

HORIZON 2020: NETWORK ORGANIZATIONS IN THE AEC INDUSTRY

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INTRODUCTION

'Organizational structure', 'strategic alliances', 'organizational transformation', ... are some of the keywords currently associated with research in Construction Management (IGLC-6, 1998). We feel that it is necessary to add a new keyword to the construction engineering and management research lexicon, namely: 'The network organization'. Our professional experience, supported by our recent research strongly support this suggestion - which is far more than just a play with words, as we shall show.

To set up the framework for any discussion on the network organization - or more properly on network organizations, we shall propose a view of the building industry, sketch out some trends that can be observed and explained, and show how the network organization fits proactively into this view, bringing with it many significant advantages in the near future.

THE AEC INDUSTRY

The AEC industry, it is well known, is a 'multi-industry' (comprising professional and commercial enterprises, ranging from the relatively large to the very small), operating through 'temporary multi-organizations' (short-lived, inter-disciplinary entities that are 'created' to carry out each of the projects that require building activities of some sort) (Mohsini, 1984; Davidson, 1987). It is also well known (a) traditionally, design functions are separated from construction and (b) that building clients seek new ways of relating to these 'temporary multi-organizations'.

In the past, there were only a limited number of participants in the designing, manufacturing and building processes for any one project, separated, as we have said, into the two familiar categories. However, in line with trends in society in general and in response to increasingly stringent demands by the industry's clientele, the habitual roles of the 'traditional' participants have been subdivided into ever finer specializations, leading, of course, to an ever increasing number of participants, notably at the designing and constructing phases of the process (Tombesi, 1997). Consequently, the short-term project-related relationships between these participants are

increasingly complicated to set up and manage, despite the advantages these specialists bring with them of access to leading-edge scientific and professional information.

It is hardly surprising that management of time, cost and content is becoming increasingly difficult and that building clients are seeking new ways of establishing the links they require with the AEC industry and of imposing their requirements and constraints. Within this context, design-build procurement is often promoted as a panacea, under the guise of 'integration of the building process'; the claimed advantages of 'single-point responsibility' supposedly override the potential dangers stemming from a new cast of roles and a new set of checks and balances.

INTEGRATION?

In a recent study of the future organization of the building process (CIB, 1997), it was suggested that:

Starting from the still prevailing traditional and strongly segmented form of organization of the building process, the following three main phases of growth towards an integrated process can be distinguished.

The first phase is the realization that this segmented process is the cause of a number of crucial problems and that something has to change.

The second phase [results] in a process organization that is still segmented but better coordinated and that can be applied within the present structure of the Building Industry.

The third phase is the implementation of a new and appropriately integrated building production philosophy [...] that requires a really different kind of co-operation between process participants that goes hand in hand with a re-structuring of the Building Industry (page 175).

Obviously, the key words in this quotation are 'appropriately integrated building production', and the immediate question then is: how much integration is appropriate?

In attempting to answer this question, we start by highlighting the difference between the organization of the building process that prevails today in Europe and in North America. While integration in Europe may suggest the formation of conglomerates providing one-stop procurement for European national and international projects, we venture to suggest that in Canada and the USA there are other trends that can be detected.

NETWORK ORGANIZATIONS

Katsanis and Davidson (1995) have pointed, out through a series of paradigms, that technological advances and the rapid accumulation of knowledge appear to have pushed many organizations beyond the limits of what they consider to be bounded rationality. Intrinsic complexity in products and processes have attained such high levels that the expertise required to deal with it cannot reasonably be found within the bounds of hierarchically integrated organizations. Strategies that worked in the past have become obsolete, and alternative strategies often prove fruitless for attaining objectives that resemble "moving targets".

For many organizations, it is no longer possible to satisfy the requirements of economies of scale and other market constraints within the present market fragmentation. While the team approach may be congruent with the project-centered activities that are common in the AEC industry, it lacks the dimension of continuity that extends beyond the life cycle of the individual product's process and thus deprives the industry of key strategic advantages of cohesiveness and mission

continuity which come with stability. The concept of the network as described below is significant in that it recognizes the permanence of the firm as an element which continues beyond the span of any one project.

WHAT ARE NETWORK ORGANIZATIONS?

Network organizations are clusters of firms interconnected together by either contractual or by informal communication and exchange links. The firms appear to work jointly toward common external objectives, such as the production or delivery of products or services (buildings in this context), within an explicitly defined scope, budget and time-frame.

So far, one can recognize in this definition the habitual *modus operandi* of the so-called building team, since once the life cycle of such endeavor comes to an end, the particular network organization is disbanded, while its former constituent firms are likely to pursue new alliances and join other networks in a move that is consistent with each firm's own internal objectives.

For this reason, and somewhat surprisingly, the AEC industry almost appears to be a precursor of current trends in industry in general, possibly unbeknownst to itself. However, there is a fundamental distinguishing factor which must immediately be mentioned; this can be summarized in the question: in AEC, is there continuity or only discontinuity?

Whereas each traditional building team is, as we have just suggested, an exemplary of a short-lived network, our research is revealing the emergence of long-term networks, where a cluster of independent different professional and commercial AEC firms set up long-term interconnections. We will return to the advantages of this approach in a moment.

Returning to the description of networks, external objectives refer to the shared objectives towards which all firms in a network operate. These objectives are project-specific, and a firm espouses these as a result of its contractually-assumed commitment to the network's collective reputation and well-being. The internal objectives, on the other hand, are the firm's own long term objectives expressed in performance measures, such as return on investment, stability in the market place, etc. Success of the firm in these domains is paramount for the success of current and future projects.

In the current business environment AEC firms must be flexible and agile to partake in lean construction, information sharing and exchange for concurrent engineering and other high-tech applications, where organizational boundaries are thin and transparent. Amidst the required structural flexibility and agility which are essential elements in the organizational profile of AEC firms, another apparently contradictory element is required: stability. Stability is essential for the network organization to attain its external objectives, i.e., the long-term successful delivery of products and services. It is also equally important for the assured survival and well-being of the individual firms within the network.

Three broad types of network organizations may be distinguished (Katsanis *et al.*, 1997); they can be categorized as internal, stable or dynamic. Factors which determine where a network falls in this categorization are:

- ? dominant configuration (heterarchy <-> hierarchy),
- ? concentration of assets (held by single firm <-> totally distributed among participating firms),
- ? degree of outsourcing (low <-> high) and
- ? extent of partnering (high <-> low).

WHY NETWORK ORGANIZATIONS?

In theory:

The concept of network organizations captures the essence of the holistic approach that is now recognized to be essential for the optimization of the construction process; it is consistent with the evolution of research focus in this field, which appears to be shifting from “component” to “whole system” (Ibbs, 1985; CII and NSF, 1997; IGLC-6, 1998; Carr and Maloney, 1982). Furthermore, this concept is consistent with the observed trends in the construction industry that we have mentioned, namely, increased specialization leading to fragmentation, shorter project life-cycle, and demand for single point responsibility.

Additionally, current research provides evidence of the shifting trends that point to network organizations as the paradigm of choice for both understanding and optimizing the entire construction process from inception to implementation. (Katsanis, 1995 and 1998; Katsanis and Davidson, 1995; 1996; 1998, and Katsanis *et al.* 1997).

While it appears that both the internal and the stable networks (mentioned above) are subject to considerable influences in terms of operations and structure that are linked to hierarchical organizations; in contrast, the dynamic networks tend to fit closer the profile of agile, flexible and lean organizations that emerge as the hallmark of networks of heterarchies reflecting the embedded practices of the AEC industry.

At the same time, shifts in business paradigms, as manifested in emerging practices such as “partnering”, “business process re-engineering”, “information technology” and “lean construction”, are likely to accelerate the adoption of the network organization as a viable organizational form, and make positive contributions to the understanding and operation of network organizations.

In practice:

Two classes of advantages in long-term networking are apparent.

The first advantage relates to market access. A stable AEC network permits member firms to access a clientele which fears the fragmentation of the building process and the potential for loss of management control over time, cost and content; it attains this market without (a) upsetting the balance of responsibility for design versus responsibility for production and (b) having to carry a very large in-house staff of specialists (whose skills may not be required for every project).

The second advantage concerns the adoption of current information technologies, such as electronic business, which normally require either stability or the imposition of procedures by a dominant leader (and there are not many of them in the AEC industry).

RECOMMENDATIONS FOR PRACTICE AND RESEARCH IN NETWORK ORGANIZATIONS

Our research shows that the AEC industry is an archetypal network organization, in fact a dynamic one. However, the very attributes that give rise to this particular structure in the AEC industry also act as impediments to the full exploitation of the functional potential of the network. The fragmentation intrinsic in the construction process promotes the formation of networks, yet the complexity that arises from the sheer variety of the participating firms is often countered by means that are not compatible with the underlying philosophies of the network organization.

Attempts at organizational innovation such as Design/Build while they have solved some problems have created a set of new ones, as we mentioned previously (Katsanis and Davidson, 1998).

As we suggested, the AEC industry has employed the concept of dynamic network organizations for some time. Even though the organizational configuration in the AEC industry has not been previously called a network organization, it has all the attributes ascribed to the network organizations in current management studies. However the lack of recognition of this particular structural attribute hinders the exploitation of the potential it holds for understanding the organizational dynamics and thus optimizing project operations.

Because of their archetypal nature as network organizations, AEC industry firms not only are ideally suited for case-study research to explore their own potential, but they can serve as models of knowledge for other industries. Towards this end, we believe that the following hypotheses are rich in research potential:

- ? A successful process/product is a collective effort by all network members; cooperation is essential but it must be achieved simultaneously at two levels: the process/product level and the strategic(long term) level.
- ? Product/process and strategic goal alignment is a multidimensional exercise; it must be undertaken by all participants in the network.
- ? At the individual firm's level, looking beyond one's own concerns often reveals that apparent anomalies are simply natural constraints; they can be dealt with through a multi-disciplinary multi-objective mind-set.
- ? There is a need to think holistically; the product/process must be considered as a whole that results from interim products and/or services being put together by the network organization subject to the effects of the external environment.
- ? Considerable benefits are likely to accrue for other industries from a systematic organizational study of the AEC industry as an archetype of network organizations.
- ? The implications that construction project management as a discipline has on network organizations should be assessed in terms of its impact on the design, operation and maintenance of the network organization; establishing a framework that allows the application of project management - in the context of network organizations - to a broader field of endeavors, is important.
- ? Establishing programs for basic construction engineering education and training that address environmental turbulence (the impetus for network organizations) as a norm rather than an aberration is long overdue; as a consequence programs should focus on pertinent and innovative solutions such as network organizations for dealing with such conditions.

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