatory) structures and (ii) bureaucracy theories (bureaucratic/complex or unbureaucratic/simple structures). Within the organic theory there are two fundamental dimensions of organizational structure: the mechanistic structure that is top-down management control, and the organic structure, which allows lower level employees a degree of autonomy in decision making.

Table 1 The variables that affect organisation types

Theme	***Organisation theories***			
Main types	Organic theory		Bureaucracy theory	
Sub types	Mechanistic	*Organic*	Simple	Bureaucratic
Centralisation	Centralised	Decentralised	Centralised	Decentralised
Formalisation	Formalised	Unformalised	Low on formalisation	High on formalisation

Task	High task certainty	Low task certainty	Low task certainty	High task certainty
Specialisation	High on specialisation	Low on specialisation	Low on functional specialisation	High on functional specialisation
Function and control	Clear job descriptions	Self directed team	Direct maximum control	Indirect sufficient control

The similarities and differences between these structures are (Donaldson 2001): the simple and organic structures are both low on specialisation and formalisation with the former centralised and the latter decentralised. The bureaucratic and mechanistic structures are both highly specialised and formalised but the bureaucratic structure is decentralised**.** The major difference between organic and bureaucracy theories lies in their view or rating of two organisation structure variables: centralisation (decision making) and specialisation -formalisation (job specification - rules).

Thus, this theory is also applicable to project organisation. On the one hand it is an integrated approach that is centralised in its decision making with less formalisation and specialisation. On the other it is a fragmented approach that is more decentralised in its decision making, i.e. high specialisation and formalisation.

3.1 Contigency theory of organisation

Another important factor that shapes organisation structure and affects organisation performance is the organisation contingency factor, which includes the environment, organisational size, and organisational strategy, among others. According to Donaldson (2001) contingency moderates the effect of an organisational characteristic on organisational performance depending on its rating (high or low).

Further, Donaldson (2001) assesses the two main contingency theories of organisational structure: organic and bureaucracy theories, with task and size contingencies as their main variables respectively. The task contingency is composed of task uncertainty and task interdependence. Task uncertainty is the main contingency of the organic theory while the size contingency is the main contingency in bureaucracy theory. Task interdependence serves as a minor contingency in both theories. We can deduce that both structures are suitable for a project organisation. For instance, traditional design and build falls under task uncertainty from the outset and task interdependence within an organisation, while the STO approach falls under the contingency variable of size and task interdependence among many organisations.

However this cannot be generalised for instance, in bureaucracy theory, the level of bureaucratisation of the structure fits the contingency of size (number of the employee) resulting in a small organisation having a structure that is high on centralisation, low on specialisation and formalisation, and allows top management direct control. In contracts, a large organisation has a structure that is low on centralisation, high on specialisation and formalisation, and delegation of decisions by the top management (Child 1975). Thus, this is a major differentiating factor between integration and fragmentation in a project organisation.

Further, the concept of bureaucracy covers structural differentiation and divisionalisation. Structural differentiation deals with the splitting of an organisation into separate parts, both horizontally (division, job title, span of control) and vertically (hierarchy levels) (Blau 1970). Divisionalisation features are based on decentralisation and increased functional specialisation and formalisation (Grinyer and Yasai-Ardekani 1981).

Project organisation is extensive in size with many stakeholders from both the demand and the supply chains. The industry itself is comprised of structural differentiation along trades from the horizontal and the

vertical levels. Thus STO the approach fits in this set up, as specialisation is encouraged with a decentralised divisional management and an overall centralised management via web management.

4. Emperical studies in relation to STO

Due to the practical limitations of obtaining empirical data and the use of pilot projects, questionnaires were developed to probe cases of projects executed in Finland. This allowed the author to validate the use of STO through project organisation set-ups and its related contingency factors with regards to the relationships between the players and some project performance variables. The advantage of this approach is to have access to as many projects as possible in order to determine the contractual arrangement used and to correlate same with the suggested STO approach.

Many of the case projects were executed under an uncoordinated task approach or under a subcontractors approach with back-to-back form of risks. In some cases where specialist contractors are used, the specialist contractors are responsible for their detailed drawings, which are often checked by the design organisation before incorporation into the project. In such cases the specialist contractor is responsible for the risks, and often there are not many claims and changes, both in material and design. This also encourages innovation and increases quality standards of the project, which can also be improved further via the use of a coordinated STO approach. A good project example is a situation where there are changes in the structural support of an external structure to a self-supporting glass wall so that a reduction in the area of the glass wall is made with the involvement of a specialist contractor (case 9).

This fact is supported in comparative studies carried out to measure the relationship among major project players. Table 2 shows that the ACM route rated best in relationship ratings along contracting forms i.e. in owner and consultants, owner and contractors, between consultants, and owner and contractors in the design and the construction stages respectively. The STO approach encourages direct contracting between the owner and specialist organisations, and between the owner and consultants (project team).

Table 2 Comparison of overall relationship ratings in the design and construction stages along contracting types

	Contracting types	Owner & consultants	Owner & contractors	Between consultants	Consultants & contractors	Contractors & subcontractor
Design stage	O/A	4,05	3,88	3,87	3,8	3,86
	GC-st	4	4	4	4	4,33
	GC-t	3,86	3,8	3,67	3,25	4
	ACM	4,4	4	4	4	3,25
	At-risk	4	3,67	4	4	4
	DB	4	4	4	4	4

	Contracting types	Owner & consultants	Owner & contractors	Between consultants	Consultants & contractors	Contractors & subcontractor
Construction stage	O/A	3,86	4,1	3,94	3,89	3,75
	GC-st	3,33	4	3,5	3,67	3,5
	GC-t	3,67	4	3,75	3,5	3,6
	ACM	4,1	3,6	4,25	4,2	3,9
	At-risk	4	4	4	4	3,8
	DB	4	4	4	4	4

The services sector (M&E) is subcontracted by the main contractor to the specialist contractor or directly subcontracted by the owner in the studied cases. There are no major changes in M&E in all the cases examined, as the specialist contractors were involved from the onset. Many of theses cases show the applicability of using specialist contractors in the present form of project execution in uncoordinated ways.

The suggested STO routes outline a coordinated form of specialist contracting that is more appropriate with the integrated management-centred approach rather than that of the contractor-centred approach.

5. Conclusions

We could deduce that there are different types of organisations depending on the degree of formalisation, specialisation, centralisation, etc. The structure of an organisation might dictate structural differentiation, divisionalisation, integration, or functional differentiation. The most important factor is that structure must fit contingency for the purpose of achieving better performance. It should be borne in mind that better performance goes with fit management structures depending on the level of task certainty/uncertainty, size of the organization (in construction sense – project), level of technology, categorization of function (dependent or interdependent). Such a structure may be a centralised integrated whole, especially for small outfits or project, or one that is decentralised having differentiated parts with a management integrator especially for a bigger firm or firms with many subsidiaries or bigger projects as suggested for the STO approach.

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