

MANAGERIAL PROCESS STANDARDIZATION THROUGH ILLUSTRATIVE CASE STUDY

Younghan Jung¹ and Thomas Mills²

¹*Department of Construction Management and Civil Engineering, Georgia Southern University, Statesboro, GA, USA*

²*Department of Building Construction, Myers-Lawson School of Construction, Virginia Tech, VA, USA*

* *Corresponding Author (yjung@georgiasouthern.edu)*

ABSTRACT: This paper presents an experimental case study for managerial process standardization that is supported by theoretical foundations that authorize, integrate, and optimize organizational decisions. The concept of Managerial Process Standardization improves the procedural ability of a business organization to efficiently process, exchange, measure and reason about management decision-making. This paper utilizes illustrative case study to classify the common construction management submittal process into four stages, 1) interpretation, 2) pre-qualification, 3) decision making, and 4) implementation. It compares these steps to a generalized multi-step decision making processes. The classification of the decision making process into standardized steps helps toward analyzing and explaining a processes' current status, and in the case of the construction submittal process this standardization establishes a strategic foundation from which to analyze and apply toward other construction managerial processes. The standardization of the managerial process by sequential tasking is an appropriate way to demonstrate how a decision maker can determine appropriate decisions in performing other specific management processes. By hypothesizing the application of managerial process standardization to a particular construction process, this paper explores how an organization can establish an innovative management strategy directed toward managing the organization's intellectual and technical capital.

Keywords: *Standardization, Managerial Process, Management Strategy, Organizational Decision*

1. INTRODUCTION

The construction industry is inherently multidisciplinary, with representatives from many fields, including architects, contractors, owners, and government agencies working closely together to initiate a project and see it through to completion [1]. Inevitably, managerial issues will arise during the course of such an endeavor and the Architecture, Engineering, and Construction (AEC) industry has adopted a wide array of useful, meaningful, and accessible information tools and management strategies in support of construction operations.

Typically, in a traditional design, bid, build construction project the owner communicates with the designer, who in turn communicates with the consultants and then the constructor, who passes on instructions to field trades, workers and suppliers. The work that is produced is

inspected and the results relayed back to the constructor, who may be required to correct any defects.

It is estimated that 30% of the non-productive time in general construction crafts work is a direct result of management inaction such as waiting for resources (16%), waiting for instructions (6%), late or inaccurate information (5%), etc [2]. This has created an opportunity and need for standardized, structured, and repeatable procedures to aid management personnel.

As in other industries, most inefficiencies in construction management can be ascribed to inappropriate decision making based on a lack of managerial knowledge. Many current project personnel simply record and manage construction data, as management personnel barely recognize managerial fundamentals [1].

This paper presents an experimental case study for managerial process standardization that is supported by

theoretical foundations that authorize, integrate, and optimize organizational decisions. The concept of Managerial Process Standardization improves the procedural ability of a business organization to efficiently process, exchange, measure and reason about management decision-making. This paper utilizes an illustrative study to classify the common construction management submittal process into four stages, 1) interpretation, 2) pre-qualification, 3) decision making, and 4) implementation. It proceeds to compare these steps to a generalized multi-step decision making processes. The classification of the decision making process into standardized steps helps toward analyzing and explaining a processes' current status, and in the case of the construction submittal process this standardization establishes a strategic foundation from which to analyze and apply toward other construction managerial processes. The standardization of the managerial process by sequential tasking is an appropriate way to demonstrate how a decision maker can determine appropriate decisions in performing other specific management processes.

2. BACKGROUND

Generally, construction activities divide into two main areas, production management operations and project management operations. The function of production management in construction is to manage the temporary production system dedicated to delivering the product, which may be a residential, commercial or manufacturing facility, while maximizing value and minimizing waste [3]. The function of project management is to support production operations to ensure the effective and efficient performance of construction processes. Project management therefore includes the managerial processes of planning, organizing, leading, and controlling resources, such as materials, labor, and equipment, to ensure the efficient and successful completion of production. Before starting the actual construction phase of a project, many project management operations must progress including a submittal process.

Submittals are a typical project management operation and are expected to fulfill various project requirements, including product data forms, shop drawings, samples, etc. The submittals are the contractor's responsibility and a very important part of the process that supplies materials to the site on time. First, a prime contractor decides whether a task would best be performed by their own workforce or contracted out to a subcontractor. The prime contractor can reflect all submittal-related activities within the project schedule. However, commercially available scheduling software generally utilizes the critical path method, and for most submittal-related activities it is difficult to pinpoint exactly the predecessor of a certain submittal activity with this type of software. Because many project schedules do not normally include submittal activities, many contractors create a "submittal schedule" based on the project schedule.

3. METHODOLOGY

This study utilized an illustrative case study for establishing a characteristic submittal process. An illustrative case study is primarily a descriptive study and typically utilizes one or two instances of an event that demonstrate how a real world process operates [4]. The methodology of the standardization for a case study, submittal process, is illustrated by the flow chart shown in Figure 1.

To initiate the standardization of a managerial process, one participant was first interviewed in order to analyze and create a submittal process that could be broken down into sequential tasks. The initial pilot model developed on the basis of this information was then shown to the other participants and their input incorporated into the model. The model as part of the calibration process as shown in Figure 1. The final version of the standardized model was agreed with all participants.

4. SUBMITTAL PROCESS

Before starting the actual construction phase of a project, many project management operations must progress through a pre-design phase. Prior to project closeout,

other activities including bidding, scheduling, estimating, change order, submittal, requests for information, etc must occur. The managerial process standardization developed for this paper was tested using the submittal process that occurs typically during the construction phase.

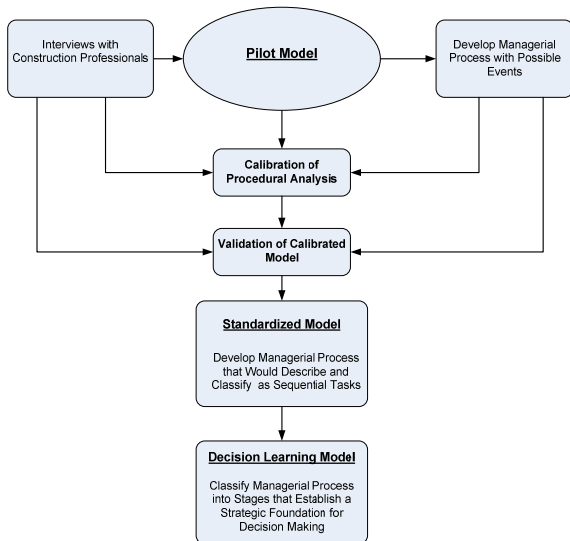


Fig. 1 Methodology for a Case Based Study

A flow chart of the process for material product submittals by prime contractors was constructed as shown in Figure 2. The diagram shows how a prime contractor’s procurement process for submittals functions. During the submittal process, a professional may have to deal with several issues, illustrated by decision nodes in Figure 2. Before contacting suppliers, the professional must interpret the contractual requirements from drawings, and data sheets. Based on these interpretations, the professional will decide the amount of materials, delivery time, and administrative requirements.

Contractors will select and prequalify suppliers from an existing list unless the products are unusual. After the prequalification, contractors send the contractual specifications and requirements to the suppliers, who then submit proposals based on the project requirements. The proposals generally include availability, price, and the supplier’s terms and condition. In general, every supplier has its own protocol, terms, and conditions for

the business, so contractors should thoroughly review and compare each supplier’s proposal and select the supplier who best meets their needs. The contractor then draws up an official contract with the selected supplier. After receiving detailed product information, the contractors perform a final review before preparing and sending a submittal to the A/E for approval. In this final review the contractors identify potential problems due to material defects, confusing terms, dimensional requirements, etc. Once all the issues have been resolved, the A/E signs off on the submittal, certifying that it meets the contractual and design requirements. Each sequential task in Figure 2 contributes to other construction processes that are further analyzed and standardized.

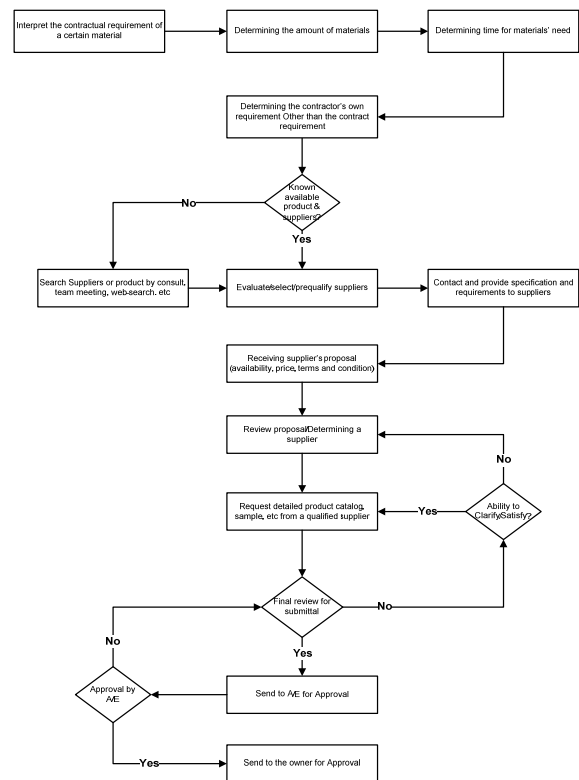


Fig. 2 Submittal Process-Illustrative Case Study

The submittal process is a necessary and entrenched step in construction projects, and various factors will affect its performance and ultimately the successful completion of the project. The experimental prototype of standardization can be used to identify these potentially disruptive factors to ensure that effective and efficient

performance occurs, which is the first step toward effective organization's decision making.

5. MANAGERIAL PROCESS WITH THE DECISION MAKING STAGES

The professional within the project team who is responsible for the submittal process must be familiar with various aspects of construction activities. To better understand the process, the submittal process can be broken down into four stages, 1) Integration, 2) Pre-qualification 3) Decision Making, and 4) Implementation, as shown in Figure 3. This classification of submittal processes can be compared to the general decision making process, which consists of five steps: 1) state the problem 2) identify alternatives 3) evaluate alternatives 4) make a decision, and 5) implement [5]. The classification of the decision making process into steps helps to analyze and explain the current workflow status, in addition to establishing a strategic foundation from which to analyze and apply other managerial processes.

In submittal processes, the activity of interpretation equates to stating the problem, and pre-qualification is the process of identifying and evaluating alternatives in the decision making process. After the evaluation of alternatives, two or more potential alternatives are generally very close to the evaluation criteria or requirements. Making decisions is about eliminating all the low ranked alternatives and the carefully examining the high ranked alternatives in the light of the evaluation criteria. The evaluation criteria are the results of interpreting the contractual requirements and assessing the benefits to the contractors in the submittal process. After making a decision, the implementation of the decision follows. The contractor contracts with the supplier officially and sends the submittal to the A/E for approval.

As with general decision making, to clearly identify the sequential tasks involved allows each sequential task can be further broken down into four distinct stages, see Figure 4. This sequence is for a common submittal process where no conflicts occur. Here, the interpretation stage may include four steps: 1) interpret the contractual

requirements 2) determine the amount of material needed, 3) determine the time for delivery, and 4) determine the administrative requirements. The contractor's computer project management tools can perform these activities efficiently and effectively.

According to the type of materials and installments, the contractor may at the "Interpretation Stage." need "shop drawings" in addition to material data sheets.

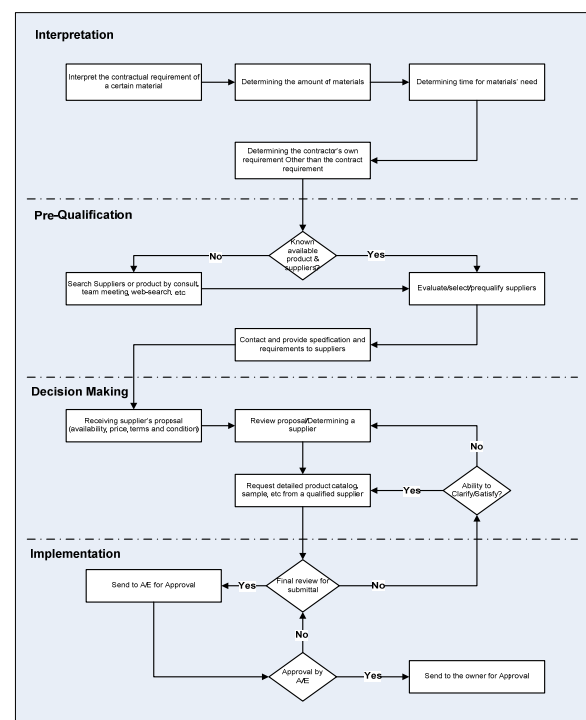


Fig. 3 Classifying the Submittal Process into Four Stages

The third step, "Determine time for delivery," is important. For instance, consider the instruction "Bldg. 550 installing acoustic ceiling grid", which is supposed to start May 1, 2011. In order to ensure that the materials are at the job site before May 1, the contractor must consider the manufacturing period and how often suppliers receive materials from the manufacturer, as well as the delivery times, submittal preparation, and submittal approval times. If the required materials are contracted and processed through suppliers or manufacturers and approving entities, the contractor may have to allow for as much as 30 days for manufacturing, 15 days for delivery, 10 days for submittal preparation,

and 10 days for submittal approval. Consequently, in this case the contractor must start all submittal work at least 65 days before May 1. These additional times are also part of the submittal process.

The fourth step in the interpretation stage, “Determine administrative requirements,” varies based on the environment of each project. The contractor must be clear concerning their specific requirements from suppliers, rather than the requirements given in the contractual documents, because the contractual requirements only specify the quality aspects of materials. Most contractors’ requirements from suppliers are generally concerned with the administrative aspects. In addition, the professional needs to decide whether a one time delivery or phased delivery methods is preferable because this administrative decision is directly concerned with the condition of sites, the project location, etc. These administrative aspects are thoroughly examined in conjunction with the contractual requirements by professionals.

In the prequalification stage, the contractor identifies possible suppliers who are expected to be able to provide products in a correct manner, taking into account their historical trading record and reputation. If the contractor is not familiar with the available products or suppliers, they must take other action to locate suitable products. The contractor can find available products or suppliers by consulting colleagues or other contractors, through team meetings, and web-searches. This additional process is described in Figure 5 as a contingent process. The contractor can then contact the potential supplier and provide them with detailed information concerning the products in the integration stage. Suppliers prepare their proposals according to the information provided by the contractor. The contractor will then choose from the suppliers’ proposals. To prevent unnecessary communications with suppliers, the contractor must provide precise information regarding the products and requirements, including the contractor’s own requirements, at this point.

In the “Decision Making” stage, the contractor selects the finalist who will supply the products based on the

proposals. Although the price of products is a critical criterion in choosing the supplier among the proposals, the contractor must also consider the different terms and conditions from each supplier. As mentioned above, each supplier has their own protocol, terms and condition for their business, so the proposal will reflect and include these various requirements. Suppliers’ proposals infrequently satisfy all the requirements of the contractor’s interpretation of the contractual requirements and the contractor’s administrative requirements and there are often conflicts between the supplier's and the contractor's needs. Therefore, the professional must consider various aspects of both contractual and administrative requirements beyond a project schedule when selecting the final supplier.

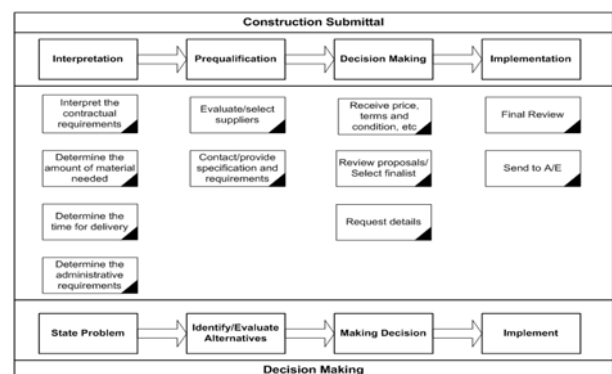


Fig. 4 Common Submittal Process

Following the selection of the supplier the contractor requests detailed information, including samples and catalogs. The supplier generally prepares the submittal documents according to the contractor’s template.

In the “Implementation” stage, the contractor makes a very thorough, review of the submittal before it is sent to the A/E for final approval. At this stage the contractor identifies defects in the supplier’s proposal such as confusing terms. To prevent unexpected problems during the supply process, the contractor must contact the supplier immediately and request clarification of any problems detected during this final review. If the supplier has made a mistake or used confusing terms, the contractor requests that this be corrected in a timely manner. However, if the supplier is not able to fix the

problems, the contractor may have to dismiss the supplier. In this case the contractor returns to the Decision Making” stage and repeats the same tasks, as shown in Figure 5. Each sequential task in the two cases, common and contingent, during the submittal process reflects directly on the performance of the organization, and this organizational performance is the result of various factors from the resources that the organization dedicates to the task.

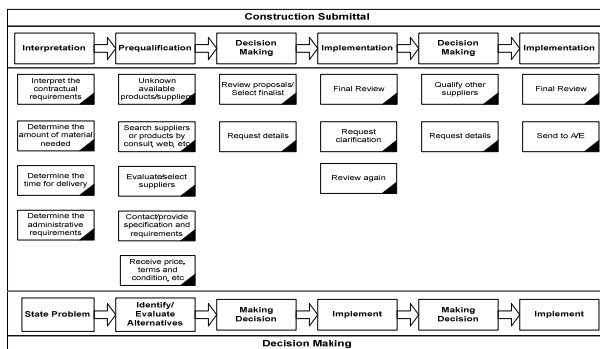


Fig. 5 Submittal Process with a Contingency

6. CONCLUSION AND FUTURE WORK

This study is the first step to develop an innovative management strategy directed toward managing the organization’s intellectual and technical capital. In many industries human workforces have been replaced by technologies such as automation or robotics, for example assembly lines in vehicle manufacturing. Labor shortages in Japan compelled the Japanese construction industry to begin to introduce construction robots as long ago as the 1970s [6]. Currently, research and development in the area of automation and robotics in the construction industry has focused on production management operations such as welding, concrete floor finishing, demolition, and bricklaying. In project management itself automation has been limited because managerial activities depend primarily on the decision making by managerial personnel.

From the structures previously identified it is apparent that by standardizing work processes various intellectual or intelligent tools can be applied to assist particularly

repeated decision making processes. For instance, utilizing the submittal process as described, the task “Evaluate/Select suppliers” in the prequalification stage, an individual project engineer will many times decides on suppliers based on various aspects of personal knowledge e.g., including company culture, trading record, reputation, and experience. However, if the organization provides a database for the supplier management system that includes contact information, product lists, and current stock levels, the time required for the evaluate/select task is markedly reduced. In addition, if the organization provides the evaluation and selection criteria as a policy that considers cultures and prior experiences with the organization, the professional can decrease and minimize the factors that must be taken into account at the prequalification stage. Further work in this area is aimed at developing an innovative management strategy that focuses on managerial tasks as processes that once mapped can be better supported by tangible organizational assets other than human capital.

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