

A Paradigm Shift in the AEC Industry and the Implications on Design Pedagogy: The Effects of IPD Processes in a Collaborative Studio Project

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ABSTRACT

*"Whoever desires constant success must change his conduct with the times." These famous sentiments, expressed in the 1532 work *The Prince* by Niccolò Machiavelli, are ever applicable to the rapid metamorphosis befalling the practices of architecture, engineering, and construction (AEC). With those changes, it is apparent that the academy must alter traditional methods of instruction in order to habituate students for the evolving landscape of professional practice. This presentation will outline one university's efforts to facilitate a collaborative project between interior design, architecture, and building, construction students, which simulates conventions of Integrated Project Delivery (IPD)[4]. The analysis will discuss methods, successes, pitfalls, and results from an established, yet ongoing, study.*

Computerized studio-based learning in design programs across the United States dates back to the nineteenth century. Specifically, schools of architecture conduct a master/apprentice collaboration in which a design problem is thoroughly explained and the final results are critically evaluated by the "master-designer" and a jury of qualified professionals and pedagogues[6].

In recent, and recently, construction education has followed a lecture-based model of instruction. These varied arrangements mirror the traditional processes of design and construction project delivery methods. Designers and constructors are simply taught to think

differently about the processes that lead to the construction of a building. Bruce and Kelly express that "the industry is often characterized as inefficient, wasteful, litigious, combative, unproductive and in need of improvements both in the US and abroad[5]."

AEC communities are implementing an alternate method of project delivery, the aforementioned IPD. This method seeks to eliminate the adversarial nature of these industries by promoting collaboration from the onset of a construction project[6].

The quandary is that university graduates are not exposed to these revolutionary methods of project delivery. The paradigm shift, while rapidly occurring in the profession, has yet to deeply converge on design pedagogy [2,All].

For the past 3 years, the aforementioned university, including 13 professors and 199 students, has been implementing IPD processes on an industry-sponsored interdisciplinary project. Pooled in teams with representation from each discipline, students were tasked with engaging in a varied collaborative project. Each year surveys were administered at the beginning, middle, and end of the project, resulting in a measure of students' assessments of IPD from a pre-project to post-project time span. Students were invited to participate in Qualtrics[All] online surveys from which qualitative and quantitative data was collected[All,All].

While the evaluations conclude that the project has merit, modifications to the process can be improved. Overall, the most successful projects, dictated by the industry led jury, were developed by groups that clearly showed collaborative efforts through the 2-3 week span. However, modifications to the project type/scope ruled many of the survey results as inconclusive. For the duration of the 3-year project, a consistent scope and more specific criteria will be utilized. This alteration will allow for better data analysis on the impact of the project. This college within the broader university is committed to this cross-college collaboration and is ready to lead in administering the necessary change.

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APPENDIX I (XII) GLOSSARY OF TERMS

Glossary of Terms	
Integrated Project Delivery	As defined by the American Institute of Architects (AIA) National and AIA California Council (AIAACC): "Project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively maximizes the talents and insights of all participants to optimize project results, minimize risk to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction."
Dashkit	Survey system developed by the leading global supplier of enterprise collection and data analysis; the system allows configuration of content, feedback optimization, and organization of all evaluation content.

APPENDIX II (XIII) AIA/AUTODESK SURVEY

Results of a survey conducted from November 2018 to January 2019 by a partnership between the Association of Collegiate Schools of Architecture (ACSA) and Autodesk®.

RESPONDENTS

57 PARTICIPANTS FROM 53 SCHOOLS

38 (66%) B. Arch programs

44 (77%) M. Arch programs

39 (68%) both B. Arch and M. Arch programs

3 respondents taught at community colleges, and one respondent didn't identify which degree program was offered.

USE OF BIM

Non-Building Courses

used in **REQUIRED ARCHITECTURE COURSES**, excluding the design studio?

44 of 57: YES (77%)

Is BIM used in **SELECTIVE COURSES**, excluding the design studio?

44 of 57: YES (77%)

Is BIM used in **DESIGN STUDIOS**?

40 of 57: YES (70%)

Yes
No
BIM

USE OF COLLABORATIVE DESIGN STRATEGIES IN DESIGN STUDIOS (40%)

Teaming architecture students at the same year level

44 of 57 (77%)

Teaming architecture students with non-architecture students

37 of 57 (65%)

Teaming architecture faculty in the same studio

45 of 57 (79%)

Teaming at least one architecture faculty member with a non-architecture faculty member

38 of 57 (67%)

Using non-architecture critics or instructors during the term (not just during reviews)

39 of 57 (68%)

[OPEN ENDED] Disciplines of non-architecture students, faculty, critics, or instructors (in respondents' comments)

Engineering (any discipline): 23 mentions

Other Disciplines: 21 mentions

Landscape Architecture: 13 mentions

Interior Design: 13 mentions

Graphic or Industrial Design: 9 mentions

Urban Design or Planning: 8 mentions

Structural Engineering: 7 mentions

Mechanical Engineering: 5 mentions

Business: 5 mentions

Other Engineering Disciplines: 5 mentions

* From this survey evaluation, the inclusion of a construction management or related discipline is not evident.

APPENDIX B (JAB) DATA ANALYSIS FROM IPD PROJECT SURVEYS (2012 & 2013)

COMPARISON DESCRIPTION FOR EACH SURVEY YEAR:

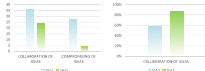
2012	2013
Number of Teams: 14 Project Scope: 8 of level: 2-8 - Story height: 8 - Floor area: 11,828 sq. ft. Team Composition: - Architectural: 3rd Year (3 per team) - Building Construction: 4th Year (3 per team) - Interior Design: 4th Year (3 per team)	Number of Teams: 11 Project Scope: 8 of level: 8 - Story height: 12 up to 20' (slipping) - Floor area: 1,700sq. ft. Team Composition: - Architectural: 3rd Year (2 per team) - Building/Construction: 4th Year (3 per team) - Interior Design: 4th Year (3 per team)
3 YEARS PROJECT	3 YEARS PROJECT
In addition to the student participants, there has been consultation in facilitation and critical processes from 2 Architecture faculty, 1 Building Construction faculty, 1 Interior Design faculty, and at least 1 Industry Partner each year.	

DEMOGRAPHIC DATA

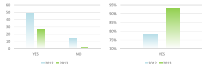


RESULTS:

REFLECTED THAT THE PROJECT OUTCOME WAS A COLLABORATION OF IDEAS



STUDENTS HAVE A BETTER UNDERSTANDING OF IPD AFTER COLLABORATING ON THE PROJECT



BELIEVED THAT COLLABORATION IMPROVED THE PROJECT OUTCOME



BELIEVED THAT THEIR SKILLS BENEFITTED THE PROJECT OUTCOME



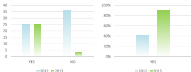
STUDENTS THOUGHT THAT THEIR TEAMMATES VALUED THAT THEIR SKILLS BENEFITTED PROJECT OUTCOME



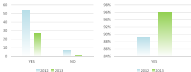
TEAM HAD GOOD COMMUNICATION BETWEEN TEAM MEMBERS



ACHIEVED ANTICIPATED TYPE OF OUTCOME IN THIS INTERDISCIPLINARY PROJECT



STUDENTS LEARNED ABOUT OTHER DISCIPLINES WITH THIS PROJECT EXPERIENCE



* Results from the 2011 survey are not included in this analysis; paper surveys were completed and results are formatted differently; beginning in 2012, surveys were completed using Qualtrics.

* For 2012 and 2013, the same pool of students from architecture participated in the integrated project.

APPENDIX IV (AIV) STUDENT PROJECTS AS EVIDENCE OF OUTCOMES

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