

Square 320 Project

1199 F Street NW Wash, DC

Michael Webb
Construction Management

Dr. David Riley
Faculty Consultant



Executive Summary

The duality of the Square 320 project is all the more clear in the dissection and analysis of its construction. The differences between the historical renovation and the Class A office tower are clearly seen in the types of challenges and issues both buildings have encountered during their construction. The challenges have become so dissimilar that this report discusses the buildings as if they are two different projects with the majority of the focus put on the historical renovation.

The report is built upon three interviews with construction management professionals who provided insight from different points of view from the same company. Tyler Moyer is an assistant superintendent with Davis who joined the historic renovation project nearly six months ago. Keith Foote is the project executive for Square 320 and he has been involved from the early stages. Bill Moyer is Davis' Director of Operations working at the senior executive level for the past six months to refocus the Square 320 job and get it back on schedule. All three men have very different perspectives of the project that complement each other well.

The main constructability challenges lie in the historic renovations where information on the existing conditions was lacking at the early stages and new challenges increase as demolition brings them to light. Prior planning and extensive surveying would've played a vital role in encouraging the success and overall efficiency of the renovations. Additionally, the close proximity of the Washington METRO forced specific measures to be taken to ensure the excavation support of the western wall opposite from the historical buildings. These concerns were addressed with little prior planning and have been tackled one by one through intentional evaluation.

The project schedule played a weak role in this project and as a result it became very difficult to track the progress of work and inevitably the project fell behind schedule. The biggest cause of this delay was the lack of initiative and prior planning that would've led this project to success by avoiding delays rather than the reactive response to the problems as they arose in order to just keep the work rolling. Significant schedule time was made up with the creation of leadership meetings that guided the project teams to take the initiative to accelerate the progress of work, the restructuring of the work on the bathrooms as the manpower was doubled and the time was compressed, and the façade restoration work was re-sequenced to take advantage of available personnel and space on site.

The value engineering implemented on this project directly reflects DAVIS' decision to honor Douglas' goal of building highly luxurious Class A office space in a timely fashion such that tenant can open their offices by early spring of 2009. While mainly cutting costs through the prefabrication of the curtain wall with minor material changes and transitioning from copper to aluminum conductors, DAVIS upheld the quality of Square 320 that Douglas called upon.

The biggest disappointment in this project was the lack of prior planning that went into the construction of the historical renovations. Small changes could be made to have prevented the serious challenges that the current project team now faces including laser surveying, developmental leadership instruction of emotional intelligence, and an innovative delivery method where each player has a vested interest in the project's success. These issues have been evaluated and commented upon to better focus ideas of thesis research for the coming semester.

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Constructability Challenges

Challenging Construction Issues

The initial observation that must be discussed is the apparent duality of this project. In this investigation of constructability challenges faced on the Square 320 project the historic renovation and the office tower must be evaluated separately. Not only are the two construction types nearly incomparable but the on-site leadership divides the responsibility as per the staffing plan. For that reason and for ease of organization this report will address the main challenges posed by the office tower first and the renovation second.

Class A Office Tower

The 12-story office tower is built upon a 5 story below grade parking garage. The loads of this entire building are considerable and as such require a highly engineered heavily reinforced structure. In order to adequately transfer the loads on the building to the earth properly a lot of effort and planning went into the buildings construction. The site conditions required an aggressive dewatering plan to drop the water table below the excavation plane. In addition, the construction site falls immediately adjacent to the Washington METRO property line and required excavation right next to the tunnel. Washington METRO was very stringent on the excavation of the soils adjacent to the tunnels and monitored them daily to very strict tolerances. For that reason the excavation of the earth on the west side of the site had to be supported by a significant system of rakers. These huge rakers had to support the walls throughout the excavation phase and well into the superstructure phase until the support had risen to the ground floor. Penetrating each floor of the parking garage were between ten and fifteen rakers that need to be framed around and protected during the concrete pours. The concrete company not only had to plan out before each pour exactly where these holes were located but also planned exactly how they would access each of the necessary areas in the pour to ensure even distribution. This turned what might've been a straightforward concrete pour into a well engineered plan every day the trucks arrived. Additionally, after the structure reached the ground floor the rakers needed to be removed by crane with limited access, the holes had to be patched, and then a secondary pour had to fill in each void.



*Figure 1 – Parking Garage During Formwork/Reinforcing
(Notice the Rakers along the west wall in the upper left of the photo)*

Historical Renovation

The renovation and restoration portion of this project represents the majority of the constructability issues experienced on site. These issues include the lack of intelligible design information throughout the project, the large amounts of structural steel placed, the excavation and expansion of the basement floor area.

Existing Conditions Surveying

There were concealed conditions all throughout the historical buildings where beams were wrapped in drywall or weakening structures were disguised by aging wood and brick. Before construction started on this aspect of the project, the General Contractor and the Subcontractors had little information on what to expect. Even to this day nearly a year and a half into the project the design has yet to be completed and there are no complete drawing sets. The buildings require almost an entire structural overhaul and yet little investigative research and prior planning went into this project. As it is in its current state, the renovations of the historic buildings have been the biggest nightmare of the project and have forced various delays in the project. All of the constructability challenges point towards the design teams for lack of information and in some cases misinformation as more and more of the existing conditions changed on site. There just was never enough research and design work performed in the beginning.

Historic Buildings' Structural Redesign

The DAVIS approach on historic renovations is to redesign a building for the next 100 years. For a building that has already stood for nearly that long it takes a considerable amount of structural redesign to accomplish this task. The placement of so much steel into an existing building was a significant challenge to the project. These buildings were built as infill buildings meaning that they were built between two previous structures and therefore were tied into the structure at either end instead of having a system of internal supports. This only led to the challenge of the installation more. At numerous locations workers would cut pockets in the bricks and then leave them hanging there until the steel would be placed. The replacement of the old windows required the removal of the previous windows and the resizing of the openings leaving portions of the brick façade loose and precarious until the new windows were installed; for minutes there would be bricks hanging unsupported. This portion of the renovation had significant safety concerns and a very intentional safety plan had to be put in effect to protect both workers and the public.

Basement Expansion

In order to create additional rentable space, the owner and architect agreed to take advantage of the void space beneath the sidewalk that once housed the utility infrastructure in the days of the building's original construction. The design scheme was to lift the entire building off of its foundation, excavate beneath the sidewalk, pour the new basement and then raise the structure four to six feet to create additional rentable square feet. The Owner was very excited about this option but it has only seemed to require more time and money than originally planned. This plan represented a large and risky investment in the buildings but has not had the outcome expected. Unfortunately the unknown risk has required a significant amount of money to be thrown at it to fix the problem resulting in delays and increased frustration. At one point in the process, there was even a portion of the building that fell down during the job.

Solutions To The Challenges

The conclusion that was come to was that with little knowledge of the conditions ahead of time and a limited amount of design, the seasoned superintendant and contractors had to problem solve and come up with their own solutions. At some point the site team came to realization that the work just needed to get done at all cost and the run-in-gun strategy quickly took over. The success of the work wouldn't have been possible without the experience and knowledge of Bill Myer, the renovation superintendant with nearly 20 years of hands on experience. Bill was brought in to focus on the renovation work so that the other superintendant could handle the new construction with the assistant superintendant being the relay in between.

Prefabrication

In respect to the historical renovation work, very little could be done to employ prefabrication to ease the constructability concerns. In fact, due to the indefinite nature of the historic building conditions there wasn't even an opportunity to ease coordination problems with modern design schemes like 3D Mapping. However, in reference to the new construction, the tower design employed several prefabricated systems for ease of installation. With the current wall, DAVIS was able to have the entire glazing, frame, and stone assembly prefabricated, set, and caulked off site. The stone would've had to be hand set each time a panel was raised. Due to their foresight, DAVIS implemented this plan from the beginning. In addition to the glazing panels, most of the HVAC plumbing was prepped offsite so it could be brought to site in large set pieces and then quickly placed and installed. Prefabrication played a role in this project but only in the office tower and only a small role at that.

Schedule Acceleration Scenarios

Critical Path

Traditionally the critical path is the sequence of activities which when combined determines the minimum amount of time available for the job's completion. With the Square 320 project the critical path takes on an entirely different appearance. This project has several, parallel, near critical paths and as a result determining a single path is not possible. Additionally, in order for the critical path to play a deciding role in the life of the project, the project schedule has to be followed closely and monitored over the course of the construction. In respect to the historical renovation work, the project schedule was not involved at all. In fact, the lack of schedule has only led to further delays because it is not being utilized to the extent that it should. Ideally the schedule should be updated in real-time so the contractor can understand the pace of work – this is not the case. The lack of schedule for the renovation has come to hurt the project by not giving the subcontractors a sense of what is expected of them. In respect to the office tower, the schedule has played a minor role other than the sequencing of activities. Additionally, the submittal log has been disregarded as vital to the project's success and is often times ignored; it should have been a priority from the beginning. The Square 320 is an atypical project in that the project schedule is not appropriately used and the critical path is effectively non-existent. As a result the mentality has transitioned to reactive problem solving trying to keep the project moving forward at all costs.

Risks To Project Completion

The majority of the risk that threatens project completion comes from the lack of creating a strong plan in the preconstruction phase. Incomplete drawings and unforeseen conditions have led to a large amount of RFIs that have piled up on the design team's desks. There should've been a standard set from the beginning outlining exactly what design information is required for the drawings. As a result of not being proactive the crew plays the catch-up game where they sit and wait for answers in a timely fashion. RFIs concerning the structural engineer couldn't come fast enough as they appeared to have little 'skin in the game' and no reason to expedite the information. The lack of urgency that the outlying players are showing is the greatest risk to the project's completion on time.

Areas For Potential Schedule Acceleration

In order to speed up the project all of the players needed to be incentivized to work hard. This is extremely difficult and as a result the owner inevitably loses out because they don't get their product on time. This is because the contractor goes to the RFI log looks at how long it took for a response from the design team and then requests an extension of exactly that much time in the project schedule. As a result, nobody wins. If the schedule would've been used and followed more often than there would've been considerably less delay in the project. The biggest area for schedule acceleration would be in utilizing a more simplified schedule identifying rough durations to better understand the sequence of the work. Additionally, if more effort is put into identifying the high risk areas of the renovation then a better understanding of the project scope would have resulted and the necessary energy could be focused where it would be most effective.

Effective Strategies for Schedule Acceleration

Leadership Meetings – The most effective strategy to accelerating the project schedule is a routine GC leadership re-focus meeting where individuals from each level of the project team investigate where the problem areas of the renovation are, how they quickly react, and what to be looking for in the future such that the sequence doesn't repeat itself and delays are avoided. Overall, the meetings force the team to take the initiative to speed up the project by encouraging quick and efficient communication in an effort to overcome the backlogging of RFIs and information. These meetings have been very effective and should have been implemented from the start.

Bathrooms – The original schedule planned for the bathrooms in the office tower to be finished in succession working up to the top floor. However, when delays came up in the building's progression the trades were overlapped in order to save time with more manpower. The cost stayed the same as the manpower was doubled but the time was cut in half allowing for the project to get back on schedule. Overtime was not needed in this case which benefited both the workers and the contractor because more often than not the quality diminishes overtime time and even though you might be paying a crew for 10 hours of work in a day they might actually be providing more like 8 hours. One way that DAVIS does not encourage the implementation of an overtime staffing plan is because they only pay the subcontractor the difference between the contract value and the time and a half from the overtime hours. Additionally, DAVIS doesn't pay for the overhead of the work, any profit that the subcontractor might be making, and doesn't pay for the added supervision if necessary. Therefore, for a subcontractor working overtime is not a

viable option, they are much more encouraged to work hard and double the manpower than resort to overtime to complete a project on time.

Means of Access – There is one place in the historic renovation portion of the project that has seen a lot of benefit result from the investment of time and money. In the renovation of the historic buildings, work was logically sequenced to occur from the inside out progressing from the demolition and restructuring internally to reappointing the brick faced externally. However, there was a considerable issue with the means of access for the trades to get to the façade of the building especially since their work was to occur after the tower was to be finished and the pedestrian spaces were to be landscaped. In order to make room for the landscapers the only available method for working on the faced would be by calling upon a series of aerial lifts to reach the work. Considering the size of the work to be done and the crew that would be performing it, renting enough lifts would've been a very expensive strategy. Instead, DAVIS organized the work so that the façade could be reappointed while the external scaffolding was still in place while no other trades were working in that area. This alternative strategy likely did not incur any additional cost on the project but it prevented the unnecessary cost of rentals later in the project and effectively saved the project a significant amount of time and money.



Fig. 2 – B&W Building Façade Restoration



Fig. 3 – Corcoran Building Façade Restoration

Value Engineering Topics

While Douglas had already teamed up with DAVIS from the beginning, DAVIS was required to open the Square 320 project to the public for public bidding. For that reason, there were a lot of subcontractors vying for work for this project and as a result DAVIS benefited from very competitive pricing on the jobs. However, from the beginning of the project a very intensive and intentional value engineering strategy was put in effect.

Key Areas of Value Engineering

Curtain Wall – The curtain wall was designed as one of the signature looks of Square 320 to uphold the high luxury appeal of the Class A office space. Very early on in the transition from the design to the construction stages, the curtain wall was value engineered to simplify the design, allow for quick pre-fabrication, and to lower the cost per unit while upholding the same quality and value. The original design called for bronze panels to inlay vertically in between each large piece of glazing from the ground

floor up to the roof. Additionally, each glazing was to have decorative stone set in each panel. Due to significant schedule implications and the added labor cost of its placing, the system was redesigned. The new curtain wall was slightly simpler having each stone piece set in and caulked off site. Additionally, the bronze panels that were designed to be actuary bronze throughout the entire height of the building remained only on the first two floors. At the third floor, the curtain wall switched to a painted aluminum that simulates the appearance of the bronze and couldn't be noticed from a distance. The design and appearance remained intact despite the changes to the exterior materials. This was in keeping with the owner's desire to offer high luxury Class A office space.

Bus Duct – In the modern market with the advancements of certain technologies, materials that were once regarded as the best for their unique qualities have been equaled by newly engineered products that can achieve the same performance at less cost. In the world of electrical conductors, copper has always been regarded as the best product for the job. However, over the years, aluminum has been redesigned to imitate copper's conductance and has achieved top performance. Therefore when the electrical contractors called for copper bus duct in the design the value engineers found an immediate opportunity to achieve the same performance at a much lower price. The ductwork is unseen so its appearance doesn't matter at all and since the aluminum bus ducts are just as adequate it was a relatively easy sell to convince the owner that the newer product would save money but ensure designed performance.

Elevator Lobbies – The decision was made to remove the finishing of each floor's elevator lobby from the scope of work that DAVIS was required to complete. Since each tenant was given provided the ability to custom fit-out their rented space, the finishing of the elevator lobbies at each floor became the responsibility of the tenant and their subcontractors. Transferring the responsibility to the tenants relieved each of the following trades: drywall, painting, plumbing and HVAC, sprinkler, electrical, and millwork saving the owner upwards of \$100K.

Douglas Development's Primary Concerns

Douglas Development has worked with DAVIS on a handful of projects, the most recent one being a historical renovation as well. And as such, there is a strong working relationship and an unspoken understanding of exactly what one expects from the other. Douglas's primary concerns with the project rely in two areas, as designed quality and the on time delivery of the designed product. Douglas maintains a strong reputation as a real-estate broker in the Northern Virginia metropolitan area. Therefore, they have certain standards that must be upheld. In Square 320 those standards are focused on protecting the luxury of the building and ensuring that the tenants can move in on time as planned. In fact, currently there are 3 law firms that have not only committed to moving in but have also begun working to fit-out their space and finish their floors in the office tower. Tenant fit-out began towards the end of October and will continue through to the new year to ensure that the new offices can move in on time in March. Furthermore, Douglas has made a commitment to design and pay for highly luxurious office space that would attract the wealthiest of tenants. This is most evident in the level of attention that was paid to both the design, construction, and finishing of the tower's lobby, bathrooms, and fitness center. Douglas' priority is to create an environment where upper class professionals come to work, this is the product that they have sold the tenants and it is DAVIS' responsibility to ensure that product is delivered.

Rejected Strategies of Value Engineering

Douglas remained dedicated to the priorities discussed above and as a result rejected any VE strategy that detracted from the overall aesthetics and or quality of the building. Additionally, there several concepts for a reduction of scope that would effectively cut cost as well but the majority of those were rejected also. Some of these denied concepts were as follows: painting an imitation material bronze in the curtain wall or deleting the bronze detailing all together, removing the series of bridges and ramps that connect the old and new buildings in the atrium space, leaving the concrete columns exposed, reducing the opulence and/or total number of the lobby elevators, and the entire elimination of the tower's green room and decorative paving design. It is evident that each of those concepts would've significantly detracted from the designed luxury of the project and therefore were not acceptable to the owner. Additional money saving concepts that were rejected include the switch from galvanized to stainless steel tower basins on the roof HVAC system, to prepay for the entire curtain wall system at procurement, and the removal of HVAC installation in the historic buildings turning the responsibility over to the tenants. It is not difficult to see the direct conflict between the owner's main priorities and the goal of these value engineering strategies. In the end, these concepts represent upwards of \$2M in potential savings on the project but they also represent a \$2M decrease in the deliverable value of the product. Therefore we can assume that the additional \$2M not saved on the project came in the form of an investment by Douglas back into the overall value of the project

Problem Identification

In order to understand the current state of the Square 320 project it is important to back up and look at the project as it was first getting underway. As mentioned previously, Douglas had a close professional relationship with DAVIS after working with them on previous projects. In fact just before the Square 320 project DAVIS completed the construction of another historical renovation project for Douglas very similar in concept and design. Based on the nature of the relationship DAVIS was offered the Douglas job without having to market themselves or the project to Douglas.

Lack of Information Due To Poor Planning (Topic 1)

Problem – The reason that this became so problematic was due to the fact that there was not a significant effort put forth in the research, understanding, and planning of this project, especially in regards to renovation work to be done on the historic buildings. Whether the responsibility falls on the design team or DAVIS as the GC, the fact remains the same: the renovation is an entirely different beast than the office tower and much more of a focus should have been put forth on understanding the existing conditions. The renovation work on the historical buildings has never truly been 'on its feet'. Much to the contrary, little initiative was taken by the design team to adequately research and understand the existing conditions and as a result the entire project has been struggling to prevent crippling delays and working hard to get back on schedule; everybody has been working to 'put out the fire' that is the renovation work on the project. There were never enough resources put towards the renovation aspect of the Square 320 project to ensure proper planning and ease of completion. Had the subcontractors gotten answers from the design team early on the project the pace would've been considerable different. Instead, the subcontractors bid a project, planned their work, and arrived on site only to find that their plan went right out the window with the initial demolition. The whole goal was to

create a structure for a falling building to ensure they last for 100 years but this was never accomplished because the design team never truly understood the existing structure. This has caused an overhaul of the original structural plans and forced considerable delays creating a project nightmare. Unfortunately, there was never a single entity that set clear straightforward goals for everyone to stay on track, and with a failing schedule, they had no way of appreciating their delays and nobody to point them in the right direction.

Reason – During the preconstruction phase little attention was given to the project in terms of what scope of work was expected in the historical renovation. The minimal amount of planning is evident in how the project team approached the various delays they faced: they just ‘rolled with the punches’. The delays can be more easily attributed to the lack of communication between the different parties involved. In particular, after the historical architect formulated their design for the renovation work they were paid and focused their energy elsewhere. In addition, evident in their design (or lack of a complete design) was little information on the existing conditions. Therefore, when the subcontractors signed on to begin work there were immediate confusions. There was so much on site that never made it into the drawings that the subcontractor was met with surprise and when RFIs were issued to the architect they were not responded to in a timely manner. This only led to further frustration and delay as the lack of research early in the project had a snowball effect on its progress.

Delivery Method (Topic 2)

Problem – The basic design-bid-build delivery method for this project actually did more to hurt it than to help it. It is important to mention that with three architects involved in the project, the lines of communication were clouded the majority of the time, especially as the architectural firm’s work had different scope of work, competing for the Contractor’s attention. The design-bid-build method led to confusion, delay, and frustration on the project and needs to be reevaluated before being implemented again, specifically on a renovation project.

Reason – Due to the length of time involved in a delivery method as such, by the time the designs reached the hands of the General Contractor and subcontractors, the architects had already been compensated and moved on. At the point that the construction begins the subcontractors are already committed to the architect’s design before truly having a chance to challenge it based on their expertise. The later review of the design forced a later start of the historic work than originally planned. In the situation of the historical renovation where the subcontractors have field expertise that the designers do not, they want to have their say in the drawings and as such further delays are incurred. Had more information been included in the drawings and had it been offered to the subcontractors earlier then a proper plan could’ve been put in place and the work would’ve run much smoother. The lack of information made it extremely difficult to plan ahead and perform under the challenging conditions of the unknown.

Complacency (Topic 3)

Problem – Evident in the working relationship between Douglas and DAVIS is an underlying sense of complacency. Through the preconstruction planning to the on site management, especially in the earlier phases of construction and specifically with the renovation work, the project team’s performance is indicative of a nearly disinterested and at times apathetic mindset that the project will run its course and take care of itself.

Reason – Douglas and DAVIS have a very long and close working relationship and the selection of DAVIS by Douglas came as no surprise; the job was guaranteed business from the beginning. Additionally, the Atlantic building, a similar historical renovation, had just been completed and the overwhelming sense was that the Square 320 project was very similar and as a result would be easy to build. In a sense, there was a very comfortable attitude throughout the preconstruction phase going into the construction of the building that this would be routine project. In preconstruction, the Project Managers set the tone for the project and the responsibility lies on them to start off the project strong. There was not enough attention put on understanding the complexities of the project early on so that resources could be targeted at the high risk issues. This is an extremely complex project that fell into the hands of DAVIS without them having to prove their expertise as they might have been required to do if the existing relationship was not in place.

Basement Expansion (Topic 4)

Problem – When the owner approached the design team with the idea of excavating beneath the existing historical buildings, they worked towards a solution. Their answer was to excavate under the existing sidewalks (the void resulting from the relocation of old utilities) and the historical buildings in order to create a basement level for more tenants. Additionally, this plan called for the jacking up of the entire building by 4-5 feet in order to achieve the required floor height for the basement. The plan was appealing to the owner at the time but brought with it significant financial and constructability risks. After the plan was implemented it became more and more evident the money and the energy thrown at the problem to solve it was a poor investment.

Reason – Excavating, adjacent to major roadways and under pedestrian walkways, comes with a lot of unknown risk. Additionally, disrupting soil in that manner has significant effects on everything around it. To make the matter more complex the design called for the jacking up on the entire historic building and then the forming of a foundation and basement level to rest the building back upon. Not only does a plan like that require a lot of money, but brings with it significant dangers. After work on this portion begun the project ran into multiple delays as unforeseen conditions changed the original plan. At one point in the process, there was even a portion of the building that fell down during the job. A lot of on the spot decisions were made to keep both the building up and intact. These decisions incurred more and more cost until the problem was eventually solved and the desired goal reached. However, this came at a price and it is very likely that the investment in the building through labor and work will turn out to have cost more than the rentable space can repay in sales.

Technical Analysis Methods

Topic 1: Minimal Research and Planning

Solution – By implementing a strategy of selective demolition complimented with 3D Laser mapping, significant amounts of time and money could be saved. Early in the design phase, had a team gone in for some exploratory demolition of the building's interior, the majority of the spaces would be surveyed and more information would've been available in the design. Then as a subcontractors plan their work based on a highly accurate survey, they have as much information to work from as they need. As a result

their plans would be more accurate of what they expect on site. Knowing more going into the project and understanding the effect of unforeseen conditions on the project schedule, they would likely work more efficiently, save considerable amounts of time and in the end save both the GC and the owner a lot of money. Ideally, the specialists would locate everything in the space, map it, discover and determine where the risk areas are. Then an even more appropriate plan could be put in effect to focus resources on those high risk areas.

Critical Industry

Not only is laser mapping and rising technology but in the current economic market we expect to have significant increase in the amount of preconstruction planning and renovation work, specifically energy focused. If one combines the accurately surveying of a building's interior spaces and a surplus of time to plan the scope of the project, the industry will see a rise in very efficient and highly accurate designs. These designs will minimize the need for RFIs and result in a heightened level of project efficiency.

Constructability

There is no question that more information will always lead to better designs and easier constructability. The rise of laser mapping will eliminate the guesswork in designs reducing the risk that something might be unbuildable. Additionally, if designers and builders could gain access to the same information then designs could be tailored to the constructability concerns to eliminate the challenges and confusion.

Schedule Acceleration

Specifically in this example, significant delays were encountered after the subcontractors started working and discovering the discrepancies in the existing conditions. More information would lead to more efficient construction and the job could reach completion much sooner than in its current state.

Value Engineering

If the same product costs less then value is maintained and the owner is rewarded with more bang for the buck. Even though there is an initial cost to purchase the equipment, it is likely that the product would pay for itself after being implemented only once. Therefore, since considerable time could be saved then all parties would be happy in the end. Additionally, with more information earlier in the process alternative methods could be researched to see what other options exist and what other roads could be taken to achieve substantial completion

Research Methods & Analysis

There have been multiple projects in the Metropolitan DC area that I would evaluate as individual case studies. Laser mapping was most recently used in the restoration of the Smithsonian Project, and the new construction of both the Constitution Center and St. Elizabeth's hospital. WH Gordan is the local business in DC that has routinely used this technology on previous projects. I would make every effort to get in contact with them, discuss the financial implications of purchasing the equipment and compare that to how much additional funding has gone into the historic restorations of Square 320. I would be able to get additional data from the previous projects that used the system to get a better sense of what to expect.

Topic 2 – Modernize the Standard Delivery Method for Historical Renovation Projects

Solution – I recommend that when working on historical renovations, an alternative to the Design-Bid-Build delivery method be employed. The designers need to be incentivized to maintain the relationship with the builders. At construction time the leadership and drive of a project has to come from the expert tradesmen and if they have more skin in the game then perhaps we might see a rise in performance. Start with the basic Design-Build method and include some criteria for performance and how it is to be graded. With the contractor leading the design-build process there would likely be a better response from all parties. Additionally, if the designers and the skilled tradesmen worked for the same organization the success of their project would be mutually beneficial. Not only would each gain from the other's success but the subtle pressure of not wanting to be the weaker link in the chain might propel both groups to new heights in performance.

Critical Industry

The advantage in our immediate future would be the economic certainty that would come from specializing in a market of construction that is likely to see continued growth. Additionally, having one organization that could perform more efficiently as a single entity than two or three organizations are currently performing on this project, only increases the likelihood of more efficient projects with profits not being split between various trades. A cheaper product could be offered and the organization would be likely to find more work.

Constructability

The biggest advantage would come from a single entity working together for a common gain. Communication would be greatly improved and each party (design and build) would be taking the appropriate initiative to work towards a quick solution. Ideally the product would be better than the current one and would cost significantly less.

Schedule Acceleration

Significant amounts of time would be saved if the lines of communication were kept within and if both parties had much to gain from working together to expedite the project. Additionally, the designers have the potential to design towards new and more efficient construction methods.

Value Engineering

The benefit of value engineering could come much earlier in the process as designers and builders are in communication from the beginning. The close relationship between the two would only spur on those types of discussions earlier. Both parties are motivated by the same thing, a better faster project, and the positive internal pressure that both feel would propel the organization to success.

Research Methods & Analysis

The best strategy for research is to get in contact with design-build companies that work on highly specialized projects, like pumping plants or data centers to gain a more specific understanding of what advantages they experience in the market. After determining from design-build companies what makes their delivery method so necessary I would then compare that to the DAVIS' and the owner's requirements and desires for this project to discover where they overlap. This topic would not allow for the analysis of data per se. However, it would be a fascinating opportunity for comparison between the Square 320 model, where different variables affect each of the players in opposing ways and an ideal circumstance where the organizational priorities fall directly in line with owner's best interests.

Topic 3: Complacency

Solution – The project would be considerably improved if significant effort was made to teach the project teams and the workers emotional intelligence competencies and basic leadership instruction. On site the responsibility falls mainly on the superintendant to define the project's expectations and to set the tone for the work early. Requiring a series of early project orientation meetings would clearly articulate those expectations and empower the workers and project team to rise to the occasion. One has to be proactive about leadership to ensure that people unite as they work for a common goal, it will not happen automatically. A focus must be kept to deliver on time and individuals should be held accountable for not doing so. In order for Square 320 to be a successful project, it must be transparent: where an increase in productivity rates can be seen immediately. Some of this was noticed in the weekly leadership meetings on site where the DAVIS team works to develop a mindset of being proactive instead of reactive. Teaching Emotional Intelligence (EI) can have a considerable impact on self-regard, self-actualization, emotional self awareness, and interpersonal relationships. When teams experience significant levels of these competencies they experience an unparalleled performance.

Critical Industry

As discussed at the PACE roundtable, investing in your own people will reap huge benefits as their growth leads to their success and the success of those around them. By establishing a strong appreciation of EI in the workplace, the company culture will allow employees to constantly develop and seek self-improvement. Future growth will come from better performance today – EI can have a significant impact in an organization's future.

Constructability & Schedule Acceleration

The most significant affect of EI in both of these categories is that when challenges are encountered on a jobsite, individuals have the skills necessary for both to act swiftly in search of a solution that benefits all parties. The development of EI will greatly enhance an organization's teamwork effectively making them more efficient. When a company as a whole is looking for every opportunity to improve and its individuals strive to for great communication, then whatever task lies in the way will be quickly accomplished.

Value Engineering

As mentioned above anything that increases productivity rates either through new technologies or behavioral change will result in added value as less money is spent on the completion the same project. The advantage of using behavioral change to reach that goal is that the individual's skill set is strengthened through each process and he or she continues to develop.

Research Methods & Analysis

The majority of my research and analysis will come in the form of interviews with industry leaders and research professors. Mr. Bill Moyer of DAVIS has been very supportive of my desire to study the interpersonal relationships and interactions between DAVIS employees to better understand the role emotional intelligence (EQ) plays in their organization. I hope to visit the site in person where I can research the relationships in person. Mark Konchar, Vice President for Business Acquisition of Balfour Beatty Construction, has agreed to talk with me about the importance of interaction between employees and their managers in a way that can empower both sides and allow for the

development of the younger person. Lastly, Andreas Phelps has offered to share with me some of his research material and personal insight from his studies of organizational behavior and the role it plays in a company's success. I am especially passionate about this topic because I believe it will be most applicable in my immediate future as I transition from being a college engineering student to a naval flight officer.

Topic 4: Basement Expansion

Solution – Through each of the professional interviews, hindsight confirmed that removing the basement expansion for the Square 320 scope of work is the best decision to make. The significant danger of the procedures when combined with the financial risk of the excavation leads me to believe that little is to no gain from this activity. While yes, there is more rentable space in the end and it may potentially pay for itself in time, the financial benefits do not appear to measure up to the investment.

Critical Industry

In the current economic situation, when financial stability is unknown, working to minimize risky investments appears to be the only right decision. Specifically in this project, the strength of the investment relies entirely on the expectation of a consistent demand for that rentable space. Since there is no guarantee that companies will be financially empowered to rent the space in the future, the investment is risky and the likelihood of it paying for itself anytime soon is small.

Constructability, Schedule Acceleration, & Value Engineering

These three items have been lumped together because in light of all the challenges that this activity has faced, the same benefit will come in each scenario and they are significantly interwoven. The constructability of the basement expansion distracted the project team from other more important aspects of Square 320 and led to significant delays in the project. Therefore, if the basement expansion was to be scrapped entirely then there would be no constructability concerns, no potential delays in the schedule, and money won't be thrown at a problem just to fix it. In all, the project would likely save time, money, and energy if this design decision had not been made.

Research Methods & Analysis

As the project nears completion and more of the exact cost figures are finalized I would work to get my hands on a report of exactly how much time and money were thrown at this expansion. On the other side I would calculate how many additional rentable square feet were created with this activity and by using a Douglas Development rental price from a similar project calculate exactly how much money the owner stands to make in profits from the basement square footage. A simple comparison between the invested funds in the construction and the potential gains from rental would be an adequate enough group of data to comment on whether the basement expansion is a wise or a poor investment.