

**Six key components of Collaboration in Higher Education buildings: a case study of
Stakeholder Engagement at the University of Washington**

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Abstract

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Collaboration has taken on an important role in the construction industry lately with the inception of project delivery methods like Integrated Project Delivery that promotes interaction of multiple stakeholders cohesively to deliver high performance and good quality buildings. A vital aspect of collaboration is engaging the stakeholders especially when the project is complex such as a Life Sciences Building (LSB) that requires minute details pertaining to end users/building occupants such as space utilization or power infrastructure needs. Through a detailed literature review, the key components of Stakeholder Engagement are determined which include Stakeholder Identification & Analysis, Stakeholder Consultation, Information Disclosure, Stakeholder Reporting, Grievance Management, Stakeholder Involvement in Project Monitoring, Negotiation & Partnerships and Management Functions. The purpose of this thesis is to determine which of these components of Stakeholder Engagement are more prevalent in construction of complex projects involving multiple

stakeholders. For this purpose, two sources of data have been used - firstly the Capital Initiative workshop notes that included discussions regarding the importance of implementing the various key components of Stakeholder Engagement mentioned earlier for best results as far as University Buildings construction was concerned were analysed and secondly, a case study has been conducted on a Life Sciences Building (LSB) currently being constructed on the University of Washington, Seattle campus.

The components of Stakeholder Engagement which were found to be important through the analysis of the workshop notes were then used as part of the interview of the various stakeholders on the LSB project to determine the extent to which each of those components were being implemented and followed on the project. Key components such as Stakeholder identification & Analysis, Stakeholder Consultation, Stakeholder Involvement in project monitoring and Information Disclosure were found to be followed and implemented well on the project site which contributed to the overall project success so far. A graphical representation and truth table analysis further reinforced the results. By identifying aspects of Stakeholder Engagement like Grievance Management and Stakeholder Reporting which were not found to be implemented as well as some of the other components on the project, awareness can be spread to implement these in a better manner and ensure a much smoother and effective project execution. The research is also a pilot study for implementing the key components of Stakeholder Engagement that can be used as critical identifiers not just for higher education buildings but all projects that involve multiple stakeholders and especially a project delivery method such as IPD that promotes multi-party collaboration.

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1. Introduction

The advent of modern technology and globalization has led to a tremendous growth in the Construction Industry. As the complexity of the industry started to grow, the various stakeholders involved in the construction activity, their roles and responsibility and certain principles had to be

defined in order to stream line the whole process. This led to the inception of various project delivery methods, which helped allocate the respective roles and responsibilities to the primary stakeholders involved and also tend to the uniqueness of challenges in different projects and client requirements. The project delivery methods are usually selected due to a variety of reasons like project characteristics, owner's needs, market conditions etc. Many different types of project delivery methods have been created specific to client requirements and in order to ensure the projects are completed well within the anticipated schedule and budget.

In the past, the concept of "Master Builder" was dominant. It typically consisted of one entity that was responsible for design and construction of the project (DBIA 2014). As time passed, the design and constructions activities separated and respective professional entities began to be formed. Thus, there was a need for project delivery methods and assignment of roles and responsibilities to the various core team members or stakeholders. The introduction section speaks about the various methods of project delivery in the Construction industry and how they have progressed over time to replace the traditional, individualistic approach with the collaborative and more integrated approach.

1.1 Types of Delivery Methods

- **Design-Bid-Build (DBB):** It is the most traditional project delivery method. It was predominantly used on public projects during the early inception period of project delivery systems. It did not promote collaboration and engagement and involved three typical phases:
 - 1) **Design Phase:** In this process, the owner hires a designer to design and produce construction drawings, technical specifications as well as bid documents. The owner would convey all his needs to the designer who would then proceed to designing as per the owner's needs and requirements. Sometimes, the designers will bring in our specialized design professional which include mechanical, electrical and plumbing engineers, structural engineers and even civil engineers and landscape designers.
 - 2) **Bid Phase:** During this phase, the bid documents, which are prepared during the design phase, are bid out to contractors. This phase is essentially characterized by hard bids and typically the lowest bidder ends up winning the tender.
 - 3) **Construction Phase:** Following the Bid phase, the contractor begins the construction as per the finalized design. There might be a lot of unforeseen problems, which the contractor might have overlooked during the bid phase but it is his responsibility to construct and hand over the facility within the finalized budget and time as long as it is within his scope of the contract. If the owner decides to implement some changes during construction, the change in scope would be compensated by him through a change order. Otherwise, everything else is the contractor's responsibility.

A lot of problems arose because of such a delivery method:

- 1) As the contractor is brought on post design, there is very little room for innovation and value engineering and thereby the quality of the project is compensated.
- 2) There is no fast-tracking (overlap during the design and construction phases), which result in longer time to construct and handover a building.
- 3) There are multiple contracts involved between the Owner-Designer and the Owner-Contractor, which could prove to be risky for the owner as he would have to bear all risks associated with any change in work outside of the scope of the contractor and designer.
- 4) Essentially, the lowest bidder won the project thereby eliminating potential bidders who might have had a better performance record.
- 5) Typically, there were a lot of change orders involved and projects mostly exceeded the anticipated cost and schedule, which proved to be quite tough especially for first time contractors looking to establish a foothold in the industry.

Thus there was a need to replace this age old conventional method of delivery with more advanced form of delivery that involved higher value engineering, higher quality of buildings being handed over and projects that could be completed well within the anticipated cost and schedule. This gave rise to numerous new project delivery methods like:

- **Design Build method (DB)** - This was a form of project delivery method wherein the design and construction services are contracted with a single entity called the Design Builder. Unlike the DBB, this involved just a single contract between the owner and the Design-Build entity. It added more value to the design as both designer and builder were involved early on and since both these activities overlapped there was much lesser time delay.
- **General Contractor Construction Manager (GC/CM)**- In this form of project delivery method, the contractor is brought on by the owner during the design phase to provide input regarding constructability that involves scheduling, pricing and phasing aspects of construction. It helps in

adding value engineering as the contractor is involved early on in the design process. The GC/CM is also usually selected on the basis of qualifications, past experience or best value unlike DBB.

1.2 Integrated Project Delivery Method

With the advent of latest tools like BIM and concepts like Lean Construction, there was more collaboration and engagement encouraged early on in the design phase which eventually led to the inception of another project delivery method called **Integrated Project Delivery (IPD)**. The concept of Primary Team Members (PTMs) arose in IPD. By involving the PTMs early on in the design phase, IPD ensures faster project delivery, lower costs, higher quality and smooth overall process. This is one of the characteristic features of IPD.

The American Institute of Architects (AIA) defines IPD as “a project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all project participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction” (AIA California Council 2007). IPD has replaced the traditional design-bid-build project delivery method. Typically characterized by low bids and lack of overlap between the design and construction phases, the DBB method has been more or less obsolete today in comparison to newer delivery methods like IPD.

One of the most basic advantages of the IPD method is the ability of all parties to be present and be involved with all aspects of the project right from the earliest design phase. This helps to bridge the gap between the designer and contractor which would often lead to schedule and cost overruns. Although there might not be a necessity for using tools like BIM early on in the design phase, its advent has only added to making the process a whole lot smoother thereby ensuring the project is delivered well within the scheduled time and cost with minimal change orders and maximum quality and value.

Integrated Project Delivery (IPD) is an evolving, bold innovation in construction delivery. It generally contemplates the owner, the architect or engineer and the contractor all entering into one contract and functioning as a cooperative and collaborative team to design and construct the project with shared risks and rewards in the ultimate cost, schedule and quality of the overall project (Andre 2011).

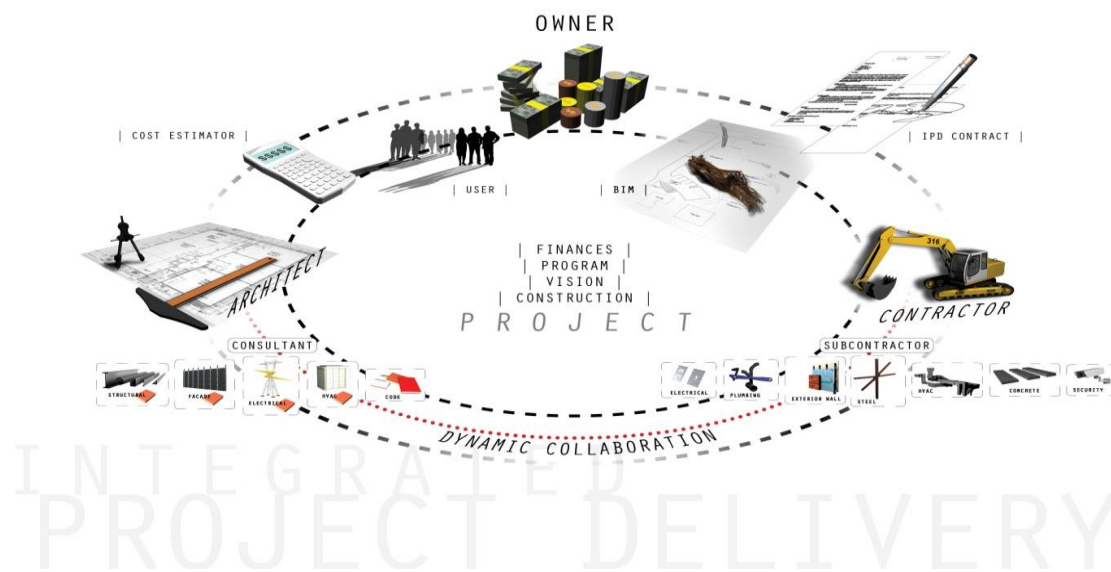


Figure 1: Pictorial representation of Integrated Project Delivery

(http://www.archdaily.com/153953/integrated-project-delivery-methodology#_=_/ Accessed 1/16/2017 at 2:46 pm)

IPD has no standard definition. It is an evolving delivery method based on broad concepts that can be customized on a project-by-project basis. As Gregory Andre mentions in his paper, “There is no such thing as one way to do a project by IPD, and there is no need for a rigid definition of it. When a group decides to form a partnership and act as partners, they are free to define their relationship as they wish, and IPD is much the same. While there is no strict definition of IPD, the following basic concepts or themes are generally present” (Andre 2011):

1. **One Integrated Agreement:** In IPD, the Primary Team Members (PTMs) like the owner, GC and architect all enter into a single contract. They are all responsible for the risks and rewards as a single entity rather than blame each other for various short comings throughout the project. As in a Design

Build contract, where there are multiple contracts between the major players like Owner-Architect and between the Owner-GC, there is a single contract between every major party. It is pretty similar to a Design Build contract wherein there is a single contract between the Owner and the Design-Builder. However, in a DB contract, there is a bilateral relationship between the entities (Owner and Design-Builder) whereas in an IPD form of a contract there is a multi-party agreement between the various entities directly involved or the Primary Team members (Andre 2011)

2. **Shared Risk and Reward**: In an IPD form of an agreement, the PTMs share the various risks and rewards amongst themselves with regards to the project outcome (Winstanley 2011). It could be a positive outcome if the project is completed well within the anticipated time or well within the anticipated budget. If there is some kind of delay in the various activities due to any reason then the project outcome is affected negatively and the risks associated with such an outcome is borne by the PTMs and not just one single entity. The core IPD team members manage and share risks and rewards in the outcome of the project, usually its cost and time of completion, but any number of performance standards can be established (quality, sustainability, minority hiring, etc.). This is generally accomplished by making part of the compensation of the architect/engineer and the general contractor contingent on certain goals being met and providing bonuses to them for exceeding these goals as an incentive. It's a win-win or lose-lose proposition for all involved.(Andre 2011)

A lot of times in traditional delivery methods, the various parties whether it the GC, Architect or MEP sub contractors may use the maximum time period to perform various activities or to take some required action within their respective contracts for personal benefits and rewards. In an integrated agreement however, all the entities have a motivation in the form of some kind of an incentive to perform their work well and on time for overall good project progress and also to share the benefits between the PTMs provided under the single entity contract.

One approach is to divide the compensation of each core team member into three categories: (1) direct costs, (2) overhead and profit and (3) bonus. The owner may agree to pay for direct costs

unconditionally (except due to default, fraud, etc.); overhead and profit on the condition of meeting a targeted cost and schedule; and a bonus in the event that those goals are exceeded.(Andre 2011)

3. **Dispute and Liability Avoidance**: As mentioned earlier, regular meetings with the main team players could result in a clash of egos, which is not ideal for the success and smooth operation of the project and its associated activities. Hence, there is a constant need to resolve internal disputes and digest egos in order to see past personal views and putting the team and project ahead of individual interests and ideas. This may be accomplished by establishing an internal dispute resolution process administered by a committee of the core team members, at least as an initial step prior to mediation, arbitration or litigation (Andre 2011).

4. **Joint Decision-Making**: Since IPD functions on the basic principles of collaboration and partnership, team work is a vital aspect of this delivery method. IPD normally uses a committee approach to foster just decision making especially when multiple parties will be affected by the outcome of the various decisions taken. To make decisions with respect to the project, unanimous approval may be required, votes may be weighted, veto power may be reserved in certain team members or the owner may be given the right to decide where consensus is not achieved (Andre 2011).

That being said, decisions related to the different aspects of the project will be viewed as and handled differently. For example, the architect/engineer must be given sufficient say with respect to design issues to fulfil its obligations as the designer of record under state licensing laws and will likely have much less say with respect to construction issues.(Andre 2011). The joint decision making concept is another characteristic of IPD that makes it stand out in comparison to the more traditional delivery methods like DBB. The decision making structure is one example of how a typical IPD project might be functioning. Different projects work with different structures for the decision making process. However, irrespective of how the decision making is structured, the primary idea that is to be implemented and followed is teamwork which is a vital aspect in the overall success of the project.

As a result, there may be a need for constant meetings between the various PTMs which can be considered as a burden at times and there might even be ego clashes which might not help with the whole idea of collaboration but nevertheless is considered necessary to achieve the full benefit of IPD. This joint decision making ability is another stand out characteristic of IPD in comparison to the older, more traditional delivery methods.

5. **Collaboration**: IPD not only motivates the various entities directly involved to function better in order to ensure good overall progress of the project but also promotes collaboration. The various drawings, plans and schedules are not only shared between all the parties but also developed considering inputs from every member thereby functioning together as a one unit team right from the start. Every PTM including the GC and designer and sometimes even the sub-contractors are involved directly from the beginning of the project. Instead of having a separated trailer or site office of their own, some IPD projects literally use a so-called “big room”, usually on-site, at which all parties are stationed in order to facilitate the exchange of ideas, collaboration and teambuilding.(Andre 2011). In some instances, they are even located in one building and this approach is referred to as co-location. Co-location helps promote and facilitate not only faster movement of ideas but also implementation of these ideas in the plan thereby effectively speeding up work and saving time and money.

The advent of newer tools such as Building Information Modelling (BIM) helps aid collaboration. BIM tools helps in creating 3D models of the project which the various team members can get together on and discuss regarding the various problems faced and identify clashes between the different parties and their works and thereby straighten out these problems before they start impacting the project progress and profitability. Usually, the IPD contract addresses how BIM or other technology will be used, especially in terms of input, access, modifications, confidentiality, copyright ownership, technological compatibility, reliance on data submitted by others and limited or full responsibility for errors.(Andre 2011)

Thus, Stakeholder Engagement is an extension of collaboration which ensures the smooth transition from design to construction to commissioning to finally turning over the project. Stakeholder

Engagement is a broad term comprising of numerous key components (International Finance Corporation 2007)

- Information disclosure
- Stakeholder consultation
- Stakeholder identification and analysis
- Stakeholder involvement in project monitoring
- Stakeholder reporting
- Management functions
- Negotiations and partnerships
- Grievance management

This thesis will look at the Stakeholder Engagement in a specific case study of a Life Sciences Building (LSB) on the University of Washington campus.

1.3 Research Question

The primary objective of the thesis is to determine what key components of Stakeholder Engagement play out and aid collaboration in Higher Education Buildings or lab spaces where end users like scientists and facility managers require specific building controls and conditioning to carry out their experiments in a controlled setup and to maintain the operability of the building for its entire lifecycle.

The construction of the LSB on the UW campus is a perfect example of a Higher Education Building that requires Stakeholder Engagement as early as possible in order to consider all the requirements and specifications as required by the end users and incorporate them into the design to ensure smooth transition in all phases of construction and handing over.



Figure 2: Rendering and location of the Life Sciences Building being used for the Case Study on Stakeholder Engagement

(<http://cpd.uw.edu/life-sciences-building/> Accessed 1/15/2017 at 3:42 pm)

In order to find out what key components of collaboration play out in Higher Education Buildings, the following three tasks were performed:

- 1) Prepared an interview questionnaire covering all aspects of personal involvement in project design and construction.
- 2) Carried out interviews to determine which aspects of Stakeholder Engagement were more prevalent on the Life Sciences Building project at the UW.
- 3) Determined how important a role Stakeholder Engagement played in the feasibility of the project.

The various components of collaboration are a common ground for all projects that involve engagement in any sector and not limited to just construction. There is however an added engagement required between the end users or eventual building occupants and the AEC team especially when spaces have to be conditioned for the specific conditions like a certain equipment load or certain power infrastructure needs. While there is a general agreement that Stakeholder Engagement plays a vital role in the feasibility of any project (especially complex ones that require more involvement), the idea behind this research is to identify which of the components resonate strongly as far as specialized buildings that require higher degree of co-ordination between the end users or building occupants and

AEC teams are concerned. This thesis serves as a pilot study for understanding the extent of stakeholder engagement in the construction industry and more specifically in complex, higher education buildings through a case study project of a Life Sciences Building currently being constructed on the University of Washington, Seattle campus.

The Literature Review which follows in the next section will speak about the growth of partnering, integration and collaboration and how it is useful as well define the various components of Stakeholder Engagement which will act as the critical identifiers in our case stu

2. Literature Review

2.1 Introduction

The title of the thesis includes the term ‘Stakeholder Engagement’ which is a trending word in the construction industry describing the involvement of all members directly (or indirectly) affected by the project outcome early on in the design phase of the project. This helps overcome commonly seen problems like adversarial relationships, low rates of productivity, high rates of inefficiency and rework, frequent disputes, and lack of innovation, resulting in too many projects that cost too much and/or take too long to build. Also, projects continue to injure or kill too many workers, and owners are often disappointed with the quality of the end product(Thomsen et al. 2009).

A stakeholder is someone who is directly or indirectly involved with and affected by the outcome of a project. For example, if we consider the construction of a building, then some of the direct stakeholders involved are people involved with the design and construction of the facility- the owner, contractor and designer. The contractor is often supported by smaller parties called sub-contractors who support the various specific functions like mechanical, electrical and plumbing co-ordination. All of these parties form what is known as the Primary Team Members (PTMs) as they are directly involved with the outcome of the project.

In certain Higher Education Buildings such as lab spaces for universities or Life Sciences Building for biological tenants, there are certain specific requirements which are mandatory whether it is the temperature control or conditioning of the rooms where experiments are to be carried out which the designers and others might overlook at the beginning of the project. Thus, in more complex project types, the PTMs group expands to include end users such as scientists and facility managers who are responsible for utilizing the spaces after it is commissioned and supervise the building controls respectively. Their inputs are just as vital to the project as ultimately the success of the facility will be determined by its operability over a long period of time.

2.2 Partnering, integration and collaboration

The construction industry is diverse. It is a complex and high risk multi partner business that has received a lot of criticism over a long period of time for its relationships between the contactor and owner where less integration, lack of communication, unbalanced risk allocation in contracts, limited trust and lack of consumer inputs and focus are mentioned as commonly observed shortcomings (Cheung et al. 2003; Eriksson 2008). Nowadays owners everywhere would want to get better value with their money and investment and the construction industry is not any different. Having realized this, the industry has started migrating towards other, more collaborative forms of contract procurement and away from the limitations of the traditional, lowest price methods (Wilkinson and Shestakova 2006).

As of late, the trend of the Construction development delivery has been changing rapidly with an added emphasis on partnering, joint venture, public/private partnership, and strategic alliance (Dulaimi, Akintoye, and Main 2007). A lot of factors affect collaboration in various industries worldwide. Some of the factors influencing collaboration globally include globalization demand, competition and the risk and uncertainty within the business environment (Stiles 1995). A lot of research regarding collaboration in the construction industry had been done in the past by studying some of the big players in the industry. It was noted that due to a constant rise in technological developments and access to new technologies, alliances have become a key success factor in many industries. Also, it was noted that there was a sudden shift from the traditional cost driven alliances to more knowledge intensive alliances, where inter partner learning was a major objective (Douma et al. 2000).

A lot of project delivery methods are in use today other than the Design Bid Build (DBB) like Design Build (DB), General Contractor Construction Management (GCCM) and Integrated Project Delivery (IPD). DBB differs from the other three methods in that there is no collaboration promoted at all and it is a highly cost dependent initiative. Although it is advantageous because of the fact that it is a well understood delivery method in which the level of risk is reduced through firm control of the design and construction processes, it also has a lot of disadvantages (Thomas et al. 2002). Since there is no fast tracking of design and construction activities, project completion period usually took much longer

than normal, In addition, there was also no room for value engineering since the contractor was not involved in the design phase as well. Fast tracking is vital because the contractor is involved early on in the design and this can save unanticipated costs due to including the constructability aspect into the design. As Patrick MacLeamy rightfully presented at a conference to discuss “key strategies for the future” in 2001, a designer has the most “ability to impact [a project’s] cost and functional capabilities” (MACLEAMY 2010) at the start of a project, and this ability decreases during a project while the cost of making design changes increases (Davis 2013). It means that as the designs get more developed, drawing changes are harder to implement. This is a direct result of not engaging stakeholders’ early on in the design phase when they can provide you with their constructability review as well as provide valuable input which could prove to be profitable and value adding in the long run. The MacLeamy graph is hence an indication of front loading during the design phase rather than wait till the construction phase to bring the contractor and the remaining stakeholders on board. The MacLeamy curve identifies the two major components affecting a majority of projects – time and cost. As seen in the graph, the engagement of stakeholders in an integrated manner (prominent in the IPD delivery method) increases the ability to impact cost and financial capabilities as opposed to the traditional DBB project delivery method. The early involvement also helps reduce the design costs as indicated in the graph because mutually agreed upon design changes are less susceptible to further change at a later stage of the design process which could prove to be very expensive. The graphical representation of the MacLeamy curve is shown below:

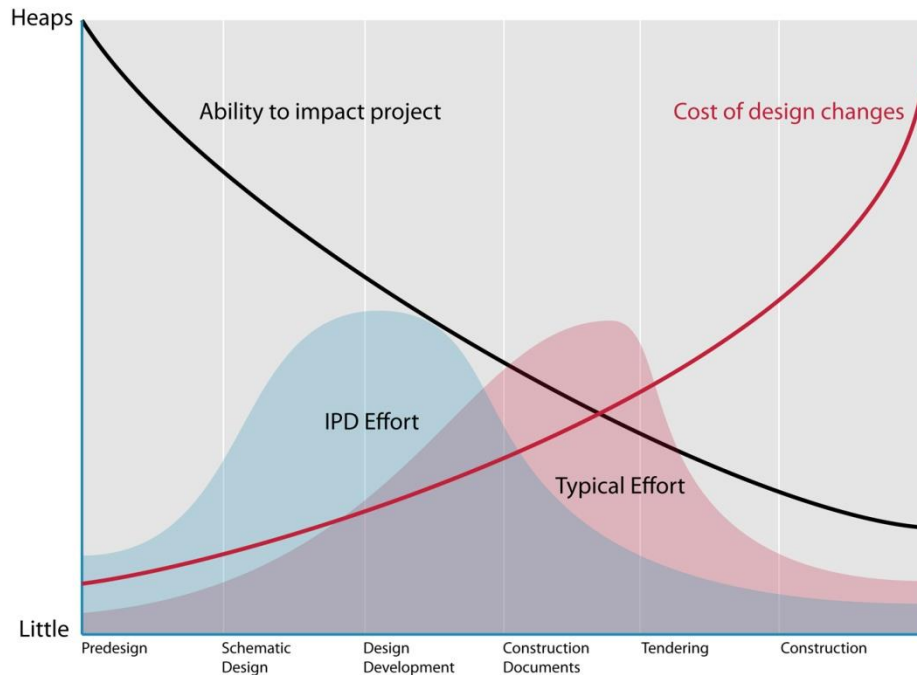


Figure 3: The MacLeamy Curve

(<http://www.danieldavis.com/macleamy/> Accessed 2/08/2017 at 7:19 pm)

The move towards collaborating and early involvement led to the inception of partnering. Partnering is one of the most innovative developments in delivering a project efficiently and reducing construction disputes (Cheung et al. 2003). It provides a solid ground for success in every endeavour and promotes synergistic teamwork (Cheung et al. 2003).

Partnering is not an easy concept to define. It is a state of mind more than anything else and can help build an atmosphere of communication, co-operation, respect and trust (Sorteberg 2017). Partnering helps provide the A/E with a construction perspective and the contractor with a design perspective (Sorteberg 2017). This process is usually started before any of the work begins. A pre-construction meeting is held and attended by all major stakeholders- the general contractor, the owner, designer, consultants and sub-contractors. The primary purpose of the initial meeting is to structure communication lines and for all team players to commit their full cooperation for the partnering process which is characterized by a written mission statement that is signed by all the stakeholders (Sorteberg 2017).

Although partnering has been successful in numerous ventures, the concept is still catching on and is not popular among all parties involved in a project especially construction. Some of the positive beliefs about partnering as mentioned by Wilkinson and Shestakova are:

- 1) Helps remove potential adversarial behaviour between all the primary stakeholders on the project.
- 2) Promotes good working relationships which ultimately lead to substantial benefits.
- 3) Improves the team spirit and encourages a much closer bond between all parties involved.
- 4) Encourages innovation and creativity which leads to increase in quality, efficient safety programmes and greater concern about environmental issues.
- 5) Provides more control over possible cost overruns and increases opportunities for financial success of the project.

Ultimately, partnering has resulted in a higher percentage of successful projects and promoted closer alliance between the stakeholders involved. However its unpopularity can be attributed to the fact that actual or true partnering cannot be carried out contractually, it is something that has a very personal association with the individuals or groups working together. Also, a lot of the stakeholders view partnering as an obstacle for incentives and real financial drivers in the project which is why it is still not common today (Wilkinson and Shestakova 2006).

2.3 Stakeholder Engagement

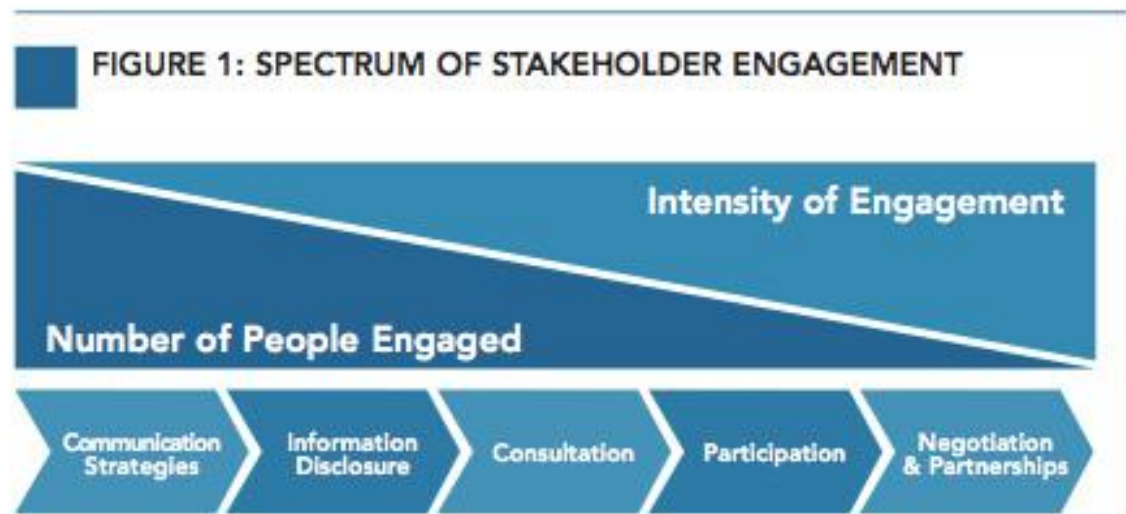


Figure 4: The wide spectrum of the components of Stakeholder Engagement that focuses on parties outside of the Primary Team members

(Stakeholder Engagement, IFC Handbook 2007)

When we talk about Stakeholder engagement with regards to construction, we think of contractors, designers, owners, sub-contractors and maybe even suppliers but we never think about the end users and their inputs. The idea behind this research is to explore the concept of “engagement” from a broader perspective involving primarily the building end users and how their involvement early on has added value to the project or not. This concept is best illustrated pictorially by Figure 1 shown above. It highlights the two most vital aspects of Stakeholder Engagement – the Intensity of Engagement and the Number of people Engaged.

Number of People Engaged refers to participation and involvement of all the affected parties actively where there is encouragement of information flow and disclosure. This promotes good understanding of the project between all members involved and also helps understand the risks and rewards associated with every decision which again is an important aspect of IPD. Intensity of engagement deals with the various steps taken to encourage the involvement of the Stakeholders outside of the group of PTMs like building end users, facility managers etc. This can be done in numerous ways like

involving them in the project monitoring process, reporting back to them regarding a value adding idea which they proposed and how far along has the implementation of that idea progressed or even consult them about various specific requirements which could be easily overlooked.

Some of the key components of Stakeholder Engagement are:

a) Stakeholder Identification and Analysis – The primary aim of this method is to identify all those who could and should have a stake in the planning and management process (Renard 2004). In a complex project there are multiple stakeholders. The Contractor, Architect, Commissioning Agent, Structural Consultants, Building Envelope Consultants, Construction Managers, Sub-contractors, Facility Managers and Building Occupants are all examples of stakeholders that make up a project team. Some of these stakeholders might be directly affected by the project that is under design for construction whereas some of the stakeholders are indirectly affected by it. Hence, the very first crucial step in Stakeholder Engagement is to identify the directly and indirectly affected stakeholders so that their inputs can be prioritized accordingly. Once the stakeholders have been identified, the next step in the planning process is to analyse their interests and concerns (Renard 2004).

The success of a project depends upon developing the support and managing the expectations of key people involved (Kennon et al. 2009). A satisfied stakeholder can improve the relevance and progress of a project significantly and thus conducting a Stakeholder Analysis is an important preliminary step in managing the human and social capital resources in the project (Kennon et al. 2009). A Stakeholder Analysis is a process of understanding in-depth the interactions between a project and its stakeholders (Grimble and Wellard 1997). It is the primary tool that prompts thinking about the type of influence individuals have and in what way they might be an asset (or liability) to achieving successful outcomes thereby developing engagement strategies for building and maintaining networks necessary for delivery of successful project outcomes (Kennon et al. 2009). The following tool is an example of how Stakeholders are analysed after they have been identified:

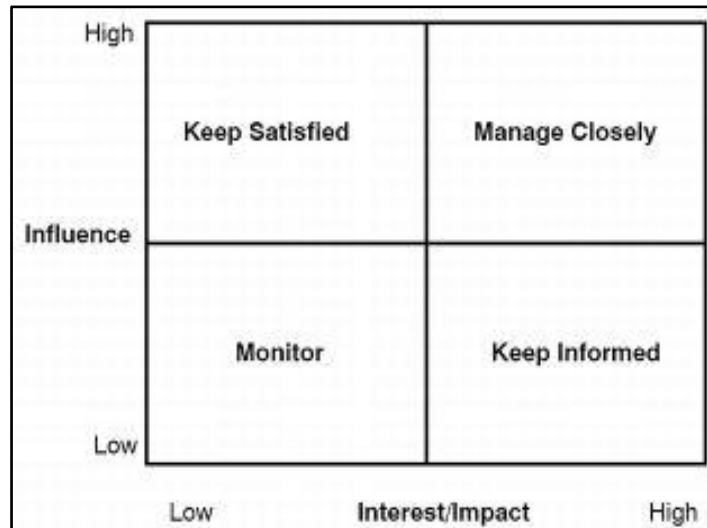


Figure 5: This shows a simple Stakeholder Analysis tool after identification is done
 (http://about.usps.com/manuals/spp/html/spp1_010.htm/Accessed 2/14/2017 at 8:38 pm)

According to figure 5 as per United States Postal Services webpage on “Prioritize and Understand Stakeholders”, the following observations can be made:

- 1) High influence, high impact individuals- these are highest priority and efforts must be made to keep them satisfied.
- 2) High influence, low impact individuals- efforts must be made to keep them satisfied as well but on a much lower basis as compared to high impact group.
- 3) Low influence, high impact individuals- these members are adequately informed and are well aware of all the major discussions and communications.
- 4) Low influence, low impact individuals- members of this group are monitored for consideration and consultation.

Thus, even though Stakeholder identification and Analysis is the primary component in the Stakeholder Engagement process, it is vital in order to organize and pave way for the subsequent components to be incorporated and followed in the project.

b) Information Disclosure - Information disclosure is a formal sounding term for making information accessible to involved parties and communicating such information in a manner that is understandable to the stakeholders is an important first step in Stakeholder Engagement (International

Finance Corporation 2007). In any project that involves multiple stakeholders, it becomes critical that there is transparency in whatever information is being passed on or disclosed. Especially in complex projects that have specific requirements, transparency becomes a vital aspect of collaboration as it helps understand exactly the needs of the project keeping in mind the best interests of everyone involved. Transparency is a global issue whether the subject under discussion is global business, corporate governance, or national and international politics (Bennis, Goleman, and O'Toole 2008). Transparency is an inclusive word that includes integrity, honesty, ethics, clarity, full disclosure, and legal compliance (Bennis, Goleman, and O'Toole 2008). It aids in promoting collaboration among the various parties that are responsible and involved in any venture and helps deal fairly with each other. In this way, the various responsibilities are clearly defined in a no-blame culture leading to identification of problems and not determination of liability. (AIA California Council 2007). Transparency is vital to all aspects of the project. All other activities including consultation, informed participation and negotiation and grievance resolution will be more constructive if all stakeholders involved have accurate and timely information about the project and its impacts and any other aspects that may impact them. (International Finance Corporation 2007). For any complex project involving a number of stakeholders to be successful it is very important to inculcate a sense of good practice. This involves taking initiatives to encourage information flow openly thereby promoting understanding of the project better as well as gaining trust of those involved (International Finance Corporation 2007). Lack of transparency in complex projects leads to misinformation about the activities and project as a whole and also stunts the efforts taken to create open communication between the various stakeholders which will delay the project progress in the long run. As per the handbook on Stakeholder Engagement by the International Finance Corporation published in 2007, some good principles to be followed which helps promote open communication, trust and transparency especially in complex projects involving multiple stakeholders are:

- 1) Disclose early - This refers to making the information regarding any aspect pertaining to the project readily available to all involved parties much ahead of making a decision so everybody involved has a say in the decision making process.

- 2) Disclose objective information - This refers to being open about the project status or problems (if any) as it is and not exaggerate or play down any particular information. This helps promote that sense of team work and collaboration that plays a huge role in the success of especially projects that involve much higher levels of collaboration and integration.
- 3) Design disclosure to support consultation - This refers to including transparency as a part of stakeholder consultation as and when required. Whether it is issues related to the economy of the project, implementation of any environmental related process/tool or even usage of a new material from a new manufacturer, it is always important to let the stakeholders in on the latest developments so that they can weigh the risks-benefits associated and make a proper decision rather than hearing or seeing some information about the project for the first time and expected to make a decision immediately.
- 4) Provide meaningful information - This refers to presenting the required information in a format and language that is understandable to the targeted stakeholder group which enables them to take informed decisions about any aspect in the project that could affect their schedule, budget and expectations.
- 5) Ensure accessibility of information - This refers to making the information to be relayed to the affected parties easy to access. Whether it is through daily or weekly meetings, over video conferences, telephonically or through e-mails, the appropriate mode of transmission must be chosen keeping in mind the ease with which the entire stakeholder team is comfortable with regards to accessing the information is concerned.

As much as promoting transparency is important as far as long term profitability of the project is concerned, not all information can be disclosed without careful thought. For example, at an earlier stage in a project revealing your plan and ideas to competitors during the bidding stage or even while consulting during the pre-construction stage can pose serious business threats. Hence, it is very important to weigh risks and benefits associated with disclosing information. As far as a collaborative initiative such as Integrated Project Delivery is concerned, the higher the level of transparency, higher the long term profitability of the project as in such a delivery method, risk and reward sharing is a characteristic feature.

c) Stakeholder consultation - Stakeholder consultation is a two way process of communication between the project company and its stakeholders and involves initiating and sustaining constructive external relationships over time (International Finance Corporation 2007). Now in the context of a construction project, the project company can be the owner and the list of stakeholders include (but not restricted to) contractor, architect, engineering consultants, building users, facility managers and sub-contractors. The process of Stakeholder consultation consists of identifying the inputs given by the stakeholders considered relevant in the project to be completed, in determining the risk-benefit relationship and the weight given to each priority (Eric Baran and Jantunen 2004). This process can be done by a few experts (Peterson and Evans 2003; Eric Baran, Makin, and Baird 2003) but also provides a platform to bring together the views and experiences of multiple stakeholders from various backgrounds (Borsuk et al. 2001; E. Baran et al. 2004). Another advantage of this process is that it provides a platform for reasoning and encourages identification and examination of underlying assumptions (Eric Baran and Jantunen 2004). Beyond the fact that there is integration of information, the consultation helps stakeholders to better predict the consequences of their decisions and to consider conflicting ideas and interests (Marcot et al. 2001; Rieman et al. 2001).

Different projects have different levels of Stakeholder Consultation. For example, projects that will have potential social and environmental impacts, the consultation process is not limited to one conversation but a series of discussions to help create a sense of understanding amongst the various stakeholders with respect to the project and the risks associated with it, impacts, opportunities and mitigation measures (International Finance Corporation 2007). Listening to Stakeholder concerns and feedback can prove to be a valuable source of information which can help add value to project design, improve outcomes and help identify and control external risks (International Finance Corporation 2007). From the Stakeholder's perspective, this consultation is a medium of presenting their reasons and concerns which they think might help improve the quality of the project and add value to it.

Stakeholder Consultation is a repetitive process that continues throughout the project right from the pre-design till the handing over of the final building. The more stakeholders that are going to be involved in the project, the more complex it gets and the more is the need for proper consultation.

Hence it is very important to remember to go about the consultation process in a systematic and disciplined manner. The Handbook for International Finance Corporation published in 2007 highlights some of the basic steps that need to be considered during Stakeholder Consultation:

- 1) Plan ahead - In a complex project involving multiple stakeholders. It becomes imperative to plan regarding who needs to be consulted for what aspect and so on. This ensures reduction in costs, saving in time as well as help keep expectations at check.
- 2) Consult using basic principles of good practice - Given the nature of consultation there is no one right method of consulting the various stakeholders. The techniques, methods and approaches have to be modified for the various stakeholders being consulted. In general, a good consultation process will be targeted, early, informed, meaningful, two-way, free from manipulation and documented.
- 3) Incorporate feedback - One of the main reasons Stakeholder Consultation is carried out is to consider and incorporate ideas that might not have been thought of which can prove to add value and improve the quality of the project. That being said, not all ideas can be considered to be incorporated and this must be made clear to the stakeholders that only ideas pertaining to aspects of the project which are still open to modification will be considered in the design change.
- 4) Document the process and results of consultation - Documenting consultation activities and outcomes is vital in managing the Stakeholder Engagement Process. When and where did the meeting occur? What were the themes of discussion? What were the results? All this information is critical in ensuring all critical information is being organized and incorporated accordingly.
- 5) Report Back - This is an important aspect of Stakeholder Consultation especially when the entity is taking time off their day-to-day activities to help provide important information critical to the project outcome. It is good practice and common courtesy to let the stakeholders know how their concerns are addressed and how their ideas are being considered and implemented and also helps them be up to date with the project status.

Hence, Stakeholder Consultation plays an important role in the Engagement process especially in huge, complex projects involving multiple stakeholders.

d) Stakeholder Involvement in Project Monitoring - The involvement of stakeholders in the project monitoring aspect of engagement helps gain their trust and strengthens the relationship between the project and its stakeholders. They also feel empowered that they can provide valuable feedback to improve the design and construction of buildings they might be using in the future.

Involving the stakeholders in the monitoring process helps satisfy their concerns and promotes transparency by involving project affected stakeholders in monitoring various aspects whether it is implementation of mitigation measures or other environmental and social inputs (International Finance Corporation 2007). Monitoring the progress and evaluating the impacts have been implemented from a long time to ensure that the money is being spent right and the various objectives are being met (Guijt, Arevalo, and Saladores 1998). Apart from this conventional focus, a lot of companies are using monitoring and evaluation for internal learning as well as improving their work and its quality (Guijt, Arevalo, and Saladores 1998). 'Participatory Monitoring' is a widely used term these days. It refers to the physical presence of the various affected stakeholders to be present at the time monitoring is being tracked and not just the company consulting the stakeholders remotely (International Finance Corporation 2007). Participatory monitoring is a process of self-assessment, knowledge generation, and collective action in which stakeholders collaboratively define the various issues, collect and analyze data, and take action as a result of what they learned through this process (Jackson and Kassam 1998). As per Jackson and Kassam, there are several benefits associated with Participatory monitoring:

- 1) By involving those that are directly affected, a more realistic and clear picture of both the success and failures in a project can be drawn.
- 2) The stakeholders feel a sense of empowerment and feel more responsible through the participation.
- 3) There is substantial benefit for team building and creating commitment through collaborative inquiry.
- 4) There is a potential for development of capacity and evaluation skills in general which can be used in other activities or instances on the project.
- 5) There is a scope for modifying drawings and making value adding changes throughout the entire length of the project.

Due to the various benefits associated with Participatory Monitoring like impact measurement, a lot of organizations want to implement it into their design and management of projects but are faced with a lot of constraints. The project staffs who are busy with their day to day operation feel that they don't have the time or money to invest in monitoring (Salafsky and Margoluis 1998). Similarly, the field staffs feel like such high levels of monitoring can only be carried out by specialized researchers and scientists and that they are not qualified enough to oversee it (Salafsky and Margoluis 1998). Also sometimes the people might just feel like they don't know how to create comprehensive and useful monitoring plans especially when they are involved especially with complex projects (Salafsky and Margoluis 1998). Hence, although it is an important value adding component of Stakeholder Engagement, it is still finding its feet especially in larger projects where multiple stakeholders are involved and the process is more complex.

e) Reporting to Stakeholders - In any kind of relationship whether it is personal or professional, following through is considered to be polite and important. Similarly in Stakeholder Engagement as well, reporting back to the various stakeholders after they have been consulted regarding any pressing concerns or new ideas is vital (International Finance Corporation 2007). It is important to let them know which of their concerns will be addressed or which of their ideas will be implemented and also helps them stay in the loop of the changes or developments occurring in the project. This helps increase the trust and bond between the organization and the stakeholders as they feel like their opinions and concerns are being considered in the design. In complex construction projects that involve a lot of environmental impact, sustainability reporting needs to be provided to external stakeholders like the environmentalists as well who might not be very comfortable with the idea of constructing a building in order to ensure that all activities are being carried out compliant to environmental standards and using sustainable practices. In such cases, external reporting forms a critical aspect of stakeholder engagement as well.

As noted in the IFC Handbook published in 2007, some of the tips to consider when reporting to stakeholders are:

- 1) It is critical to understand and determine what information needs to be reported to which stakeholder and by what method and how frequently.
- 2) It is important to disclose project progress to affected parties or stakeholders. Material changes in any commitments or implementation which varies from the contract or other publicly disclosed documents must be reported back to the stakeholders and ensure they are always in the loop.
- 3) Information must be translated in an organized format and language which makes it easy for the stakeholder to comprehend and follow.
- 4) It is critical to report the process of Stakeholder Engagement as a whole to both the directly as well as indirectly engaged stakeholders.
- 5) Project monitoring reports must be made readily available to all stakeholders on a daily, weekly or monthly basis as their needs and requirements.

Stakeholder consulting is an important role in the engagement process. Reporting back to these stakeholders plays an equally critical role to ensure smooth transition throughout the project period and also to strengthen the various relationships of people involved in the project.

f) Grievance Management - This aspect of Stakeholder Engagement is a characteristic feature seen in projects that have environmental and social impacts. For example, if there is new infrastructure that is going to be installed or built in a rural area for the betterment of the people, then before it goes in, all grievances of the people affected by that installation has to be concerned and environmental effect if any needs to be addressed. A grievance mechanism must be scaled to fit the level of risks and impacts of a project and should flow from a company's broader process of stakeholder engagement and business integrity principles, and integrate the various elements of Stakeholder Engagement discussed earlier (International Finance Corporation 2007).

In higher education buildings (like the one that will be studied in this case study research), grievance management refers to much smaller scale of issues mainly highlighted by the building occupants and end users. Whether or not their concerns regarding spacing for rooms to include their laboratory equipment and power infrastructure needs were listened to and required changes were implemented in the design to address these concerns forms a focal point of grievance management on the specific

project. How the contractors and architects respond when such grievances or concerns surface is important and can have significant implications for business performance (International Finance Corporation 2007).

Again grievances can be of varying scales. Some small scale issues that arise can be readily resolved by co-ordination between project team members whereas certain large scale issues would require the intervention of higher ups and senior members of the project teams and sometimes the owner as well. Either ways, it is important to have a grievance management mechanism in place to avoid road bumps and ensure smooth work flow during the entire length of the project.

g) Negotiation and Partnerships - This is a key component of Stakeholder Engagement especially when considering working with repeat clients and looking for a long term relationship with owners/clients as far as traditional construction projects are concerned. Negotiation and consultation are different processes but are related in this broad spectrum of Stakeholder Engagement (International Finance Corporation 2007). While consultation is a more two way process which is open ended with the idea and purpose being to exchange information and ideas, negotiation intends to reach agreement on an issue or a set of issues (International Finance Corporation 2007). Because effective negotiation involves reaching a definitive agreement, laying the foundation by establishing credibility and trust through prior process of consultation is important (International Finance Corporation 2007). Partnerships on the other hand are specific configurations of parties from different sectors of the industry as far as construction is concerned where each partner represents a particular interest and comes with specific hopes, expectations and claims, and has their own strengths and weaknesses (Gray 2007). In a complex project involving multiple stakeholders, there is a pressing need to consider the inputs and ideas from all stakeholders which are value adding and at the same time negotiating the change from a cost perspective so that not only will the idea be implemented but also within the anticipated project schedule and budget. This helps prevent cost overruns in the project and also strengthens the relationships between all parties involved. With negotiations and partnerships, the quality of stakeholder relationships are key to facilitating mutually acceptable outcomes (International Finance Corporation 2007).

h) Management functions - For any project or organization to be actively involved in Stakeholder Engagement it is vital for the managers to identify critical points in the entire life of the project where stakeholder engagement will be needed, and determine who will deliver these actions and how they can be integrated with the core business functions (International Finance Corporation 2007). Management functions play a huge role in projects where there is an interaction between the primary project team and the community or people that will be affected by the infrastructure that is going to be constructed. Projects that would require end user inputs to help understand the exact needs and answer the lingering concerns of the end users without compromising on the environment are mostly governed by effective and strategic management functions. Just like any other business function, stakeholder engagement must also be managed with clearly defined goals and objectives, professional, dedicate staff, established timelines and budget, and senior management responsibility and oversight(International Finance Corporation 2007).

2.4 Conclusion

The various components of Stakeholder Engagement play a crucial role in delivering a quality project well within the anticipated schedule and budget and also understanding and incorporating what works for the eventual building occupants. All of these components might not necessarily be deployed on a project. For example, if you are considering the installation of a new water supply and sewage system to provide clean, safe water and sewage services to a community in a developing country, then such projects will benefit by using a lot more of these stakeholder components than a project that involves construction of a two storey office space in a developed and urbanized country. In a project affecting a large community (like in the former case), there will a lot more stakeholders involved like the villagers, local authorities, land owners etc. along with the usual project team members. The difference being, when there are a lot of stakeholders involved there is a lot more opportunity to incorporate all aspects of stakeholder engagement especially the not so common ones such as grievance management, management functions and negotiations and partnerships as opposed to the construction of a simple office facility.

The Life Sciences is a sector of the construction industry that requires meticulous planning and execution in every aspect of building construction mainly because the end users are scientists or biotechnological tenants and most of their work is carried out in a controlled environment and under specific power needs. Thus, there will be an added engagement of stakeholders in this sector of the industry as compared to any other sector. By studying the extent of Stakeholder Engagement on a Life Sciences project on the University campus, a better understanding of which components of Stakeholder Engagement resonate more strongly with the construction industry will be determined and establish a platform for further research regarding the same in various other sectors of the construction industry.

The next section will talk about the project- the need for the project on the UW campus, details of what goes into the building and a brief description of the key players involved in the construction.

3. Project Overview

3.1 Introduction

In order to better understand the complexity and the intricate details of stakeholder engagement in a project that involved multiple stakeholders, a case study analysis was performed on a Life Sciences Building (LSB) which is being constructed on the University of Washington, Seattle campus. The intent behind the case study was to understand how early involvement of stakeholders in complex projects helped address potential design issues that would have caused time and cost delays if they had not been identified earlier. In doing so, the various components of stakeholder engagement (mentioned in the literature review) will be used as critical identifiers to help understand which of the components resonated more strongly on the case study project. By understanding which components of stakeholder engagement played a vital role in the smooth transition of this project from design phase to construction and ultimately handing over, we hope to create a platform for future similar research in the various sectors of the construction industry which would help identify areas for improvement and help make the transition more efficient and value adding.

Skanska is the general contractor chosen for the project and were actively involved during the pre-construction and design phase. Perkins and Will are responsible for the overall design as well as the sustainability aspect that goes into the Life Sciences Building. Currently they are monitoring the construction phase of the project and will be involved until the handing over of the project. The University of Washington is the client for the new LSB project. The new building will provide modern research and instructional space for the Department of Biology so that it can (UW- Capital Planning & Development 2016):

- 1) Recruit more faculty to meet undergraduate student demand and retain a world class faculty whose innovative research is the engine of scientific discovery.
- 2) Provide open, flexible, modular, high density labs ideally suited to the collaborative, interdisciplinary research that is not met by the current Biology buildings.

3) Educate and train the current generation of undergraduates in state-of-the-art research methods working side by side with faculty, post-docs and graduate students.

The CPD (Capital Planning & Development) is UW's internal construction management department that acts as the owner's representative to coordinate the delivery of the facility between the architects, engineers, contractors, end users (Department of Biology, UW- Seattle) and commissioning agent.

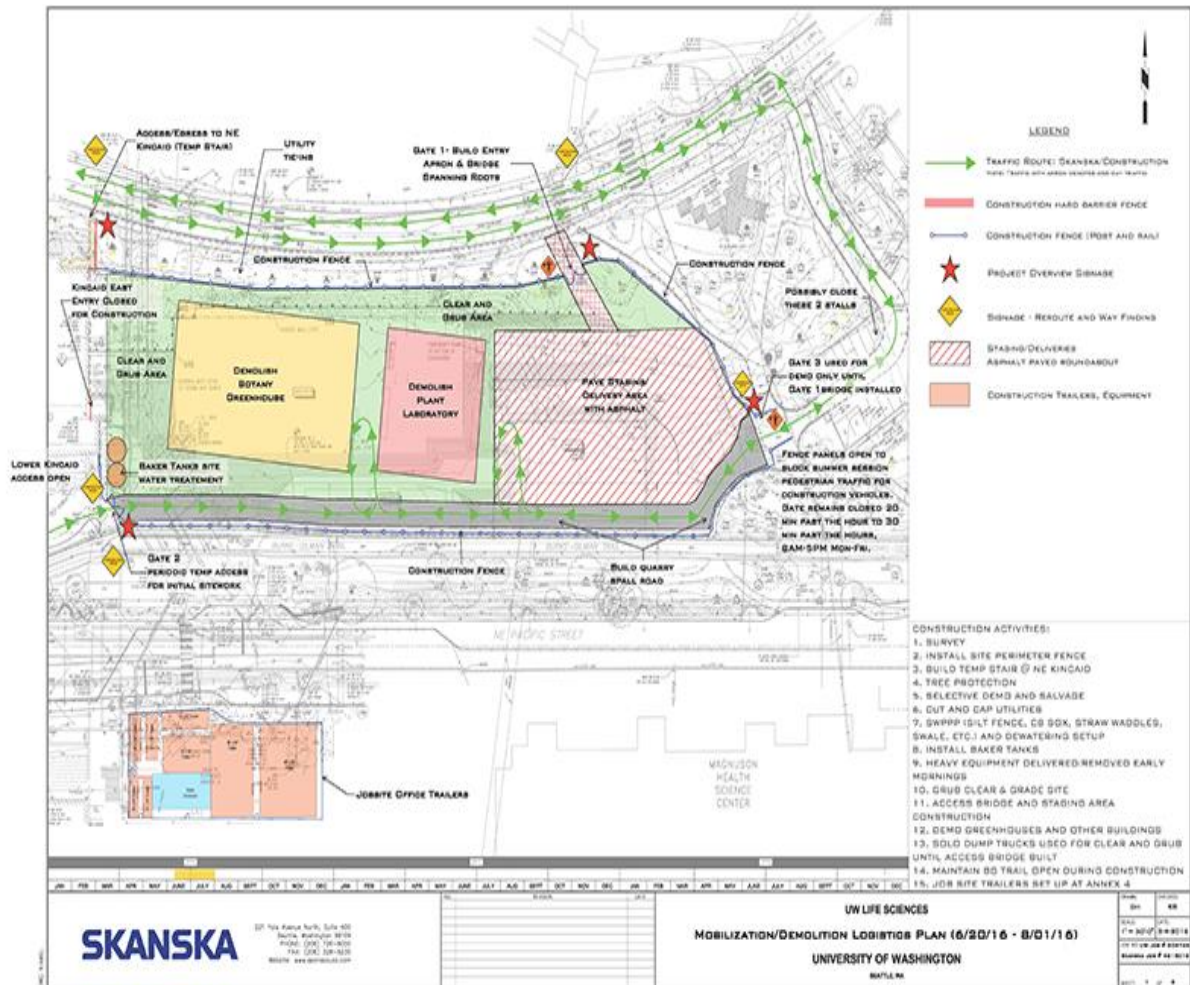


Figure 6: Mobilization and Demolition plan for the Case Study on Stakeholder Engagement.

(<http://cpd.uw.edu/life-sciences-building/> Accessed 2/20/2017 at 11:01 am)

3.2 Project Description:

The new Life Sciences Building and Greenhouse offers the Biology department and its faculty the opportunity to take its truly integrated approach to biology and its highly collaborative culture to a new level (UW- Capital Planning & Development 2016)

The College of Arts and Sciences Life Sciences Building (LSB) project is a five story above grade building plus a mechanical penthouse with two stories below grade. The site encompasses the existing greenhouses and landscaped area located on the east side of Kincaid Hall (UW- Capital Planning & Development 2016).

The existing greenhouse and associated buildings will be demolished and an approximately 167,700 gross square foot LSB will replace the existing greenhouse site with a 20,000 gross square foot greenhouse positioned south and east of the LSB. Both the LSB and Greenhouse are positioned on the site to optimize with the building program and minimize the impact to significant Deodar Cedars along Stevens Way and trees in the woodland grove to the east (UW- Capital Planning & Development 2016).

The first floor will have an active open entry to the building at grade with Stevens Way and include four research/teaching laboratories. The greenhouse and loading dock are at grade with the Burke Gilman Trail designated as the Basement 1 level. The upper four floors are modular in design consisting of 10 research labs per floor with procedural program on the north side, laboratories in the centre and offices along the south bay. The Basement 1 and Basement 2 levels house growth chambers and research facilities. The greenhouse program is integrated into the LSB and consists of research, teaching and collections (UW- Capital Planning & Development 2016).

The new Greenhouses that are being built also have many purposes. It is a brand new, one of a kind facility for the university and its proximity to the Burke-Gillman trail draws public attention. The public can ride their bike by or walk with their family and look in and see not just research but also seeing the University's collection that has been there for a long time. Attracting people to come in to the service area that opens into the Green Houses and teaching labs helps promote awareness.

The methodology explained in the next section will further outline in detail how the data collection was carried out and the sources from which the data was obtained and the processes involved with data collection.

4. Methodology

In order to effectively study about the components of Stakeholder Engagement and their implementation, the Capital Cost Initiative workshop notes were analysed and key components of Stakeholder Engagement that have to be implemented as far as University buildings construction was concerned were identified. These key components were later used on the LSB project to identify the extent to which each of these components were being implemented on the project site and a comparison was made. Data for the LSB project was collected by conducting interviews with important stakeholders identified on the project. The stakeholders were interviewed at various locations depending on their time and convenience and a transcript of the interviews were prepared after initial recording for the purpose of data analysis.

While the Capital Cost Initiative workshop comprised of speakers representing the core team members of a project like designers, contractors', consultants, owners and sub-contractors and analysis of their views, the LSB project comprised of end users representatives and peripheral stakeholders in addition as well. The comparison between the results of analysing both data sources identifies components of Stakeholder Engagement important as far as the whole project team is concerned and not just the primary team members.

The following flowchart identifies the steps in which data collection was carried out prior to being analysed:

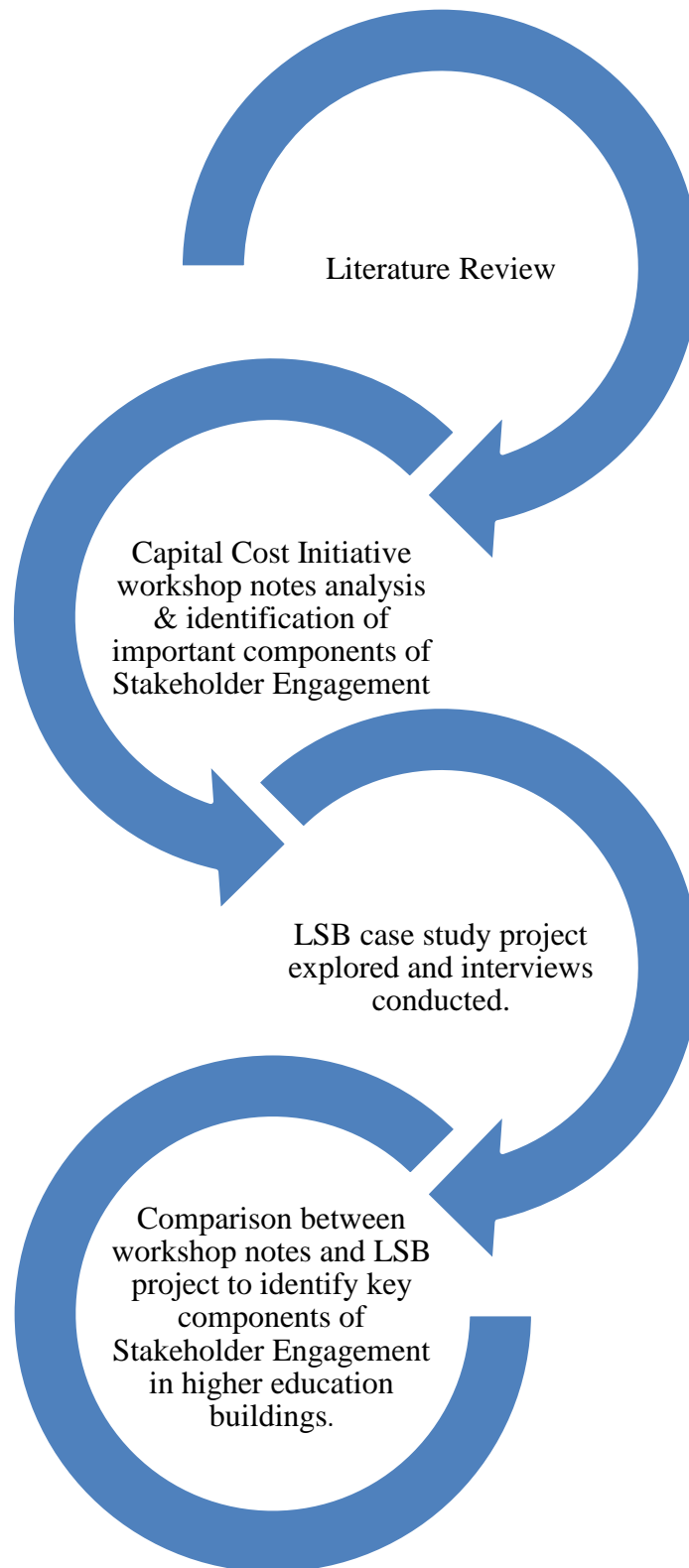


Figure 7: Flowchart indicating the various steps involved in the data collection and analysis

4.1 Capital Cost Initiative workshop notes

The Capital Cost Initiative Conference was held on the 24th of October 2016 and is a joint initiative by the University of Washington and Washington State University where some of the industry's best minds including consultants, GCs, sub-contractors, owners and designers were invited to discuss what can be done to add value and innovation around how and what to build (Center for Education & Research in Construction 2016). The objective of the meeting was to identify approaches, tools, methods and processes to improve (Center for Education & Research in Construction 2016) :

- 1) Design and construction solicitation and procurement
- 2) Project definition and set-up
- 3) Programming and design process
- 4) Project governance and decision-making
- 5) Team creation and best work encouragement

The primary theme of the break-out sessions that followed was improving value through careful consideration of “what universities build” and “how universities build” (Centre for Education & Research in Construction 2016) . To achieve the above mentioned objectives, the various groups focussed on three core themes in the breakout sessions (Centre for Education & Research in Construction 2016):

- 1) What we build: Programming, planning and design
- 2) How we build: Teaming
- 3) How we build: Fostering innovation

As a result of these breakout sessions, a number of observations were made regarding how university projects were being constructed and how they can be constructed better. The notes from the various groups at the conference will be analysed to compare any similarities which stood out between the case study being researched and the conference speakers' inputs. This will further help to reinforce

the inputs obtained through interviewing the stakeholders involved in the project and will provide more clarity as to which aspect of Stakeholder Engagement is prominent in the case study and hence to higher education buildings in particular. The analysis of the interview transcripts and notes taken from the conference will help throw further light on which aspects of stakeholder engagement resonate strongly in the construction industry especially on the LSB project currently being executed on the UW, Seattle campus.

The graphical representations and truth table analysis shown in the next section of data analysis will help provide a visual picture of the results.

4.2 Personal Interviews

The case study research involved conducting multiple interviews with people who were identified to be important stakeholders in the project right from cradle to grave. The primary step to begin the interview process involved preparing the interview tool that consisted of a set of questions that covered the various aspects of stakeholder engagement. Based on previous interview tools developed by Dr. Dossick and other researchers in the past, we created a set of questions that covered the following topics:

- 1) The Stakeholder's roles and responsibilities
- 2) The Stakeholder's activities related to the project, and
- 3) Various aspects of Stakeholder Engagement

The next step in the interview process involved the signing of a consent form (prior to conducting interviews) which was prepared by the author highlighting every important aspect of the research and making it clear to the stakeholders regarding what the interview entailed and giving them a choice of whether to participate in the interview or not. The interviews were conducted only after obtaining the various stakeholders consent. Interviews were held at various locations depending on the availability of the stakeholder and their convenience. Locations included jobsite office trailers, cafes, campus office locations etc. The research team consisted of Dr. Laura Osburn, Dr Carrie Dossick, and

Achaiah Ramesh Malachira. To aid with our research, meetings and subsequent interviews were arranged with certain primary stakeholders involved on the project. A summary of the Stakeholders is outlined below:

SUMMARY OF INTERVIEWEES	
Construction Manager (CPD)	1
General Contractor	1
Designer	1
Building End User representative	1
Commissioning Agent	1
Building Envelope Consultant	1
Total Interviewees	6

Table 1: List of interviewees for the LSB project

5. Data Analysis

After the Conference notes were analysed to determine which components of Stakeholder Engagement were prominent on the Life Sciences Building project, the interviews were carried out with the stakeholders to determine the extent to which the identified components have been implemented on the LSB project.

5.1 Capital Cost Initiative workshop notes:

The notes taken from the various speakers representing some of the best minds of the Construction industry at the workshop like designers, contractors, consultants, engineers and sub-contractors were analysed to identify the important aspects of Stakeholder Engagement as far as University buildings construction was concerned. A truth table was prepared to determine which components were considered to be important. The green dot indicates that the speakers felt that particular component was important and had to be considered while constructing buildings for Universities. The red dot indicates that the speakers have not identified that particular aspect of Stakeholder Engagement to be as important as the others and have not spoken about them during the workshop. In the truth table shown below the various note takers are identified as A,B,C,D, and E and the importance of each of the 6 components of Stakeholder Engagement as per their notes is denoted by green and red dots respectively.

The different breakout groups →

	A	B	C	D	E
Stakeholder Identification & Analysis	●	●	●	●	●
Information Disclosure	●	●	●	●	●
Stakeholder Consultation	●	●	●	●	●
Stakeholder Reporting	●	●	●	●	●
Grievance Management	●	●	●	●	●
Stakeholder involvement in Project Monitoring	●	●	●	●	●

INDEX	
High importance	●
No importance	●

Table 2: Truth table analysis of workshop notes

5.1.1 Truth table Analysis:

The truth table indicates the following three components of Stakeholder Engagement as the most important as far as University buildings construction is concerned – Stakeholder Identification & Analysis, Information Disclosure, Stakeholder Consultation, Information Disclosure and Stakeholder Involvement in Project Monitoring to an extent. The other component that is Stakeholder Reporting was not considered as important as the others by the speakers at the workshop. This could be due to a large representation of the primary project team members or stakeholders as speakers at the workshop.

5.2 Personal Interviews for LSB Project:

The key stakeholders on the LSB project were identified to be interviewed. A personal interview was carried out with each of them and was recorded. These recordings were later transcribed for analysis.

The interviews have been analysed and rated according to what each stakeholder thought about how each of the 6 components played out in the LSB project. For certain components a rating of zero (0) has been depicted on the graph. This indicates that the stakeholder has not mentioned anything about that particular aspect of engagement in the interview. This can be because they felt that on this particular project there was very little or no role played by that component as opposed to some of the others that were rated 5 which is very good. This helps understand which components of Stakeholder Engagement outlined in the literature resonated strongly on the Life Sciences Building project.

By understanding the major aspects of collaboration, we are hoping to paint a visual picture of the same with the help of a bar graph as well as a truth table in the next section to reinforce our findings from the interviews.

The analysis of the data obtained through the interviews and the conference notes is depicted below graphically.

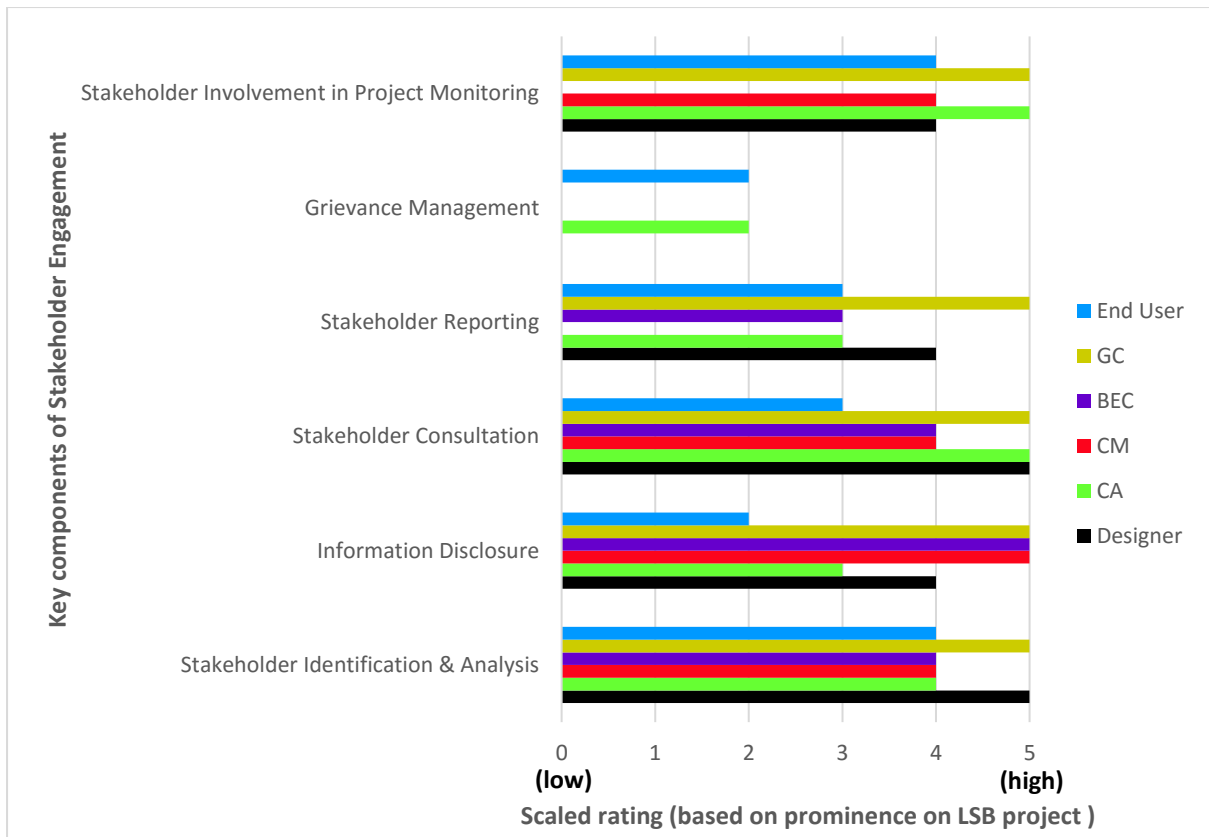


Figure 8: Graph depicting the popularity of each component of Stakeholder Engagement according to the different stakeholders’ perspectives on the LSB project

The various Stakeholders’ that were interviewed and identified by the legend are:

- a) Designer/Architect
- b) Commissioning Agent (CA)
- c) Construction Manager (CM)
- d) Building Envelope Consultant (BEC)
- e) General Contractor (GC), and
- f) Building end user

The Y-axis represents the various components of Stakeholder Engagement used as identifiers on the LSB project. The X-axis represents the values (on a scale of 0-5) for each component rated on the

basis of responses of the various interviewees to the questions asked. The following are representations of each rating on the scale:

a) 0 - **no answer**

b) 1 - **very bad**

c) 2 - **bad**

d) 3 - **average**

e) 4 - **good**

f) 5 - **very good**

The interviews have been analysed and rated according to what each stakeholder thought about how each of the 6 components played out in the LSB project. For certain components a rating of zero (0) has been depicted on the graph. This can be because they felt that on this particular project there was very little or no role played by that component as opposed to some of the others that were rated 5 which is very good. This helps understand which components of Stakeholder Engagement outlined in the literature resonated strongly on the Life Sciences Building project.

5.2.1 Interpretation of the graph:

1) Stakeholder Identification & Analysis

This aspect of Stakeholder Engagement has proven to be one of the most significant factors that have attributed to the project's success. It is important to note that there has been early identification and involvement of two types of stakeholders- the core stakeholders involving the designer/contractor/owner team and the peripheral stakeholders involving end user representatives. One of the stakeholders' said "I'd say this was a very successful project and it was clear from the beginning that there was one point of contact from the University who was from the user's side. Everything funnelled through him and he managed all activities and from our side it helped a lot

because we could just feed things to him and he was that funnel. I felt it was a very successful move which could have proven to be difficult if he was not as involved”. Thus, there was a clear identification of the peripheral stakeholders involved after primary analysis which included an end user representative.

From the conference notes, it was noted that there is a common misunderstanding about what a university building is about between the stakeholders involved. This includes the needs as per the occupants as well as keeping in mind the University’s budget and resources. This misunderstanding which could have potentially proved to be a barrier to smooth project execution was negated as the end user need was identified and a representative was brought on early in the project which was a huge positive.

Another aspect of stakeholder engagement which was a common theme at the conference was focussing on the core users and empowering them rather than working just within the primary team members’ which was another successful initiative by the LSB project. The core stakeholders were recognized early on in the project and empowered as well which led to substantial reduction in change orders and RFIs. As one of the stakeholders’ mentioned “At one point, we decided to give the mechanical contractor the authority to move forward with actual design so they acted in a design assist role where they physically drew the shop drawings of how they wanted to build the building components like their duct work and their pipes and then they reviewed it with the mechanical consultant who bought off and then they literally printed those drawings after they had agreed with them and then the mechanical consultant stamped the drawings with their license of engineering and those actually became the construction documents so that’s a super collaborative effort”. Thus, the Stakeholder Identification & Analysis aspect of Engagement played a huge role in establishing the platform for success through organized planning and constant empowerment of core stakeholders which is well depicted by equally weighted representations on the graph.

2) Information Disclosure

Transparency or Information disclosure is a vital aspect of Stakeholder Engagement. The more transparent and open is the communication between the stakeholders and the project team, the more the success is observed leading to minimal disputes and adding maximum value to the project. While most of the stakeholders agreed that the LSB project was transparent overall, their degree of agreement varied from bad to very good. From our observation through the interviews, the primary team members of the project felt that there was open communication, transparency in every process and very good collaboration overall but some of the core stakeholders did not feel the same way. The stakeholders felt that they have worked on similar projects earlier and have been more involved early on as opposed to just assisting in design at a later stage of the project. As a result, there have been many Design Intent Clarifications (DIC) meetings at a much later stage than the stakeholder would have liked to be involved in and more frequently in the project. Another stakeholder who feels the same way admits “there is always a period of adjustment for my involvement that they say “what is this guy doing here? We’re not used to this”. They eventually come around when they learn to appreciate the local knowledge and its value and usefulness to them. That was true in this project too but it was so much larger and there were so many discussions on so many topics that go on behind the scenes and so many things that need to have upper level decisions made, that for my level, the transparency is sometimes much more obscure”. He also felt that information provided was not as clear or as thorough and time to think about and weigh the pros and cons of the decisions as the project moved forward was not considered. This basically led to making decisions with much less information as one would have liked or with a clear lack of flexibility. This is clearly represented on the graph where there are a few equally weighted representations and a couple not so equally weighted representations as far as transparency is considered.

3) Stakeholder Consultation

Stakeholder Consultation is yet another prominent aspect of Engagement on the LSB project which is well depicted by rather evenly weighted representations. One of the common concerns that was addressed in the conference was a lack of involvement of stakeholders in the decision making process. They usually operate in silos and are rarely interested in listening to what other groups or parties have

to say and there is a need for more representation from their end. On the LSB project however, the stakeholders after being identified in the initial stages have been consulted at every stage of the design process to ensure fewer changes, added value and a smooth transition from design to construction well within the project budget and schedule. One of the many examples for Stakeholder Consultation includes implementation of reverse osmosis process for excess lab water to be re-used. The excess lab water would typically go out into the storm drain and into the city which would then be treated from a sewage stand point and re-used. The project parties talked about the opportunity to capture that water and storing it and then re-using it within the building and that actually ended up being a cost savings approach because the initial plan was to capture all the water from the winter months and then use it during the summer months from a very large cistern. What was realized was that this reverse osmosis process is a 24/7 process and would include a much smaller cistern which would lead to cost savings overall. It was also less effort to pump it around the building rather than having the city treat it. This was an interesting synergy in that the Green houses also needed water all year. In typical projects, outside irrigation would be considered to meet the needs of this problem especially in the summer. This had year round irrigation, so it was really one of those unique conditions where the designer in collaboration with the other stakeholders were able to find this good solution where they took this extra lab water and gave it to the Green House and were able to be more efficient.

One of the stakeholders also mentioned how important it was consulting with the other stakeholders to arrive at the best solution. He said “The GC came on board during Schematic Design phase, the mechanical and electrical sub-contractors came on during the late Design Development phase or early Construction Documents phase which proved to be invaluable. I’ve never worked on a project where you get your primary subs involved, helping make decisions and actually a lot of the drawings which involved a lot of detailing on the mechanical side was done by them which was incredible and that was a new setup for me. I’ve had pre-construction services from the GC in the past but all the other subs come on once design is completed. So this I really liked this system and even though I know it’s a little extra cost from an owner’s standpoint but I bet it is a huge investment in terms of rapid and smooth completion of the project”. Thus, this aspect of Stakeholder Engagement was also prominent

on the LSB project and is considered to be one of the many reasons that have led to smooth transition from the design to construction process on this project.

4) Stakeholder Reporting

Stakeholder reporting lets the core team members know the current status of the project and also helps inform them about whether or not their ideas and concerns were implemented or addressed. On the LSB project, this was not done as much as the stakeholders would have normally liked which is indicated by a not so evenly represented graph for this particular component. One of the stakeholders felt that the reporting could have been a lot better than what is happening currently on the project. There would be a lot of emails exchanged based on the recommendations to be implemented which would be marked up on the drawings/specifications and delivered to the architect. However, there was no definite reporting from anyone to the stakeholder on whether their concerns were going to be addressed or ideas implemented which sort of distances the stakeholder from the project as he is unaware of the final decisions being implemented in the design. One of the stakeholders on the LSB project was in agreement that there is some reporting from the primary team members as he got to review the design after some of his inputs were considered in design. He was however not happy with the entire process and said “I got to review all of the documents as they were presented and had some of my inputs. The hard part is they can’t do everything you want to do especially when you get to value engineering where it is just no fun at all. All in all they did report to me as best as they could as far as incorporating my inputs were concerned. I mean there are many things that I would do differently but there isn’t that option”. Thus there was reporting to the stakeholders to some extent on the LSB project but not to the extent that the stakeholders would have preferred it to be which is well depicted in the graph shown earlier (Figure 7).

5) Grievance Management

While it is very difficult to listen to every core team member’s grievance and address it or implement some change in the design, there should be a proper mechanism in place so that at least the affected stakeholders may have an opportunity to voice out their opinions and sometimes even help suggest

changes which would add more value to the project in the long run. This mechanism was not available to the core stakeholders as far as the LSB project is concerned. While most of them do not even specify it in their interviews, there are a few stakeholders that express concerns about how they were not asked for an opinion before some critical decisions were taken in the project. There were many instances on the project when the primary team members did not value some of the peripheral stakeholders' inputs because it interfered with their expertise on the project. For example, one of the stakeholders says "The experts would rather say "tell us what you need and we will take it from there till you move in". That's a mistake. And this is where we then get into the dialogue and repeated meetings we talked about to allow both sides to fully understood what the stakeholders need. It's not unreasonable for the professionals to have this attitude but another key component is "who is providing the occupant input?" which is missed in normal practice. As a result, it is very hard for knowledgeable occupants to crack the barrier of previous experience". Hence it was very valuable to listen to some of the stakeholders' concerns and address them on this project which was not done up to the level expected which could play a hindrance to the project in the long run. One of the stakeholders' also felt that in some of the earlier projects he had worked on, there was a lot of involvement and requirement by the primary team members from his end. As a result of which there was no need for him to review the design for any sort of clarification at a later stage of the project which could prove to be a costly affair if a small change is to be made. This however was not the case on the LSB project where his valuable inputs were not considered during the early stage of the design process. This led to a number of Design Intent Clarification meetings where certain changes were made at a later stage which could prove to hurt the project as far as time and money is concerned which could have been avoided. Hence, the overall prominence for managing grievance of the stakeholders on this project was not very high and is one of the very few negatives in the project.

6) Stakeholder Involvement in Project Monitoring

Stakeholder Involvement in Project Monitoring is an important aspect of Stakeholder Engagement as it is of high prominence on the LSB project. This is well depicted by the graph which indicates this aspect on the higher scales of 4 and 5 on an average. In general all the core team members were kept

in the loop of activities as far as site execution was concerned through weekly OAC (Owner-Architect-Contractor) meetings. Like one stakeholder says “We meet weekly, we call it our OAC meeting and then we report out of that. So we provide a schedule update of direct activities. Early on we did a lot of pull planning with the design team to determine where we needed to have certain design complete so that we can have permit drawings to go into the city “. This aspect of project monitoring was a common aspect to all stakeholders to keep themselves updated on the overall site progress. There were also specific monitoring as far as certain specific aspects were considered like start up and commissioning schedules. The GC provides a master schedule for the project but tends to be architecturally driven whereas the commissioning and start-up schedule is based more on the operational aspects of construction like when to install a particular AHU (Air Handling Unit) or any other installation for that matter. All of these would be pre-requisites prior to functional performance testing of a system. For example the stakeholder overseeing this specific schedule on the LSB project said “If we are going to look at a heating hot water system in a building, we will schedule out the pre-requisites so that we know we will have to have installation complete, we’ll need to know we have power to the pumps, we’ll need to know all the end points that this system serves are in place and ready to operate, we’ll need to know that the controls contractor has done their point to point testing , we’ll need to know that the pumps have been started up and that the variable frequency drive manufacturer that drives the motor for this pump has come out and checked that out . Then there’s documentation that has to be given to us verifying the completion of all these start-up activities and leak tested the piping as well. Once we get all the pre requisites filled, we know that’s the day we can start the functional performance test for this system”. Thus the level of project monitoring percolates down to specific stakeholders as well apart from the overall general construction monitoring. Hence, this is another aspect of Stakeholder Engagement which is of very high prominence on the LSB project which has contributed to its success so far.

5.2.2 Truth table Analysis:

A truth table analysis was carried out to measure the prominence of the various components used as critical identifiers on the LSB project on the UW campus. The various levels of prominence were colour coded ranging from high prominence (green color), low prominence (orange colour) and no prominence (no color) on the project as per the various stakeholders' inputs. Green colour has been allotted for components that have a score towards the higher end of the scale which is 4 or 5 and orange colour has been allotted for components that have a score of 3 and below on the basis of stakeholders' answers to the interview questions.

The truth table analysis tells us that the three most successful components of Stakeholder Engagement that have been implemented and followed with dedication on this project include Stakeholder Identification and Analysis, Stakeholder Consultation and Stakeholder Involvement in Project Monitoring. The interviewees felt that these components have played a huge role in ensuring limited changes in design, lack of disputes between the various stakeholders despite the complexity involved when there are multiple stakeholders involved in a single project and also overall savings in terms of cost and time.

The conclusion and future research that follows this section will summarize the results of the research and set aside a platform for future scope in studying Stakeholder Engagement in different sectors and industries.

		Designer	CA	CM	BEC	GC	End User
LSB Project	Stakeholder Identification & Analysis	●	●	●	●	●	●
	Information Disclosure	●	●	●	●	●	●
	Stakeholder Consultation	●	●	●	●	●	●
	Stakeholder Reporting	●	●		●	●	●
	Grievance Management		●				●
	Stakeholder involvement in Project Monitoring	●	●	●		●	●

INDEX	
High	●
Low	●
No	

Table 3: Truth Table Analysis for the LSB project

5.3 Similarities between workshop notes and LSB project

There is a lot of similarity observed between the views of the speakers at the Capital Cost Initiative workshop as well as the implementation of the key components of Stakeholder Engagement as observed on the LSB project.

The workshop notes identified the following components of Stakeholder Engagement as a must for success of a complex project involving multiple stakeholders such as a University building – Stakeholder Identification & Analysis, Stakeholder Consultation, Information Disclosure, Stakeholder Involvement in Project Monitoring and Grievance Management.

While it was observed through a thorough interview with multiple stakeholders involved on the LSB project that in addition to the 5 mentioned components, there is also Stakeholder reporting that is strictly followed on the site. According to the personal interviews and data analysis, the project up until now was a success and implementation of these key components of Stakeholder Engagement on has played a huge role in it. Thus, the key components identified by the speakers at the workshop and implemented on the LSB project are - Stakeholder Identification & Analysis, Stakeholder Consultation, Stakeholder Involvement in Project Monitoring, Information Disclosure, Stakeholder Reporting and Grievance Management.

6. Conclusion and Future Research

6.1 Conclusion

The case study of the Life Sciences Project on the UW, Seattle campus revealed multiple interesting aspects which were the driving factors in ensuring that the project was doing well in terms of anticipated budget and schedule. The analysis of the interview data and conference note drew a lot of similarities between the importance of involving stakeholders early on and empowering them by addressing their concerns and implementing their ideas throughout the project. Upon data analysis, the following components of Stakeholder Engagement stood out in the LSB project:

a) Stakeholder Identification & Analysis - By identifying the need for having an end user representative on the stakeholders' panel, the project saved itself considerable time and money. As a result there was smooth transition from the design phase to the construction phase and this will hopefully carry on till the project completion. All the stakeholders' that were interviewed who are key members on the project had only good things to say about this aspect of stakeholder engagement as it is depicted both graphically and through the truth table analysis as well. Another aspect of identifying the need to bring on the mechanical subcontractor early on in the design phase helped reduce a ton of RFIs. According to one of the stakeholders' "On the lower levels of the project there was heavy biology equipment like growth chambers on Basement-2 going in and on Basement-1 you have a future aquatics lab, most of the mechanical and electrical spaces and then you've got animal vivariums that's down there. Trying to incorporate all of those infra into those tiny spaces was very challenging and by the mechanical sub's drawing and involvement early, we were able to do the co-ordination without much hassle. We still do the co-ordination with our BIM model and run clash detections to see in anyone's scope interfere with each other and sort it out accordingly. That alone has saved us tons of RFIs". Thus, clearly this was the stand out component of stakeholder engagement on this building and everyone was happy.

b) Stakeholder Consultation - This was another aspect that is followed religiously on the LSB project. All major stakeholders were consulted before any major decision was taken. As one

stakeholder reported “The most successful part was that the AE team puts together their program in the early stages of design so they usually meet with the major stakeholders to get a general sense of what this building is going to be and that is supposed to translate into this Basis of Design document. It was one of the more successful aspects of this project especially the design team did a very good job of getting the inputs from the eventual building occupants as well”. Thus the success of this component of Stakeholder Engagement can be seen through the graphs and the truth table and also by looking at the overall project progress in person.

c) Stakeholder involvement in Project Monitoring - Every interviewee that was interviewed with knew every aspect of the construction at that point which goes to prove the effort with which involving stakeholders in the project monitoring was followed on the project. Not only the construction master schedule but schedules for specific stakeholders were also prepared like the commissioning and start-up schedule for the Commissioning Agent which placed an added emphasis on project monitoring from an operational and more specific point of view. This was also a major reason for the project success so far which is well depicted in the data analysis section.

d) Information Disclosure - Although a majority of the stakeholders’ were happy with the transparency on site, a few important, core stakeholders felt that they were not a part of the decision making process as much as they would have liked. In spite of these negative comments, I still feel like this was one reason for success on the project as well because all core stakeholders were still part of the decision making and value adding process. However, there is a room for improvement in this section by involving all stakeholders in every decision made and not restricting it just to the primary stakeholders instead.

6.2 Limitations and recommendations for future research

This case study research helped identify the main components of Stakeholder Engagement on the Life Sciences Building on the UW, Seattle campus that involved multiple stakeholders. Their implementation and strict adherence on the project is one of the many reasons there has been a successful transition from design to construction.

As much success the project faced in the design phase through effective collaboration, there are still some components of Stakeholder Engagement, which were not implemented that could have enhanced the project success and bettered relationships between all stakeholders as well. While this case study helps understand importance of implementing Stakeholder Engagement on a particular project, there are limitations with respect to validating the importance of Stakeholder Engagement based off of just one project. While it is definitely observed that implementing and following a majority of key components of Stakeholder engagement helped project execution in this instance, there is always a lingering thought if this hypothesis can be validated based off of one project? Due to unavailability of multiple projects where Stakeholder Engagement could have been studied at a much deeper level there is an added scope for further research in this area. By researching multiple projects involving multiple stakeholders a thorough comparative analysis can be carried out with an increased sample space of stakeholders involved which can reinforce and justify the hypothesis that implementing and following the key components Stakeholder Engagement on a project (especially complex ones that involve multiple stakeholders) helps better the process from not just a time, cost and value standpoint but also with minimal disputes and better relationships between the project parties involved.

This project is a pilot study to understand the prominence of key components of Stakeholder Engagement in a higher education building. It also provides a platform for future studies regarding the relationship between the success of a project and its level of implementation of all components of Stakeholder Engagement. The key components can be used as critical identifiers not just for a higher education building but all projects that involve multiple stakeholders and especially a project delivery method such as IPD that promotes multi-party collaboration. This study also helps identify what a project is lacking in terms of collaboration and implement what is needed to ensure the delivery of not just good buildings but buildings that meet the needs of the eventual occupants.

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Appendix A – Project pictures



Figure 9: Final rendering of the Life Sciences Building Project currently being constructed on the University of Washington, Seattle campus



Figure 10: Basement 1 Floor Plan of the LSB Project indicating the location of the various labs and green houses on the building



Figure 11: Rendering of the LSB section showing the various rooms that go in the building



Figure 12: Rendering of the Greenhouses that are an integral part of the LSB project being constructed

Appendix B – Interview Questionnaire

Part A. Define Role

- 1) Please define your job description.

- 2) What is your role and responsibility in the project?

Part B. Activities related to project

- 3) Can you talk about an instance in the project when your inputs were considered during design?

- 4) Did you identify something which the designers overlooked that added more value to the project?

- 5) Was working on a laboratory building (such as this one) more challenging?

Part C. Key components of Stakeholder Engagement

- 6) The Life Sciences project has completed design and begun construction following which it will be commissioned before being turned over to facilities. At what stage(s) of this project were/will you be involved in?

- 7) How transparent was the information flow between the various parties involved in the project?

- 8) Were you involved with the project monitoring?

- 9) Based on your experience, do you think working on specialized buildings that have specific requirements (such as this) involves added engagement of stakeholders throughout the project?

10) Was there any kind of reporting by the design and construction team regarding implementing any of your suggestions?

Part D. Conclusion

11) In your opinion, what was the most successful aspect of stakeholder engagement on this project and what was the biggest challenge (if any)?

12) Do you have anything else that we haven't had a chance to talk about?

13) Do you have any questions for me?