Evolving Organizations
The Right Folks in the Right Form

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Key Words: Human Resource Management, Organizational Planning, Project Life Cycle

Introduction

Much of the project management process was developed by the capital projects industry and the traditional tools are ingrained in the way the industry does business. However, new forms of project delivery are being introduced and the impact on the development of capital projects is still unknown. Just as private industry's desire for more value for the money sparked the creation of the Construction Industry Institute (CII) in the 1980's, public agencies have been looking for more construction for their limited funding and, having reached their capacity to borrow more funds, have been looking for alternative financing methods.

One area where the capital projects sector could benefit is in Human Resource Management where projects could improve their performance and customer satisfaction by ensuring that for each phase of each project, the right people are on the project team in the right type of organization.

The Impact of Alternative Project Delivery Methods

Although one might expect that the appropriate project delivery method would be an outcome of analyzing the project, it is becoming common for the type of delivery to be mandated and thus require early consideration of the right type of people and organization. For the public sector, the current change is from traditional design / bid / build contracting to design/build projects or public-private partnerships (P3).

To assess the impact of these alternatives for delivering projects, the complete project life-cycle was considered. Figure 1 shows a typical 3-phase Project Life Cycle (PLC) which is similar to one developed in "One Size Conducts All - Project Management Policies for a Large Utility" (1).

For the traditional contracting shown on this PLC, the Owner first awards detail design and subsequently awards construction. Other considerations are :

1. The Owner has the funding for the project

2. The decision on the method of delivery is made as part of the project plan at the end of the Definition phase.

Although design/build is different from traditional contracting in that the Owner contracts with a single entity as both designer and builder, both of the other considerations above are still the case.

Although there are substantial implications for design professionals and contractors in the transition from traditional to design/build delivery methods, from a project life-cycle perspective, design/build is just tinkering with the project delivery as the PLC diagram for design/build is virtually the same as for traditional contracting.

A project delivery process that is much more than tinkering is the public-private partnership (P3) which has the following features :

1. Proponents rather than the owner develop the detailed scope in the Definition phase as they prepare their bids.

2. The public owner contracts with a private entity that not only provides design and construction but also is the potential operator and maintainer for an agreed period

3. The private partner provides the capital funding for the construction in return for a future revenue stream to recover costs plus profit.

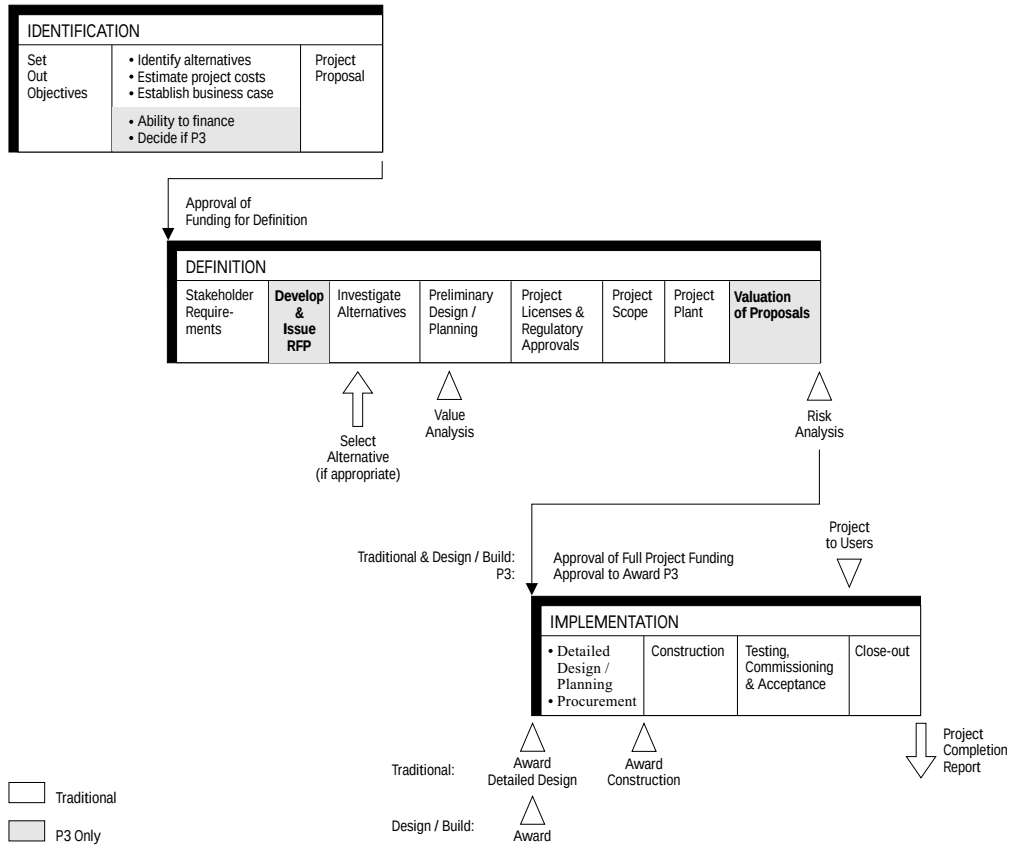
On the PLC Diagram, note that the decision on P3 delivery is made at the end of the Identification phase whereas with the traditional or design/build, this was at the end of the Definition phase. Since the decision to go to a P3 is based on ability to finance, this puts a very heavy focus on the Identification phase as the public owner may give up control of the project at that point. Therefore, it is even more imperative that public owners concentrate on the front end work as they may not get past this stage. Since P3's are a fundamental change in the delivery of capital projects, it is essential that owners consider the best types of organizations that will maximize the value of their input.

Appropriate Organizations For Phases

Most references to project organization relate to the Implementation phase as it is the largest and has most op-

PROJECT MANAGEMENT INSTITUTE 27th Annual Seminar/Symposium
Boston, Massachusetts: Papers Presented October 7 to 9, 1996

Figure 1. Project Life Cycle Diagram



portunity for difficulties. As discussed above, the preceding phases should not be ignored.

The Construction Industry Institute (CII) addressed the role of organization in phases using the certainty matrix, a 2 by 2 matrix of Definition (what) on one axis and Execution (how) on the other axis with a division between low versus high on each axis (2).

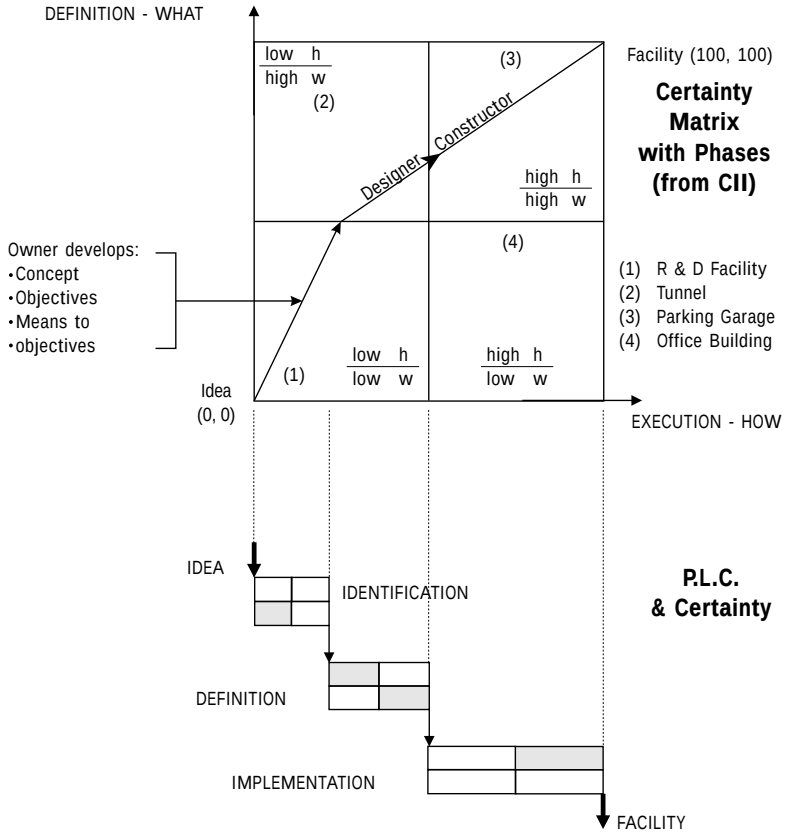
As shown in Figure 2, the four quadrants are low what-low (w) how (h), low what-high how, high what-low how and high what-high how. Projects move from idea (0,0) to facility (100,100) at different rates and follow different paths. Figure 2, which is adapted from the referenced CII publication, shows the path of a traditional project as it goes through the phases where the owner, the designer and finally the constructor take their turns at reducing the uncertainty until completion when hopefully, there are no more unknowns.

To illustrate the link between uncertainty and phases, Figure 2 also shows our 3-phase PLC diagram under the certainty diagram. The uncertainty matrices have been incorporated into the phase diagram to illustrate how these concepts complement each other.

According to CII and as illustrated in Figure 2, projects in the low/low quadrant e.g. a research facility, will have different organization requirements than projects in other quadrants. According to CII, such low/low projects must be organized so that their people can quickly collect, evaluate and act on information as the project progresses. In other words, a flexible structure that can respond to considerable change. What about a project in the high-high quadrant like a parking garage? With the scope and the delivery well defined, a more-rigid, control-oriented organization may not only be appropriate but considering the competitive nature of the business, it is the best way to organize such a project. Figure 2 also shows where they would place other types of projects on the uncertainty matrix.

Since the degree of certainly has implications for project organizations and construction management practices, the certainty matrix is a useful tool for deciding the type of organization.

Figure 2. Certainty and Phases



Evolving Organizations

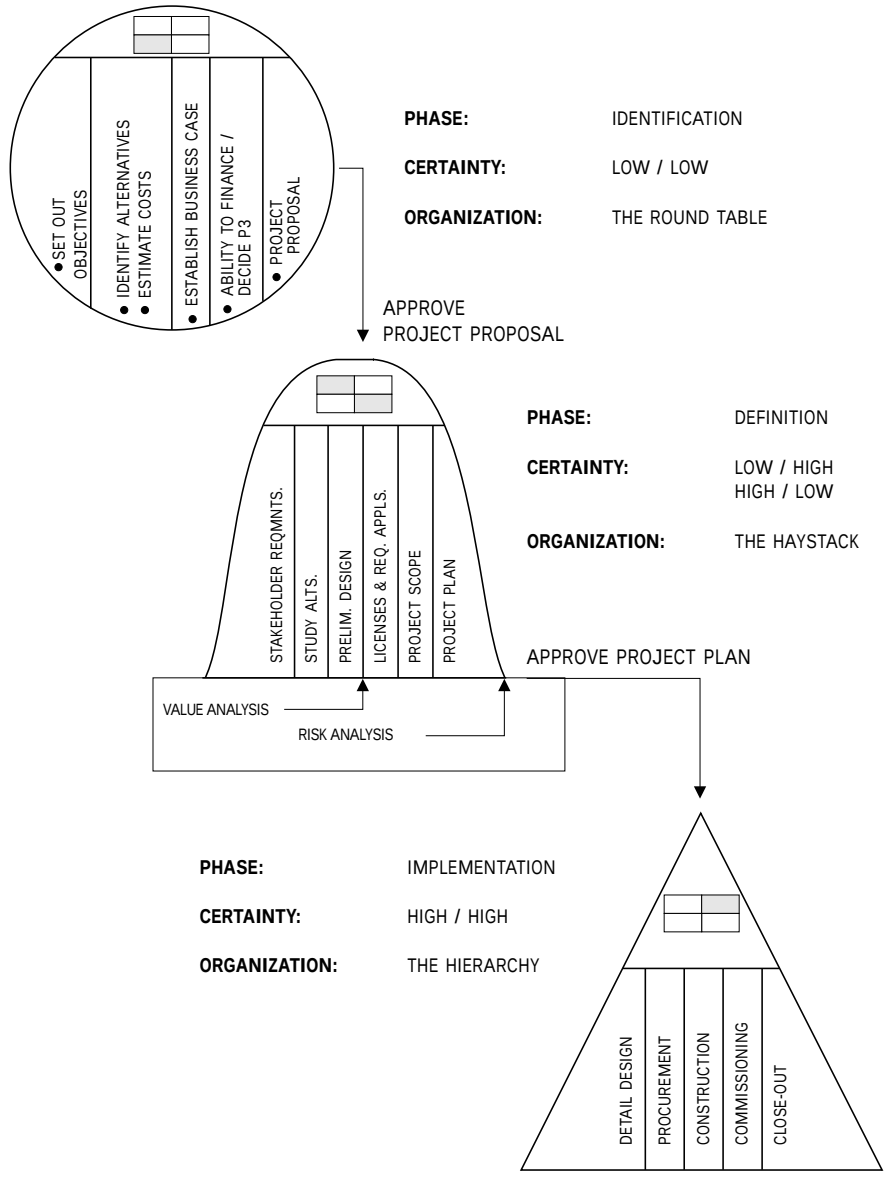
One has to look at the complexity, certainty and urgency of both the project and the phases in order to design an organization that will smoothly evolve from one phase to another. Evolution implies maintaining sufficient key personnel for continuity but changing some people and changing the way they are organized to optimize performance at each stage. We believe that successful implementation depends on such smooth evolution of the organizations from one phase to another. As is often stated, projects come in all shapes and sizes. We literally want to deal with the shape of organizations for project teams and how they evolve as they proceed from early phases to later phases.

For the Identification phase when certainty is low-low, we have adopted the CII proposal that the round table is the most appropriate form of organization (see Figure 3). Like the shape suggests, we would expect that all members at the table are more-or-less equals and whoever has the role of project manager could be more of a facilitator than a leader. The objective of this phase is to generate ideas of how to address the issue that has warranted the creation of the project and either prepare a proposal that would justify continuing the project or terminate the effort at this early stage. In this phase, the number of people is small (all the participants could be from within the organization) and since there is no dedicated funding for the project, management must use its operating funds which keeps the investment in the project very low.

At the other end of the PLC is the Implementation phase where there should be high-high certainty. The appropriate organization can best be visualized as a pyramid. This organization can be characterized as a large, inflexible hierarchy that is very oriented to its mission of delivering the scope. The military-type organization does not respond well to change and when it happens, it is very costly. To keep with the military analogy, the project manager would be the Commander.

Not surprisingly, the Definition phase, which separates the Identification and the Implementation phases and has moderate certainty (either low-high or high-low), has an

Figure 3. Evolving Organizations



organization structure which is a combination of a circle for the round table and a pyramid for the hierarchy. This shape could be described as a semi-circle atop a truncated triangle but which we prefer to call a haystack. It is characterized by still having a number of advisors working with the project manager to reduce the uncertainty to acceptable limits and a small delivery team in a traditional hierarchy. The project manager plays the role of integrator between these two factions.

So far we have blended two concepts - the phase diagram and the certainty matrix and then addressed how different geometric shapes represent appropriate organization structures. Figure 3 blends this third concept into the other two to get a project life cycle diagram that shows the degree of certainty and the recommended type of organization for each phase. For the Identification phase, we have the same stages inside a circle to indicate the round table as the appropriate organization. The certainty is shown as being the low-low quadrant. For the Definition phase, the

stages are worked into the haystack format of the organization and the certainty represented as being either low-high or high-low. For the Implementation phase, the stages are worked into the body of the pyramid and the certainty is shown in the apex as being in the high-high quadrant.

Appropriate Organizations for Alternative Project Delivery

What about the different methods of project delivery? The above evolution best suits the traditional project delivery where implementation can be represented by the hierarchy because, in theory, so much of the uncertainty has been designed out of the project before construction. We need to consider if this assumption is a root cause of much of the difficulties in this phase. That is, are we confident we have removed enough of the uncertainties to use this rigid, inflexible type of organization that does not deal well with changes?

The most appropriate organization for implementing design/build could be the haystack. There could be high certainty on what to build but since detail design is proceeding concurrently with construction, there is low certainty on how to achieve the product so development of design is nearly continuous. We would predict that the successful manager of design/build would be someone who has the capacity to deal with a fair amount of uncertainty. Long-time construction managers who have become accustomed to high certainty in scope may not deal well with the frequent changes that could be part of these projects.

For the P3's, it depends on how the private partner structures the delivery. It could be the haystack for a design/build or a hierarchy for separate design and construction organizations.

Even traditional design / bid / build projects that are expected to be straightforward implementations can be plagued by change. Even when the defined scope is under construction, market or financial conditions may change and require an adjustment to the scope or schedule of the project. This is just as prevalent in the public sector where changes in funding levels require almost continuous planning. The result is that organizations are set up to be hierarchies end up in haystacks!

The Right Folks

One of the great challenges of organization development is the infinite variety of personalities to consider when putting together any organization. One can draw up the ideal chart with the desired characteristics for the person represented by each box but when it comes to filling the positions, compromise and redesign to suit the individuals available is common.

"The Role of Leadership in a Resource-based Project(3)," addressed some of the attributes of the project managers for the Definition and Implementation phases. In summary, these were vision and persistence in the Definition phase and decisiveness and team building in the Implementation phase. It is our view that the nature and magnitude of the project uncertainty determines which people will be better suited to manage a phase of a project.

One outcome of this work is to identify those project practitioners that will be most suitable for a specific phase of a specific project. We have found that for all but the simplest projects, most practitioners have a limited span of flexibility and can only competently cover two phases - either Identification and Definition or Definition and Implementation. Few are able to do a good job across the complete range. If vision is the key characteristic for the Identification phase, the leader in that phase may be too easily distracted i.e. not have the focus for successful implementation. Similarly, a competent implementor, used to dealing with a high degree of certainty, could lead the Definition phase if the vision is set out - but may not be the person to create the vision. This argues against a common project management practice - the same project manager should see the project through from conception to completion. It rarely happens and there appears to be good reason for it. Project organizations evolve with the phases and the people change as well - even the leaders.

Since project success starts with selecting the right people to plan and execute the various phases, better recruitment and appropriate organization could make a significant contribution to managing projects.

Other Recent Work on Project Organization

After developing the above positions related to the CII work, other recent work on project organization was reviewed. Verma (4) looked at a project life cycle with four phases and proposed the following organizational strategies and personnel characteristics as shown in Table 1.

While this was one of the few references to look at project phases, this approach does not consider the variation in types of projects or different types of project delivery strategies. While the organizational strategy for the conceptual phase refers to "free form" and "committee" which could be equivalent to our round table, the balance of the organizational references are to functional, matrix and projectized/task forces. This traditional classification relates more to how the project team is regarded within

Table 1.

Phase:	Conceptual	Development	Execution	Finish
Organization Strategy:	– Free form – Task Force – Committee	– Matrix – Task Force	– Functional – Matrix – Projectized	– Matrix – Functional
Types of People Required:	– Conceptual – Innovative – Creative – Analytical – Planne	– Facilitator – Team Leader – Technical Expert – Integrator – Interface Managerr	– Team Leader – Organizer – Manager – People and task oriented – Controller	– Facilitator – Trainer – Technical Writer – Finisher

Table 2.

Technology:	Low	Medium	High	Super-high
Project Manager:	Administrator	Some Technical Skills	Good Technical Leader	Exceptional Technical Skills
Management Style:	Firm	Moderately Firm	Moderately Flexible	Highly Flexible
Changes:	None	Some	Many	Continuous

System Scope:	Assembly	System	Array
Organization:	Single Functional Group	Main & Sub-contractor	Separate PM Office

For Project Pace:	Regular	Fast
Organization:	Matrix or Functional	Project Organization or Task Force
Personnel:	Usual	Specifically Assigned
Project Manager:	Usual	Highly Autonomous

the context of a larger organization as opposed to how the team conducts itself.

Shenhar (5) takes a very broad approach to classifying projects by three dimensions - technological uncertainty, system scope and pace. His conclusions with respect to organization and personnel for each of the three dimensions are summarized in Table 2.

We expect the above classifications refer to the Implementation phase as this is the most challenging. The work does not address any differences in the phases preceding Implementation. As with (4), the references to organizations are to functional, matrix, project and task force types.

Comparison of Organization Classifications

The Organizational / Authority Continuum (6) shows that the types of organizations referred to above - functional, matrix, project and task force - can be equated to project manager authority. The top of Figure 4 shows our proposed evolution of organization forms by management style. The types of organization by P.M. authority are tabulated in the left-hand columns underneath. In the right side columns, we have added our assessment of whether the type of organization by authority is acceptable for the 3 phases we have been considering.

We maintain that even for the traditional organization structures quoted in the literature, the preferred types of organization evolves as the project proceeds through the phases.

Summary

1. Although there may be significant cost and schedule advantages to using design/build delivery, from the broad owner perspective of the project life cycle, design/build de-

Figure 4. Organization/Management Style versus Project Manager Authority

PROJECT PHASE:				IDENTIFICATION	DEFINITION	IMPLEMENTATION
PROPOSED—Organization Defined by Management Style	ORGANIZATION SHAPE:			Round Table	Haystack	Hierarchy
				ORGANIZATION EVOLVES →		
	MANAGEMENT STYLE:			Facilitation	Integration	Supervision
TRADITIONAL—Organization Defined by P.M. Authority within Large Entity	**TYPE ORG'N.**	**P.M. AUTHORITY**	**P.M. ROLE**	**IDENTIFICATION**	**DEFINITION**	**IMPLEMENTATION**
	Functional	Low	Expeditor	Yes	Not Recommended	No
	Weak Matrix	Low/ Moderate	Co-ordinator	Yes	Yes	Not Recommended
	Strong Matrix	Moderate/ High	Manager	Not Recommended	Yes	Yes
	Project-ized	High	Manager	No	Not Recommenced	Yes

livery is virtually the same as the traditional design/bid/build.

2. Public-private-partnerships are a fundamental change in the delivery of capital projects.

3. The degree of uncertainty is a fundamental factor in deciding the appropriate project organization. Uncertainty is reduced as the project proceeds from one phase to another.

4. To select the appropriate organization, assess the certainty of each phase of each project and select people who can handle that uncertainty. The shape and style of the organization evolves as the project phases change.

5. The appropriate shape of the organization for the definition phase is a "haystack" which is a combination of the round table organization for the preceding Identification phase and the pyramid for the following Implementation phase. This shape is also the recommended organization for implementing design/build projects.

6. The traditional classification of project organizations is one that relates to project manager authority. A tabulation of this classification against the phases of the project confirms that organization structures should evolve as the project develops.

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