



3D Design Coordination (Critical Issues Research)

Introduction:

The Outpatient Medical Center is currently coordinating mechanical, electrical, and plumbing systems through bi-weekly coordination meetings and the sharing of a single set of construction documents. However, being an Intern on this project and getting the opportunity to be a part of and overseeing these coordination meetings a few issues were found. The first issue was the lack of organization of each subcontractor and their idea who they thought had the most important construction element when it came to inserting their design/plans on to the set of construction documents. This created an environment of arguing and confusion for what items needed to go where on the drawings. The second issue was the lack of communication in and outside of the meetings when it came to clashes and mechanical equipment being relocated. The bi-weekly meeting seemed to be timely and very unproductive.

Proposal:

The proposed solution to this mechanical, electrical, and plumbing coordination issue is utilizing 3D design coordination software with clash detection. With 3D design coordination software becoming increasingly popular in the construction industry, the use of it on a project like the Outpatient Medical Center could greatly benefit the quality of the overall project.

Goal:

The goal to this analysis is to identify the use of 3D design coordination with the mechanical, electrical, and plumbing clash detection and implementing it during construction. Getting all project team members and trades involved is sometimes a difficult challenge. This analysis will develop research on how to implement it in the industry and what is needed to get contractors, subcontractors and owners all on the same page with using 3D design coordination on projects.



Research:

Step 1: What it costs to implement

3D Design coordination involves computer software and technical knowledge of the systems and software. This can cost a lot of money for a small subcontractor because not only does the software need to be purchased but the schooling behind how the programs works will also be needed. The following tables show the different types of 3D design programs there are and how much they cost to purchase and to get trained in it.

Software	Price
AutoCAD	\$3,970
Revit MEP	\$2,536
Revit Structural	\$3,103
NavisWorks	\$8,000

Autodesk
Corporate Classroom Training
3-Day (27hrs) = \$2,350
5-Day (45hrs) = \$3,950
Corporate On-Site Training
3-Day (27hrs) = \$1,950
5-Day (45hrs) = \$3,250

Table 3.1 Cost Comparison

Step 2: Surveying the subcontractors and engineers

Why was 3D design coordination not used on the Outpatient Medical Center? This step of the research will look at the reasons why the subcontractors and engineers are not using 3D design coordination on this project and what their thoughts are on the topic. A breakdown of survey questions with the answers of 5 subcontractors and engineers working on the Outpatient Medical Center can be found below. Please see [Appendix G](#) for a sample survey.

1. Does your company use 3D design coordination programs?
 - No
 - The company does not currently own any such programs
 - Because the CAD company that performs the coordinated drawings for the Mechanical contractor has the ability to do 3D drawings and do not need to use it ourselves.



- We do not use the 3D design ourselves. We subcontract the 3D design work out to people who are knowledgeable and competent in using it.
 - Yes
 - The company does own and utilize the 2008 LT version of AutoCAD
 - The company is currently in the process of purchasing 3D design programs
2. If your company does not use 3D design coordination, what do you see in the future for your company?
- As construction starts to move away from paper documents to digital ones, the company will eventually need 3D CAD software in order to conduct business properly.
 - In the future the company will ultimately be forced into utilizing 3D design programs as the call for coordination drawings become more frequently used in construction.
3. If your company does use 3D design coordination, what does it take to implement it on projects?
- Close coordination with other subcontractor, but in from design engineer and release for drawings.
 - The need for the project to require the 3D software.
4. What are the difficulties of using 3D design coordination?
- Cost and training.



- It is not easily used by everyone. A lot of the time you need to look at it on the computer to see certain things and every project manager may not have the knowledge to operate the system.
 - Difficult for smaller businesses to fund the training for employees that lack computer literacy.
 - Coordinating with other contract because not every contractor has the capability.
5. If your company has the capability of incorporating 3D design coordination into you productivity, what types of buildings or spaces is it used on.
- Existing buildings of tight mechanical room spaces.
 - On most projects but it all depends on size of the project and the direction of the engineer.
 - Health care facilities
 - Government project
6. Is it difficult to get other subcontractors on board with using 3D design coordination and if so why?
- Yes
 - The cost
 - Smaller contractors do not have the funds to do 2D CAD design let alone the expense of a 3D design. Many people feel that the 3D design coordination is also a waste of time because no matter how many coordination drawings are done it always seems to change in the field.



7. What are the steps needed to implement 3D design coordination with MEP systems for clash detection?
 - Buy in from the design engineer, getting the client to understand the additional cost, and making sure all subs have the technology.

8. What would you say to a small company who was looking into implementing 3D design coordination on their project?
 - The costs are high but the rewards for correct coordination and being able to see the conflicts are very beneficial.
 - It is only as good as the information that you put on it.
 - Make sure that all the other subcontractors that you work with will be able to use the 3D system to work with you.
 - If the financial ability is there, hire someone.

9. What would you say are the advantages to using 3D design coordination?
 - It allows users to view the project in a 3rd dimension before it is constructed. It can also help detect problems before material has been ordered and duct has been built.
 - Installation of equipment and materials run smoother and is more accurate.
 - Being able to visually see the conflicts before they become major problems.
 - It does an excellent job of detecting area of conflict, which allows for changes to be implanted prior to installation. This in itself lowers the cost of rework to the owner.



10. What would you say are the disadvantages to using 3D design coordination?

- The costs associated with the program and the amount of training time needed.
- Many times areas are so congested that all problems can not be identified. Also, things are always changing on the project and you may put a great deal of effort into the 3D design coordination and feel that you have all the areas of conflict identified then with one change order this may all go to waste.
- If drawings are not followed accurately it can cause difficulties in the coordination of the installation of equipment and materials.
- Sometimes coordination drawings take too long to produce and construction schedules override.



Conclusion

3D design coordination has so many benefits such as creating better visuals for design and being able to find clashes in MEP systems. However, as great as 3D design may seem, it appears that most companies today still do not have the resources to implement it. Implementing 3D design involves the funds to, not only to purchase the software products, but it requires the right equipment and the knowledge to learn how to use it. And this is just too much money for the contractors to be putting out there and not knowing how much it will even be used. Because in order for the 3D design coordination to work properly, everyone on the project team must have the resources to be able to work with and use the 3D design. This is one of the key issues for companies when it comes to using 3D design coordination programs.

Engineers and subcontractor that lack the resources to implement 3D design have to subcontract it out to people who specialize in it. This is how the engineers and subcontractor on the Outpatient Medical Center project are using and creating their construction documents. This works, although it is somewhat difficult to coordinated MEP drawings when outside people are creating the drawings. This involves many more coordination meetings and communication, which takes more time and money which could have been resolved by each contractor having and using the 3D design coordination programs.

3D design coordination has it benefits and its down falls, but overall, engineers and subcontractors see that in the future the construction industry will rely solely on the computer images instead of paper copies. Contractors may not be able to afford it now, but feel that in some time they will be starting to get more motivated to spend the extra money when the demand of 3D design coordination beings to increase.