THE GLOBAL COLLABORATIVE DESIGN PROJECT

An outline of future trends in Architectural Design

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Abstract. Collaborative design in architecture has been researched heavily in the academic world, and has begun to infiltrate the profession of architecture. Due to the effects of globalization, many different industries have become involved in the current trend of outsourcing work, or collaborating globally with geographically distributed partners. Advances in information technologies and networking are making this possible, and it is proving itself extremely successful in the world of business. The academic world, however, has seen only limited experiments in distributed virtual design. Limiting factors include an emphasis on individual assessment, administrative and logistical hurdles, and an unclear system of academic benefit. To illustrate the potential of collaborative technologies and methods, I present in this paper conceptual frameworks, collectively termed "Global Collaborative Design Project" (GCDP) that can be deployed in academia as well as in professional practice.

The GCDP has the potential to change the mode of work in professional architectural practice, and the education of architects. The technology exists today for such a system to be implemented, and new products/systems are being developed daily for use in other industries. For architecture to remain cutting edge, professionals must embrace new technologies and workflows, and they must be used to advance the field of architecture.

This paper will survey the needed technologies and work flows necessary for the implementation of the GDCP and outline future trends in architectural design.

1. Introduction

Global collaboration has infiltrated many industries but has yet to be used to its full potential within the architectural industry. However, tests have been done throughout the academic community that start to begin to test different modes of working on an architectural construct by collaborating with globally distributed partners. The "Global Collaborative Design Project" or GCDP is an attempt to leverage information technologies for academic and professional practice to create a global community for work and information exchanges to take place. This will, in turn, create a virtual community that networks together designers of various expertise and backgrounds.

In the professional application of the GCDP connected firms will be able to barter their services, allowing for projects to be completed by parties that specialize in certain aspects of the architectural design process. In academia, the issue of bartering will also be implemented to further allow for collaboration for students, allowing them access into a rich web based knowledge depot that will help them throughout their education process, different from the Virtual Design Studio (VDS), which only allowed for collaboration on specific projects done throughout the semester. By working in the GCDP students will learn the process of working in a collaborative environment, setting up workflows that they can implement into their own work.

The automotive, manufacturing, and aerospace industries have streamlined their respective workflows and should be used as model for the AEC industry. Currently, in the automotive industry, almost all of the parts of an automobile are outsourced to different companies that specialize in creating their own individual component. Through close collaboration and guidelines from the auto manufacturer they are able to complete the component and place it seamlessly within the automobile. Automobiles are created by globally distributed partners, and the same methodology of work can transfer into the AEC industry.
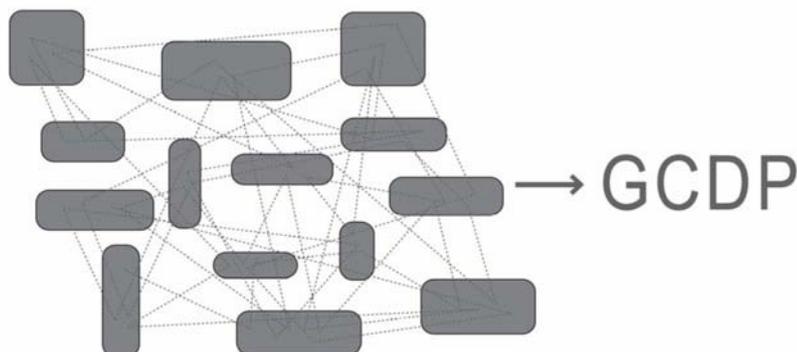

Figure 1. Conceptual Diagram.

2. Technologies

Technologies currently exist within the Information Technology sector and also in the software packages currently in use and being developed for the AEC industry.   Building Information Modeling (BIM) is quickly becoming the trend in the industry, and software packages like Revit and Archicad have built in collaborative technologies allowing for real time collaboration on virtual building models.   Real-time communication tools are also readily available to support global collaboration.   With advances in broadband technologies, high volumes of data are now able to travel quickly to many different parts of the world.   This can now facilitate real time web meetings in which users may view video of a model being manipulated and have a face to face conversation with a colleague.   These meetings can also be saved and archived for later review by the users.   Real-time communication can still be facilitated by means of email, Instant Messaging (IM), and telephone.   Online blackboards and "blogs" can also be used for posting of information relevant to projects.   These blogs can be accessed by everyone involved in the project and will also be a running log for activities going on with the project.

Technologies are being developed that can aide in collaboration between parties.   With the creation of more powerful handheld devices, one may be able to view or work on a project anywhere where he or she may have phone service.   The ever growing wireless broadband services offered today are also rapidly growing, and allow for a user to connect to the web from a laptop anywhere in their services network coverage area.   This eliminates the boundaries of an office and allows for one to be connected at all times.

Groupware software packages will be distributed to design partners to connect into the GCDP and also allow them to list their profiles within the GDCP network.   A system of distributed artificial intelligence agents will then scan to find the best match for a given problem, and connect the firms to begin the collaboration.   In academia, students will be able to also insert their profiles into a system that will allow them to find other students to work collaboratively with and solve specific problems that they need.

Collective technologies can also be used to help spread computing power across the network.   Services like rendering farms are already in use, and can be distributed across the networks to computers that are not in use. This is turn can free up computing power for users that are in need of processing power.   This will help designers save on the costs of computers,

and also allow them not to be hindered by slow processing times. Google's Compute experiment is doing something similar by allows a user to give up their c system while it is idle, and have it be used for computer intensive mathematical calculations being done by geographically distributed scientists.

3. Workflows

The GDCP is a framework for globally distributed partners to work together on building projects and also for students to connect with and collaborate with other students working on similar projects throughout academia. In addition, the professional practice will adopt many ideas already present within the automotive industry, and adapt them to the AEC industry.

3.1 Professional Practice

The GDCP will greatly improve workflows of designers. First, a design group will buy into the GDCP and receive all of the necessary information as to what they will need to connect into the network. Strict guidelines for software packages and computing requirements will be distributed, along with strict guidelines for how a user should organize their networks structure. Uniformity across the network will be most important, as to always allow for collaboration between parties.

Next, design groups will be asked to fill out a firm profile that outlines and describes each firm's experiences and specialties. All of this information will be made public to members of the GDCP and they will be able to search and get the contact information of anyone on the system if they wish to directly collaborate with a certain firm. Firms will be able to mark within their profile if they are available or not to take on more work and the database will react accordingly when polls are taken across the system.

When a firm is in midst of a project and feels the need for more help, or are in need of a party to provide specialty on the project the project they are involved in, they can request the GDCP to do an automated search through the network to find an open party that will collaborate with the firm on the project. A barter value is determined for the type of work required, then the firm is contracted to design the aspect of the project they are now contracted to do.

The collaboration between firms is most important in bringing the project into reality. Due to predetermined software packages and communication tools, the firms already have a set of guidelines for how to work and how they are to communicate with each other. Firms within the GCDP will use BIM technology and have all of their information stored on the network for all parties involved. By storing all of the information for the project in a central database, it allows for a firm to work any time they please. Information about the project can be relayed to project architects and project manages automatically when something is changed, or someone is in need of assistance. Meetings would be conducted on regular schedules to accommodate both parties and all meeting notes will be archived on the network for all parties to have access to. Design guidelines will be set by the contracting firm and be expressed to the contracted firm to aide in creating a unified design, and keep all parties involved on the same page. All project information will be stored on the network including project budgets and specifications to keep the project on track. Any changes to the project budget or specifications for the project will automatically be sent to project architects and managers so they have the ability to manage to track changes on the project.

Once the project is completed and the services offered by the contracted design firm are completed, bartered funds will be transferred into their accounts and their contracts will be fulfilled. The contractor firm can either then deliver their project to their client, or go on with the project and continue to use the services offered by the GDCP until their project has been completed and delivered to their client.

The GDCP is not just limited to firm's practicing architecture. It is opened up for the entire AEC industry to offer their services to anyone in need, and it works in all directions.

3.2   Academia

The GDCP can also be opened up for academic work. Students who are working on given semester projects can post their profiles and keep up to date with what they are working on. They will have the ability to post their weaknesses and strength's in their profiles.

Students will then have the ability to work in the network with other students on aspects of their projects that they have identified as weaknesses. A student can be located through the network that has strength in another

student's weakness and work temporarily with that student in solving their problem through demonstration and real-time collaborative sessions.

Incentives will be given to students by bartering time spent in the system helping people with their weaknesses. The more time you spend helping, the more time the system allocates to you for being helped on your weak points. The more you help other people on their academic problems, the more time you will be given in return for people helping you on your project.

Engineering students will be allowed access into the system. Engineering students will be able to help students with their engineering weaknesses, and gain hours for help on their own work. Cross disciplinary education and work on semester projects will greatly help students learn how to work within the real world, and more prepare them for what they have in stake entering the AEC industry after graduation.

5.   Discussion and Conclusion

The GDCP presents a new workflow for both professionals within the AEC industry and academia. By bringing together globally distributed partners for professional work, expertise can be bartered out and projects can become richer and work better. Students will be able to broaden their educational experiences by collaborating with students from all around the globe, and be able to share knowledge across boarders.

Information technologies exist currently to implement a system like the GDCP to create a new trend in architectural workflows. By harnessing the power of the Internet and BIM technologies, global collaborative networks can be created that aid and facilitate the creation of architectural products. The AEC industry can learn from processes of outsourcing work from the automotive industry, and implement it into architectural design processes. Advances in information technologies and also wireless technologies are making real time communication and collaboration faster and easier to use.

The GDCP has a chance to revolutionize architectural workflows and bring architecture into a new era of technology use and design.

Acknowledgements

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