Decision making in commercial construction

Ari GOLDBERG[1] and Deborah YOUNG-CORBETT[2]

[1]*Industrial and Systems Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA*
[2]*Myers-Lawson School of Construction, Civil and Environmental Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA*

Abstract. As part of an ongoing project to develop interventions to improve the rates of adoption of lower-risk materials and equipment in commercial construction, an investigation to elucidate the process of materials-specification decision-making was undertaken. Interviews at three sites revealed the following. Architects/designers typically base material selection upon aesthetic, quality, or green performance criteria. Management firms typically hire subcontractors to perform the construction operations and materials specification occasionally occurs at these levels due to quality or usability concerns over the design-specified supplies. Management firms may specify the need for hazard mitigating equipment but may not mandate a specific form.

Keywords. Construction, organizational culture, occupational health, decision making.

1. Introduction

The construction process is an intricate system with multiple stakeholders, including: property owners, architects/designers, building material suppliers, construction management (CM) firms, contractors, the labor workforce, and end users of the infrastructure (Blayse & Manley, 2004). Each stakeholder has a designated task and each project follows a general procedure. First, a client or property owner hires an architectural firm which is aided by consultants such as designers and engineers. The architect designs the product for the customer and specifies all materials to be used on site. A CM firm is hired to execute the idea and oversee construction. The firm hires subcontracted companies and material and equipment suppliers aid the project (Pries & Janszen, 1995). Thus, the stakeholders may change from site to site and is usually governed by regional constraints.

The commercial construction industry is considered a 'project based' industry where stakeholders are organized around a particular project (Nam & Tatum, 1997). The combination of multiple stakeholders and the project-based approach creates an overall fragmented organizational structure with decisions being made at multiple levels, and these decisions are not always consistent from site to site. Although there are federal, regional, state, and local building codes (Toole, 1998), the project-based approach means there is a lack of standardization in the details of the construction process (Barlow, 2000).

Understanding who makes material purchasing decisions, and what tools and equipment are allowed on site, are particulars which are not always consistent in every project. As part of ongoing research to improve adoption rates of lower-risk tools, equipment, and materials, the decision-making process in commercial construction was investigated.

2. Methods

The research team gained access to two new building sites and one renovation site on the Virginia Tech Blacksburg campus. All sites were managed by independent CM firms. Initially, the Virginia Tech University Design and Construction Office was contacted for introductions to the first two sites. The third site was contacted directly by calling the CM firm's national office.

Interview questions were formed prior to visiting the site or during the site tour. Questions formed on site were guided by unique aspects of the site, specifically the workflow related to the stage in the building process. All interviews started by gathering background information on the CM firm and the project manager. Subsequent questions focused on determining the decision-making process, roles of the stakeholders, the regulatory environment, and tool, equipment, and material usage trends and specifications.

As more information was gathered from each site, comprehensive questions concentrating on decision-making were asked. Interviews with contractors or the labor force focused on hazards and risks, and tool, equipment, and material use.

2.1 Davidson Hall Renovation

The first site visited was Davidson Hall, managed by Barton Malow Company. Only two of the existing walls of the facade were kept intact while the rest was dismantled for renovations. At the time of the visit, most of the interior walls and floors were built but two of the exterior walls were still under construction. The project manager granted an interview with the research team, and the interview consisted of touring the site while asking predetermined questions and any relevant site-specific questions. Additionally, informal interviews were conducted with three masons at separate times.

2.2 Human and Agricultural Biosciences Building I

The second site visited was the Human and Agricultural Biosciences Building I (HABB1), managed by SKANSKA USA Building Inc. HABB1 is the first in a four part complex. At the time of the visit, the site was almost finished with only weather proofing and interior work needed. The project manager granted an interview and led the research team on a tour throughout the site. Site-specific questions were asked during the tour, and predetermined questions were asked at the conclusion of the tour in the project manager's trailer. Additionally, one subcontracted masonry firm owner was informally interviewed.

2.3 Center for the Arts (Moss Arts Center)

The third site visited was the Center for the Arts managed by Holder Construction Company. The research team called Holder's national office to obtain the contact information of the project manager, and through direct communication, an interview was granted. The site was nearly finished when visited, so only the project manager was interviewed in his trailer. The questions were sent to the project manager before the meeting.

3. Results

3.1 Davidson Hall Renovation

The research team discovered there are generally accepted rules to use on sites. Many of these social norms are not governed by the Occupational Safety and Health Administration (OSHA), the agency responsible for enacting and enforcing safety and

health regulations. For instance, scrap wood was used to prevent fall risk by placing a barrier in an unfished window opening. This shows many times innovation occurs on site without regulatory intervention.

The project manager revealed information about material acquisition. In large firms, there are usually purchasing agents who negotiate prices with material vendors. For this specific CM firm, project managers are charged with the negotiating task. The project manager revealed they may not receive better prices from vendors, but the products chosen are better tailored to the site's individual needs. Additionally, material vendors may solicit project managers when a new product is available. The products may not always be better and are thus not always purchased. Other times, the project manager may have a specific need but does not know the ideal material to use. In this case, the project manager works with the vendors to find the product best suited to fill the need.

The informal interviews with workers determined they did not have opinions on material specification. Though, they understood the risks associated with the hazards they were exposed to, namely, the inhalation of dust from masonry products. This implies materials are specified from the top down, but those actually exposed should be involved in the decision-making process.

3.2 Human and Agricultural Biosciences Building I

Based on knowledge gained from the first site, a deeper understanding of the material specification process was needed. The project manager at HABB1 mentioned an architect specifies all materials to be used on site according to the Construction Specification Institute, which organizes building specifications into sixteen divisions (Gould & Joyce, 2002). Specifically, for each material needed, one to three makes and models are specified. These choices are made for aesthetic, quality, or sustainable reasons and not for health concerns. If the subcontracted firm does not wish to use any of the options listed by the architect, they will voice their concerns with the CM firm. The reasons can vary, but are usually because of work quality issues based on past experience. Representatives from the CM firm will meet with the architects and designers to discuss the concerns and try to come to a mutually beneficial agreement. If the architects and designers maintain their previous position, the contractors will state in writing the problem with the material to absolve them from responsibility should any problems arise from the material in the future.

The research team also inquired about the tools, equipment, and processes used on site. The masonry firm owner revealed they have a preferred dust control method when cutting masonry products. For this specific firm, they used a table saw with a water attachment to suppress dust from becoming airborne. Though, when cutting into a built wall to create space for an electrical outlet, a plastic water bottle was used. The plastic water bottle is an example of an innovation not governed by OSHA. Thus, the research team asked the project manager about tool selection and dust control on site. In the contract, the CM firm may specify that a subcontractor must use dust control technology but may not explicitly state which kind to use. It is possible to state a specific tool must or should not be used but this is not always the case. Thus, the ideal tool, equipment, or process chosen by a subcontractor may not be ideal for worker health, but is based on past experience related to performance quality.

3.3 Center for the Arts (Moss Arts Center)

The project manager was posed the question about dust suppression technologies. If dust control technology is specified, it may not always be for worker health. Many times, measures are taken because dust can interfere with other subcontracted companies and other work occurring on site. This may diminish work quality by other contractors or may

increase build time if all other work needs to stop. This has implications for the entire build because each step in the process is interdependent with each step being contingent on the previous step being completed first (Dubois & Gadde, 2002).

The project manager revealed there are other decisions makers on site. Usually the project manager works with one foreman or a team of foremen to manage a site. The project manager is in charge of business operations while the foremen oversee daily operations and work with the subcontractors and the labor force. If an issue arises, the project manager and foremen will meet to come to an understanding of how to proceed. If an impasse occurs, the project manager's boss will need to be involved but the project manager revealed this is extremely rare. Thus, based on the work relationship and the age of the constituents, one may have better persuasion power and leverage. This implies that sometimes a decision that is better for completing the task may occur at the expense of business operations or construction feasibility.

4. Discussion and Conclusion

The commercial construction's organizational structure makes decision-making complex. Though there are standard work practices, decision-making cannot be centralized and is site specific. Thus, enacting changes which are industry wide may be difficult.

Many times, decisions are business or work quality related and not health or safety related. Health and safety professionals were not involved in the decision making process at any of the sites. When an architect specifies materials to be used and objections to those materials are voiced, neither the specifications or the objections are health related. Additionally, many times, new controls used on sites are not governed by OSHA. For instance, dust control technology which affects worker health is usually not standardized. Thus, workers should be more involved in the decision making process considering they are being exposed to the hazards. The information gained in this study will be used to understand the barriers to adoption of healthier tools, equipment, and materials in commercial construction.

References

Barlow, J. (2000). Innovation and learning in complex offshore construction projects. *Research Policy, 29*(7), 973-989.

Blayse, A. M., & Manley, K. (2004). Key influences on construction innovation. *Construction Innovation: Information, Process, Management, 4*(3), 143-154.

Dubois, A., & Gadde, L.-E. (2002). The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction Management & Economics, 20*(7), 621-631.

Gould, F. E., & Joyce, N. E. (2002). *Contruction Project Management: Professional Edition*. Upper Saddle River, NJ: Prentice Hall.

Nam, C., & Tatum, C. (1997). Leaders and champions for construction innovation. *Construction Management & Economics, 15*(3), 259-270.

Pries, F., & Janszen, F. (1995). Innovation in the construction industry: the dominant role of the environment. *Construction Management and Economics, 13*(1), 43-51.

Toole, T. M. (1998). Uncertainty and home builders' adoption of technological innovations. *Journal of Construction Engineering and Management, 124*(4), 323-332.

11th International Symposium on Human Factors in Organisational Design and Management (ODAM 2014) CPH Conference

Decision making in commercial construction

Author: Ari GOLDBERG (Industrial and Systems Engineering, Virginia Polytechnic Institute and State University, United States)

Deborah YOUNG-CORBETT (Myers-Lawson School of Construction, Civil and Environmental Engineering, Virginia Polytechnic Institute and State University, United States)

Date: 2014-08-19 **Track:** E - Organization & management **Session:** E7 - Work organization

DOI: 10.4122/dtu:2525

As part of an ongoing project to develop interventions to improve the rates of adoption of lower-risk materials and equipment in commercial construction, an investigation to elucidate the process of materials-specification decision-making was undertaken. Interviews at three sites revealed the following. Architects/designers typically base material selection upon aesthetic, quality, or green performance criteria. Management firms typically hire subcontractors to perform the construction operations and materials specification occasionally occurs at these levels due to quality or usability concerns over the design-specified supplies. Management firms may specify the need for hazard mitigating equipment but may not mandate a specific form.