A Preliminary Analysis of the Value of End-user Input in the Front-end Stages of Project Development for New Facility Construction Projects

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A significant amount of high level construction is now performed under Design-Build and/or Construction Manager at Risk (CMAR), and this work is often performed for public or quasi-public agencies such as schools and universities, health care organizations, and state, local and federal government agencies. Because these organizations are driven by stakeholder expectations these projects tend to have large numbers of stakeholder who need to be satisfied. One of important phases of any design and construction project is the programming phase, during which the parameters of the project are determined. A large amount of time and money is directly spent during the programming, schematic and design development phases, and large amounts of the projects future time and money are committed during this phase. In most governmental and quasi-governmental projects a significant number of individuals are allowed input into the process.

Keywords: End-user, stakeholders, Architectural Fees, value added.

Introduction

The Arizona Board of Regents (ABOR) specifies certain standards for a variety of university buildings. For example, based on current standards, a faculty office is 150 NSF, there is a specified grade of carpet, lighting and ceiling tile, recommendations for electrical and voice/data specifications, and a specified manufacturer for the lockset. In spite of these pre-set design rules, Arizona universities typically start the planning process by meeting end-user stakeholder to elicit input, under the assumption that stakeholder buy-in is a critical component in the development of viable design and construction solutions. Few of these stakeholders understand the process of design and construction, and fewer know the ABOR recommendations for facilities.

A basic assumption of stakeholder involvement is to earn trust and buy-in requires stakeholder involvement. Earning trust means identifying and engaging an appropriate collection of participating stakeholders and end-users, managing the participation process, education on key issues, obtaining necessary input, receiving feedback, and working to achieve consensus. Related to building construction and renovations of existing facilities, the perceived need to include stakeholders in the entire design and construction process has significant costs.

The purpose of this preliminary study was to attempt to discover the relative cost of including stakeholders in the design and construction process and to uncover information about the validity of the assumption of involvement versus satisfaction. A significant amount of demographic data was collected, in the study surveys. After the initial findings and reviews were made, it was

deemed that this information, however interesting it might be, was irrelevant to the high level study conclusions and final recommendations.

Background

Currently, at the University of Arizona, College of Medicine, over $300 million of construction for research and educational facilities is underway, recently completed or is nearing completion. A significant amount of new and renovation construction is anticipated over the next three to five years. The College of Medicine expects to double the number of its faculty during this period of rapid physical plant expansion. One of the goals set by the College was to develop a data driven approach to space assignment, development and design. The data driven approach, in part, is an effort to depersonalize space allocation, increase the management autonomy of department, center and research directors, and to provide information on the progress of the College's strategic plan.

Part of the new approach to space management was the effort by facility management to control costs by creating effective and efficient processes for project development and design. One area of development and design that involves the expenditure of significant resources is the management and control of the interaction between the end-user stakeholder and the design professional. Cost for this process include hourly charges for facility managers, architects, engineers, designers and construction managers, as well as the cost for the time of the end-user stakeholders. Typically, however, stakeholder time is not "billed" to the project and would be difficult to quantify. However the costs of the architects and engineers and the effect on project schedule of stakeholder buy-in are verifiable.

The presented study focuses on the cost and benefits of including significant end-user input into the design process.

Literature Search

A significant body of knowledge exists on stakeholder buy-in. A directed google search, using the following exact phrase "stakeholder buy-in" yielded approximately 63,000 hits. Narrowing the search by adding the individual words architecture and design after the phrase stakeholder buy-in reduced the number to 11,300 hits.

A stakeholder is an individual or a group (Mina, 2002):

- Who is affected by your team's mandate and decisions in some way?
- Whose support is needed for the successful implementation of your team's decisions?
- Who can offer useful ideas and insights to enhance the quality of your team's decisions?

Stakeholders for a new or renovated facility are those who will reside in the completed space. On the surface, just as a homeowner would desire to have their living needs met by the space

they occupy, it would follow that end-user stakeholders would desire that their needs be met by the space provided for their work.

Pinto & Rouhiainen, (2001) argued that "client acceptance argues that projects that have been developed according only to time, cost and performance have a potential to miss the most important hurdle of all, the acceptance and use of the project once completed".

However Mina (2002) suggests asking the following questions to determine stakeholders:

- To whom are you and your team accountable?
- Who will need to ratify the recommendations that you make?
- Who could offer useful advice to enhance and enrich the quality of the consensus?
- Who will be affected by your team's decisions, and to what degree?
- Who might benefit or lose as a result of your group's decisions?
- Whose power base might be threatened by the group's potential decisions?
- Who should be aware of your progress, even if they are only marginally affected by it?

As part of this study the Journal of Construction Education and the ASC Proceedings for the past ten years were searched for articles in this area of study. A single common source was found in both the proceedings and the journal relating to the topic (Hamilton, 1996), (Hamilton, 1997).

A related work, sponsored by the Construction Industry Institute (CII) (Gibson 1993) was also reviewed. The Gibson work provided insight into owner's expectations of design costs before project authorization. Gibson asserted that between 10 and 25 % of all design hours should be expended before project authorization. During the decade since the CII study, construction market conditions have changed significantly.

We know that in designing complex facilities that "the programming stages take up a large percentage of time and cost" (Kaplan, 1973). It is apparent that facility project management should work to streamline the programming phase of any project.

"First, there is the problem of what it is exactly that can be decided individually and second, how one can go about evaluating the users decisions" (Van Wagenberg, 1976). End-users, in the Van Wagenberg evaluation, are those that will occupy the finished project. Inevitably they tend to try to satisfy there own personal needs. In large and complex projects with many end-user stakeholders the owners rarely can afford the cost and schedule implications of satisfying every end-user stakeholder. A significant complication in evaluating key stakeholders is the inevitable complexity and conflict in human organizational systems for projects selection and delivery.

On this same line, a runaway project has been described as one that has one or more of the following characteristics:

- It is way behind schedule.
- It is grossly over budget.
- When and if it is finally implemented, it subjects the enterprise to the risk of a substantial financial loss.

(Graham & Englund, 2004)

In the Graham and Englund model, coming in on time and within budget equals project success. Based on this description, a successful project does not include the satisfaction or happiness of the occupants. However, how can the end-user stakeholder satisfaction have no bearing on project success?

Problem Statement

For governmental and quasigovernmental organizations, project goals are typically set in a classical decision-making model. In the classical decision making model, goals are set prior to alternatives, always begin with a mean's to an end analysis and the test of a good decision is the best means to an organizational end, which in this case means does the project meet budget and time constraints. (Hoy & Tarter, 1995)

Space occupied by individuals for long periods of time (homes and offices) becomes a very personal thing and often the focus of irrational thoughts and behaviors. When end-users are engaged with the work of design consultants a much more complex group decision model is used. A model where objectives emerge spontaneously but are personal, personal needs determine organizational means, and the test of a good decision is whether every individual's objectives are accomplished.

One fundamental question that grew out of this study is: Should these end-users ever be involved or should those responsible for project success, be the sole source of information of architectural and engineering information and direction?

A specified purpose of this study was to evaluate the value of end-user stakeholder involvement in the development of building projects. For the study projects, the following questions were asked:

- What amount of time and money was expended in incorporating user involvement?
- Does end-user involvement equate to a more satisfied occupant?

Project Background

Two projects at the University of Arizona Health Science Center were selected for study purposes: Drachman Hall and the Medical Research Building. Both are significant capital projects recently completed with similar occupants, but with dramatically different end-user stakeholder involvement approaches.

Drachman Hall

Drachman Hall is an 117,000 GSF interdisciplinary academic building. Drachman Hall provides instructional and office space for student education, dry laboratory research activity space, and administrative function space. The total project cost for Drachman Hall was $35 million.

A great deal of time went into pre-programming exercises in order to determine preliminary project needs. The end-user/project management representative conducted a preliminary inventory of existing staff and space and worked intensively with each college to determine projected staff and space needs. Once the needs were determined an ongoing series of meetings with AE and other design and construction representatives were held design preliminary and design development.

Medical Research Building

The Medical Research building is a 145,000 gross square foot (GSF) research facility intended to bring together basic scientists and physician researchers who share an interest in the molecular basis of human health, aging and disease. Total project cost for the Medical Research Building was $60 million.

The occupants were unknown at the start of the project, and many had not been identified at substantial completion. A high-level program team of faculty investigators were brought together for a series of three intensive programming sessions. The programming effort took approximately 12 hours during three half-day sessions with the project, AE, and design staffs.

Project Delivery Method

The University considered alternative building delivery processes for both of these projects: including design-bid-build and Construction Management at Risk, (CMAR). CMAR was selected as the construction delivery for both projects, meaning that along with the costs for the architectural and engineering fees, there were costs for the CMAR contractor's involvement in the design process. We did not investigate these CMAR costs as they are certainly smaller than, and would likely track well against the AE fees during the early design phases.

Methodology

To evaluate the value of end-user stakeholder input in these two projects, the end-users were surveyed (Appendix A). Although a variety of specific demographics and usage typologies were addressed for each building, for this study we used only the overall satisfaction rating for this preliminary analysis.

In addition to the project occupant surveys, architectural consultants were interviewed to obtain data, insight and opinion about the value of multiple users being involved during the initial phases of project development. An analysis of AE fees was also completed as part of this study.

Findings

Architectural Fees

Twenty-four to thirty six percent of Architectural and Engineering (AE) design fees are typically spent in the initial schematic design and design development phases. However, for the College of medicine this percentage increased to 30-49 of AE design fees. This increase is indicative of the complex end-user decision making model of the organization.

Table 1: Architectural Engineering fee distribution Drachman Hall and MRB.

Project	Total AE fees	Schematic and Design Development AE fee	Percent of Total Design Fees
Drachman Hall	$820,000	$319,000	39%
Medial Research Building (MRB)	$1,900,000	$494,000	26%

The Drachman Hall schematic and design development fee distribution was 39% of total AE fees.

The MRB schematic and design development fee distribution was 26% of total AE fees.

By inference, if the typical University of Arizona approach to end-user involvement had been taken on the MRB project, the expected early design fees would have been more than $741,000.00, or an increase of $247,000.00 (50%) over what was actually spent during this phase. This difference in costs does not include any project delays, disruptions nor the cost of the end-users time spent on the project.

Occupant Survey

Approximately six weeks after the buildings were fully occupied and punched out the end-user (occupants) of both Drachman Hall and the Medical Research Building were given the survey shown in Appendix A. Although listed on the survey, student occupants were not included in the actual survey. Four hundred and fifteen (415) surveys were distributed to end –users, 356 to Drachman Hall occupants and 59 to MRB occupants.

Thee hundred and forty-two (342) surveys were completed and returned (283 from Drachman Hall and 59 from MRB). This is an 82.4% response rate, considered a very unusual (high) response rate, providing an additional question for us to address. For both projects a score of 1.0 is very satisfied and 5.0 is very dissatisfied.

The Drachman Hall the mean average satisfaction score was 1.89. The MRB mean average satisfaction score was 2.55, a lower satisfaction rating than Drachman Hall but in our view, not significantly different satisfaction index.

Sixty percent of Drachman Hall end-users who responded had, by self identification, actively participated in the project. Of those who reporting "actively participated", 63% felt their participation had an impact on the end product while 37% reported it did not. For Drachman Hall 51% of those that reported 'not actively participated" felt that even if they had participated it would not have had an impact on the end result.

Because the occupants of MRB were not yet identified at the time of early planning and even during construction, 100% of the current occupants of MRB were not active participants in any of the project planning, design or construction processes.

Conclusions and Recommendations

The purpose of the limited preliminary study was to evaluate the added costs and added value of end-user stakeholder participation in the development and design of a constructed project. Two similar and contemporaneous projects (for the same owner) were chosen for the study. The projects had demographically similar end-user stakeholder groups but different approaches to preliminary design in the area of end-user involvement. One project had a high level of end-user occupant involvement; the second project had no end-user occupant involvement in the development and design process.

While there was an apparent and significant cost for early end-user stakeholder participation in one project there was no significant difference in end-user satisfaction between the two projects. For these two projects, the input for the high end-user 'stakeholder" involvement appeared to increase the cost of the design fees by a significant amount without a corresponding improvement in satisfaction.

While the results of the surveys could be attributed to a variety of reasons, it was clear that on the two subject projects a significant amount of additional AE fees was spent on end-user involvement in the planning and design.

During evaluation of this paper it was pointed out that a "halo" effect may have been at work during the collection of the survey data. The high return of surveys indicates that the end-user occupants may have had a high regard for one of the authors, leading to a skewed or "haloed" positive report on the survey. Based on the preliminary information, and the potential for skewed survey results the authors recommend that this research be expanded to a wider number of construction projects with a more rigorous distancing of the participants from the observers.

The authors plan to restructure the study and apply it to a series of projects in the future, and plan to add the costs of the end-user time in the planning process as well as the CMAR time and costs to the analysis of end-user input costs.

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Appendix A

POST Occupancy Project: Medical Research Building
Building Satisfaction Survey

I would like to hear from you! As part of my capstone for the Master Program at Northern Arizona University University, I am conducting a survey to find out your views, insight and opinions related to your overall involvement with the programming and planning of the MRB and your satisfaction with the end product. Information and data gathered from this survey will be documented and used in the submittal of my final paper. The project attempts to evaluate the user's role in project programming and management and to what extend this involvement plays into overall satisfaction you have with the final project outcome.

As part of the research for this paper I will also be conducting interviews.
If you be willing to discuss your comments, please check this box ? and provide your name and telephone number
here_____
_____

I am: ? Faculty
? Administrator ? Student

General comments and perceptions

Were you actively involved in the planning/programming for this project ?Yes ?No
If yes, do you feel your involvement had an impact on the end result of this project?

If no do you feel your involvement would have made an impact on the end result of this project?

Have you had to make any modifications to your facility in order to make it meet your needs? ?Yes ?No
If yes, briefly describe the modifications required and what costs were incurred.

Please rate the following on a scale of 1 (very satisfied) to 5 (very dissatisfied) by circling your response.

Room or use function or utility	very satisfied				very dissatisfied
Laboratory size	1	2	3	4	5
Laboratory Function (shape, orientation, furniture, etc)	1	2	3	4	5
Other room size	1	2	3	4	5
Other room function	1	2	3	4	5
Circulation and student social space	1	2	3	4	5
Building finishes	1	2	3	4	5
Room acoustics	1	2	3	4	5
Plumbing systems	1	2	3	4	5
Air conditioning, ventilation, and mechanical systems	1	2	3	4	5
Lighting (quality, switching, natural light availability and control)	1	2	3	4	5
Audio visual systems	1	2	3	4	5
Signage					

Overall satisfaction with the facility	1	2	3	4	5

What do you like best or what works best about the project?
What do you like least or works poorly/not at all about the project?
If you could change one thing about this project I would change…..
Was the final result what you envisioned? Why or Why not?
You can write and additional comments below. Thanks you for your participation in this survey!

POST Occupancy Project: Drachman Hall
Building Satisfaction Survey

I would like to hear from you! As part of my capstone for the Master Program at Northern Arizona University, I am conducting a survey to find out your views, insight and opinions related to your overall involvement with the programming and planning of Drachman Hall and your satisfaction with the end product. Information and data gathered from this survey will be documented and used in the submittal of my final paper. The project attempts to evaluate the user's role in project programming and management and to what extend this involvement plays into overall satisfaction you have with the final project outcome.

As part of the research for this paper I will also be conducting interviews.
If you be willing to discuss your comments, please check this box ? and provide your name and telephone number
here_____
_____

I am: ? Faculty (only teaching in the building) ? Faculty (Teaching and office in the building)
? Administrator ? Student

General comments and perceptions
Were you actively involved in the planning/programming for this project ?Yes ?No If yes in what capacity?
If yes, do you feel your involvement had an impact on the end result of this project?

If no do you feel your involvement would have made an impact on the end result of this project?

Have you had to make any modifications to your facility in order to make it meet your needs? ?Yes ?No
If yes, briefly describe the modifications required and what costs were incurred.

Please rate the following on a scale of 1 (very satisfied) to 5 (very dissatisfied) by circling your response.

Room or use function or utility	very satisfied				very dissatisfied
Classroom size	1	2	3	4	5
Classroom function (shape, orientation, furniture, etc)	1	2	3	4	5

Other room size	1	2	3	4	5
Other room function	1	2	3	4	5
Circulation and student social space	1	2	3	4	5
Building finishes	1	2	3	4	5
Room acoustics	1	2	3	4	5
Plumbing systems	1	2	3	4	5
Air conditioning, ventilation, and mechanical systems	1	2	3	4	5
Lighting (quality, switching, natural light availability and control)	1	2	3	4	5
Audio visual systems	1	2	3	4	5
Signage					
Overall satisfaction with the facility	1	2	3	4	5

What do you like best or what works best about the project?
What do you like least or works poorly/not at all about the project?
If you could change one thing about this project I would change…..
Was the final result what you envisioned? Why or Why not?
You can write and additional comments below. Thanks you for your participation in this survey!