Collaborative Processes: Research Report on Use of Virtual Environment

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Collaborative Processes in Virtual Environments

Recent developments in networked 3D virtual worlds and the proliferation of high bandwidth communications technology have the potential to transform the nature of distance collaboration in professional design. There have been numerous developments in systems that support collaboration that have resulted in system architectures to support information sharing and remote communication. Whilst these initiatives have led to important advances in the enabling technologies required to support changes in global economic practices, there remains a gap in our understanding of the impact of the technologies on the working practices of the people who are the primary users of such systems.

Research into the characteristics of collaborative work can assist in our understanding of how the collaborative design process can be supported and how new technologies can be introduced into the workplace. An understanding of collaborative design includes such factors as the role that communication media play, the use of physical materials, and computer tools and the way people communicate verbally and non verbally. Only by gathering information about the rich and complex picture of collaborative design can we understand the characteristics and needs of the practitioners involved as well as those factors which contribute to their professional effectiveness.

1. Studying team collaboration in high bandwidth environments

Research into the characteristics of collaborative work can assist in our understanding of how the collaborative design process can be supported and how new technologies can be introduced into the workplace. An understanding of collaborative design includes such factors as the role that communication media play, the use of physical materials and computer tools, and the way people communicate verbally and non verbally (Munkvold 2003). Protocol analysis has been accepted as a prevailing research technique allowing elucidation of design processes in designing (Cross et al. 1996). And whilst the earlier studies dealt mainly with protocols' verbal aspects (Akin 1986), later studies acknowledge the importance of design drawing (Akin and Lin 1995), associating it with design thinking which can be interpreted through verbal descriptions (Suwa and Tversky 1997; Suwa et al. 1998; Stempfle and Schaub 2002). By gathering information about the rich and complex picture of collaborative design we can understand the characteristics and needs of the practitioners as well as the factors which contribute to their professional effectiveness.

In studying the impact of high bandwidth environments on design collaboration, an experimental study with 3 design settings was developed:

1. A collaborative design process in which designers work face to face with their current design and communication tools.

2. A collaborative design process in which designers use a shared drawing system with synchronous voice and video conference.
3. A collaborative design process in which a 3D virtual world is used in addition synchronous voice and video conference.

2. Background

There are many studies that reveal the nature of design thinking and the characteristics of early conceptual design as distinct from detailed or embodiment design. The results of those studies can assist in our understanding of how the processes of design can be supported and how new technologies can be introduced into the workplace (Munkvold 2003).

Protocol analysis has been accepted as a prevailing research technique allowing elucidation of design processes in designing (Cross et al., 1996). And whilst the earlier studies dealt mainly with protocols' verbal aspects (Akin,1986), later studies acknowledge the importance of design drawing (Akin and Lin, 1995), associating it with design thinking which can be interpreted through verbal descriptions (Suwa and Tversky 1997; Suwa et al, 1998; Stempfle and Schaub, 2002).

The protocol analysis technique has been adopted to understand the creative nature of collaborative design (Cross, 1997), the design behavior of teams in terms of coherent idea production (Goldschmidt 1996, Van der Lugt, 2003), process-oriented designing (Gero and McNeill, 1998); and reflection-in-action (Valkenburg and Dorst 1998). Another stream of studies were concerned with the impact of use of different communication channels on design process (Vera et al. 1998; Gabriel and Maher 2002).

The ROCOCO project studying protocols of collaborative design presents one of the early approaches to detailed analysis of drawings together with analysis of verbalizations (Scrivener et al. 1992 cited in Mazijoglou et al. 1996). Consequently recent design protocol studies employed analysis of physical actions such as drawing, moving hands (referring to hand gestures in sketching) and also seeing/looking which provided a comprehensive picture of constructing external representations during designing (Suwa et al. 1998; 2000, Kavakli and Gero 2002).

Protocol studies in the engineering design domain focused on the work environment context and the social interaction discourse (Buciarelli, 1994) as well as design behavior and communication (Badke-Schaub 2003; Glock 2003). These studies emphasized the analysis of conversation patterns, in order to gather information about the team dynamics, individual motivations, social interpretations etc. Protocol studies of this kind have been done relatively less in architectural design practice because of the difficulties in collecting protocols.

The internet and the expansion of international design practices have initiated our interest in studying "collaboration at a distance" both within the same profession and across professions. We believe that design work would be conceived as a social process, rather than design being influenced by

social factors (Suchman and Trigg 1991; Bucciarelli 1994). Consequently the architectural design process could be conceived as a process of communication and interaction between designers and different domains instead of a process where the architect is a self-sufficient individual mind.

3. Method

A series of pilot studies have been conducted for testing the experiment set up and maintaining participants' acquaintance with the technologies. Before the experiment sessions, the participants were given a training session on the use of software and related tools. Then in the experiment sessions they were asked to work on a hypothetical design brief that they are exposed to for the first time.

In our experiments, we studied pairs of designers collaborating on three different design tasks of similar complexity using a different setting for each task. We anticipate that the comparison of the same designers in three different environments would provide a better indication of the impact of the environment than using different designers and the same design task. Our designers are architects, so the design task is the design of a small building on a given site. We used the same site for each task, but specified a different type of building (gallery, library, and hostel) for each design task (see Appendix). This allowed the designers to become familiar with the site and to focus on the design of the building.

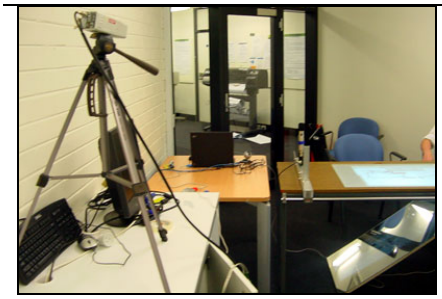
In this study we worked with two architects from Woods Bagot, who were selected on the basis of observations carried out in the workplace/baseline study. In these observations, the collaborative roles of the participants were determined, and their face to face interactions were recorded. We name the designers as Alex and Casey, the same names as their avatar names in the virtual world environment, rather than using their real names.

3.1. EXPERIMENT SET-UP

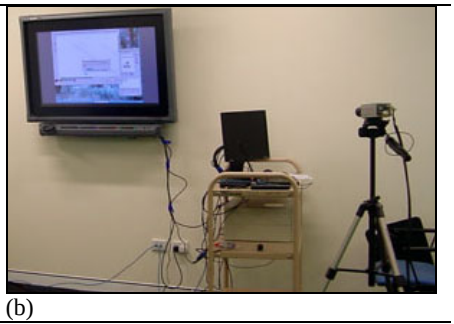
Figure 1 shows the face to face session of the experiment where the designers are provided drawing materials (pen –paper), brief and a collage of the photos showing the existing building on the site and the neighboring buildings.

Figure 1 Face to face session

Figure 2 shows the set-up for the shared drawing board environment. In order to simulate high bandwidth audio and video, both designers are in the same room and can talk to each other, but can only see each other via a web cam. The set up for designer 1 is shown in Figure 2a and the set up for designer 2 is shown in Figure 2b. The location of the cameras was an important issue, since we wanted to monitor the designers' movements, verbalizations, gestures and drawing actions. Cameras 1 and 2 capture the gestures, general actions such as walking, looking at, moving to the side, while the direct connections to the computers/screens capture the drawing process. In this setting of the experiment, the designers used Group Board, as shown in Figure 3. One designer used a pen interface (Mimio) on a projection table, shown in Figure 2a. The other designer used a pen interface on a Smart Board, shown in Figure 2b.



(a)



(b)

Figure 2 (a) Camera 1, Desktop screen 1, and Mimio on workbench; (b) Camera 2, desktop screen 2, and Smart Board

In the third setting of the experiment, the designers used an extended 3D virtual world application in Active Worlds, shown in Figure 4. The 3D world includes a multi-user 3D building environment, video contact, a shared whiteboard, and an object viewer/insert feature. Again, the designers

are in the same room with a similar camera set up. While the shared whiteboard was available in the third setting, the designers were only trained to use the 3D world and the web cam.

Figure 3. Group Board interface

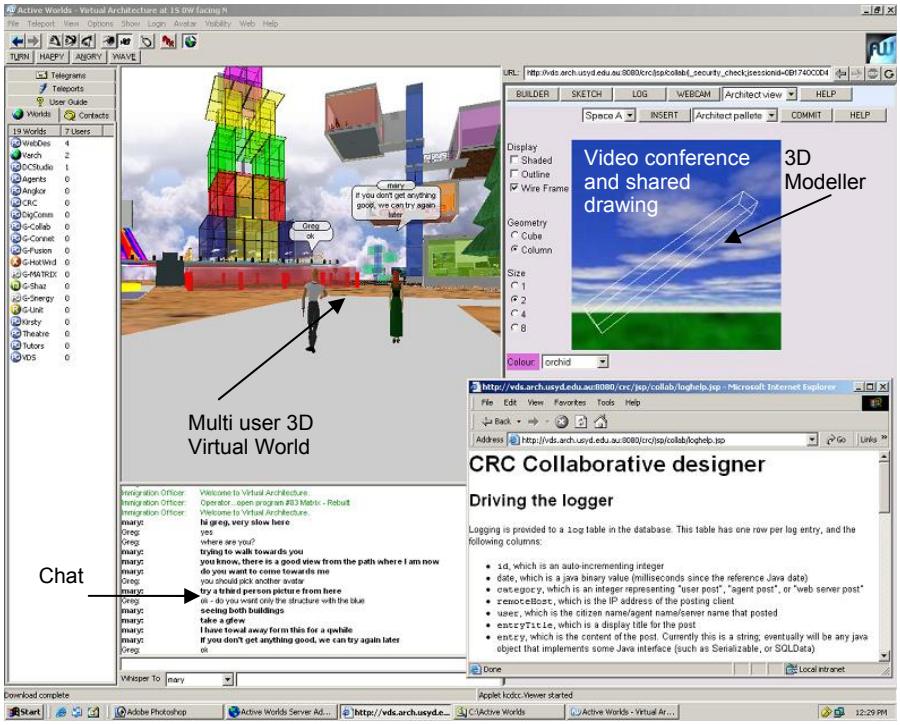


Figure 4. Extended virtual world

3.1.1. Equipment Set-up of 2nd and 3rd Phases

We recorded the designers' activities and verbal exchanges in each session with a surveillance DVR (digital video recording) system. The DVR system was set to show four different views on one monitor. Two cameras were used to monitor the two participants' behaviors and the other two views are video streams directly from the two designers' computer display screens. Two separate microphones for each participant were fed into the DVR system through a sound mixer. Figure 5 shows the equipment set-up where two participants are located in the same room with a panel in between them.

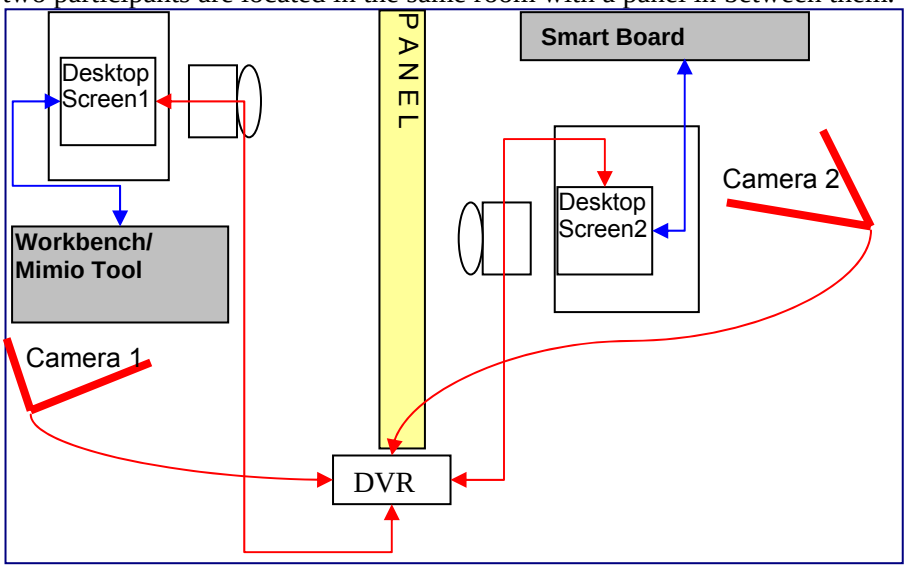


Figure 5 Diagram of equipment set up

In the experimental set-up for the 2nd phase (use of Group Board), two cameras and two computers were connected to the DVR. "Desktop screen 1" was projected on a horizontal workbench (with glass top) and a Mimio Tool[1], and "desktop screen 2" was connected to the Smart Board with flat panel plasma display[2]. In the first setting, the plasma display and the horizontal workbench were used so the designers had a large drawing surface. In the 3rd phase setting, the cameras and video streams were connected to a typical desktop computer configuration with a vertical screen, keyboard and mouse.

3.2. EXPERIMENTAL PROCEDURE

The experimental procedure was:

[1] http://www.mimio.com

[2] http://www.smarttech.com

1. The designers were given a design brief and shown a collage of the photos of the site they are required to build on. They were given time to read through the design brief and inspect the site layout and photos. They were given paper and pencils and were asked to complete their design session in 30 minutes.

2. The designers were presented a short description of how they could use Smart Board or Mimio Tool. These are both pen and digital ink interfaces to a standard windows environment. The Smart Board is attached to a vertical plasma display and the Mimio is placed on a horizontal projection display.

3. The designers were given a 15 minute training session on the use of Group Board. In the training session participants were engaged in doing a tutorial in order to review and/or build their skills in using specific features of the software application provided for collaboration.

4. The designers were given a new design brief and shown a collage of the photos of the same site. They were given time to read through the design brief and inspect the site layout and photos. The site layout was set in the share whiteboard application as a background image on several pages so that the designers can sketch on them. They were asked to complete their design session in 30 minutes.

5. After a 5 minute break, the designers were given a 15 minute training session on the use of 3D world. They were asked to do a tutorial in order to review and/or build their skills in using specific features of the software application.

6. The designers were given a new design brief and shown a collage of the photos of the same site. They were given time to read through the design brief and inspect the site layout and photos. This time the designers were using the extended virtual world. They were asked to complete their design session in 30 minutes.

7. Designers were required to fill in a questionnaire (Appendix).

Table 1 shows the summary of methods, tools and activity of participants:

Table 1 Experiment sessions

	1st Phase	**2nd Phase**	**3rd Phase**
Participants	Alex and Casey	Alex and Casey	Alex and Casey
Interface	Tracing paper, pencil, ruler	Smart Board and Mimio on a glass table	Desktop Screen
Collaboration medium	Face to Face	Group Board	Active Worlds
Application	N/A	Shared White Board	Construction Space
Activity	face to face sketching	Remote sketching	Remote 3D modeling

Webcam	N/A	√	√
Training tutorial	N/A	√	√

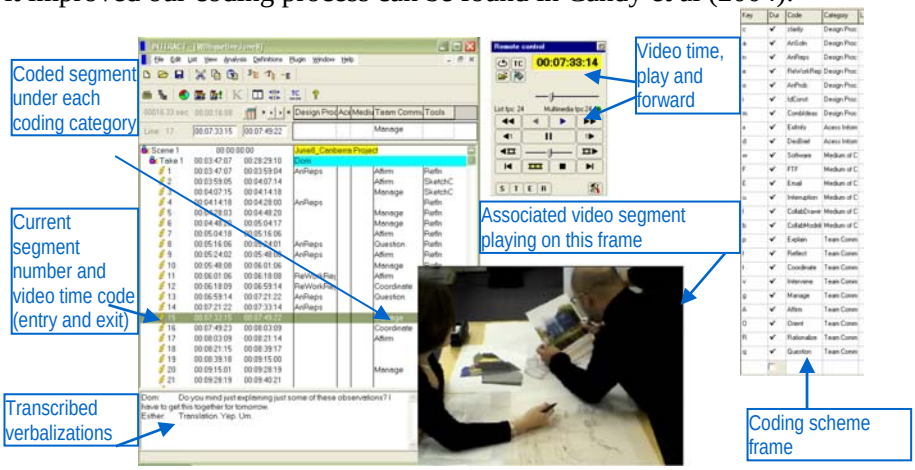
Figure 6 shows the shots from the recorded activities of the architects collaborating during Group Board (Figure 4a) and 3D world session (Figure 4b).

(a) (b)

Figure 6 Architects collaborating during (a) Group Board session (b) 3D world session

3.3. PROTOCOL CODING

The software used for the analysis of the experiment sessions is called INTERACT[3], with the interface as shown in Figure 7 for coding the recorded videos. More information on the reasons for choosing this software and how it improved our coding process can be found in Candy et al (2004).



[3] www.mangold.de

Figure 7 INTERACT Coding interface

3.3.1. Segmentation

The continuous stream of video and audio date needs to be segmented for coding and analysis. A single filmed session is called a Scene in INTERACT. There are "Takes" in a Scene which we refer to as design episodes. We utilized one take for coding one actor's activity, and second take for second actor's activity separately in a scene. "Events" are smaller activity definitions building up the "Takes" which are also the smallest segment definitions in the current study. In the study done by Dwarakanath and Blessing, an event was defined as a time interval which begins when new portion of information is mentioned or discussed, and ends when another new portion of information is raised (Dwarakanath and Blessing, 1996). This event definition is an optimal one for our study as well, since the occurrences of actions and intentions change spontaneously as architects draw and communicate interactively.

An event can change when a different person starts speaking in a collaborative activity if s/he is introducing a new portion of information. In some cases the conversation goes on between the actors however the intention or subject of interest remains the same. For example, in Segment 48 both Casey and Alex take turns in one segment, however their subject of interest is still the "ramp to a car park":

Segment 48:

"Casey: This is... there is a photo of there. That is actually a ramp to a car park. And then there is a building and a little <inaudible>

Alex: And that is the ramp?

Casey: That is the ramp."

Then this conversation could be put into one segment despite the change in speaker. Table 2 shows the segmentation of a protocol excerpt from the study.

Table 2 Segmentation in terms of event definitions

Segment 11	Casey: You were feeding, the lobbies there but not facing the void. You saw the void from around this way. Alex: Yeah but this is again Site Specific it is related to the <inaudible>
Segment 12	Alex: That is ok. I mean again within that model... Just keep that. I guess the point is
Segment 13	Alex: I think even in this model you can still to have a lift opening up this way or a lift going this way. But what he was suggesting was maybe if we pulled the lifts out
Segment 14	Alex: but I think you could actually put the lifts here.

Segment 15	Casey: You know this... what I am saying... do that, you face this way and you come out and you turn a corner and that is hanging off the edge of the void there is a void there so this is like you come out, like when you are waiting for the lift you come out and you are off the edge.
Segment 16	Alex: I like that with glass under that... you walk past the sort of lobby as you come in Casey: and as you go up this thing jumps out.... Alex: yeah so you could put that line there...

3.3.2. Coding Scheme

The purpose of the coding scheme is to provide categories for the collected data that will highlight the similarities and differences in collaborative designing using the two different design environments. These differences provide the basis for understanding the impact of introducing a new design environment. We have developed 3 coding categories: communication content, design process, and operations on external representation. The communication content category partitions each session according to the content of their conversation, focusing on the differences in the amount of conversation devoted to discussing design development when compared to other topics. The design process category characterizes the different kinds of designing tasks that dominate in the two different design environments. The operations on external representation category looks specifically at how the designers interacted with their external representation of the design to see if using 2D entities or 3D objects was significant.

Communication Content:

The communication content category is applied to the transcribed conversation between the two designers, and one code is assigned to each segment. This code category has 5 codes as shown in Table 3.

Table 3 Communication Content

Software features	Software/ application features or how to use that feature
Design Process	Conversations on concept development, design exploration, analysis-synthesis-evaluation.
Awareness	Awareness of presence or actions of the other
Context free	Conversations not related to the task
Tech Prob	Talking about a technical problem

Communication on software features involves the questions about how to do specific tasks with the software, talking about individual experience of how to do things, problems faced during the use of the software, any feedback about the interface or use of software /statements of frustration about not getting something right etc.

Communication on design process involves statements about design issues, environmental or structural issues, design ideas, design solutions, judgments about design solutions, functional issues or design constraints,

client requirements, comments on design brief, in other words any conversation about the design process.

Communication on awareness refers to conversations on participants' presence and actions in a digital environment, for example:

"I see where you are, I'll come down and join you and here I'm".

"aaaha you re working on the NE corner…."

"Did you manage to put walls?

Yes there are a couple of panels at the southwest corner".

Context free communication refers to the conversations that are not related to the design, the software, or awareness of others, for example "shall we have a beer after this?".

Communication on technical problems is coded separately from software features because they are problems that may be resolved in future experiments. The technical problems include software crashes, computer hardware or server failures, internet disconnection.

Design Process:

The design process category characterizes the kinds of design tasks the designers are engaged in for each segment. Assigning a design process category takes into consideration the words spoken during each segment as well as the actions observed in the videos. The codes in the design process category are an adaptation of the coding scheme developed by Gero and McNeill (1998). The codes in this category are shown in Table 4.

Table 4 Designing Process

Propose	Propose a new idea/concept/ design solution
Clarify	Clarify meaning or a design solution, expand on a concept
AnSoln	Analyse a proposed design solution
AnReps	Analyse/ understand a design representation
AnProb	Analyse the problem space
Identify	Identify or describe constraints/ violations
Evaluate	Evaluate a (design) solution
SetUpGoal	Setting up a goal, planning the design actions.
Question	Question / mention a design issue (for eg. how to get this done? In terms of areas we have nothing to scale)

Operations on external representations:

The external representations category looks specifically at the actions the designers perform while using the software. Each segment is interpreted using the video of the designers' behaviour including movements or gestures, and the video stream of the computer display showing how the software was being used. Table 5 shows the codes in the external representations category.

Table 5 External Representation

Create	Create a design element
Group	Group elements
Move	Orientate/Rotate/ Move element
Erase	Erase or delete a design element
Inspect	Attending to, referring to the representation

The actions required to construct external representations differ in each media. Thus the definitions of the codes in this category need to be explained for Net meeting and 3D worlds, as shown in Table 6.

Table 6 External Representation Actions

Code	**Net Meeting**	**3D World**
Create	Drawing a new entity.	Inserting a design object (wall, column, beam, slab, box) into the environment.
Group	Creating entities next to each other, which form a group.	Duplicate an object next to the previous in one segment duration.
Move	Move action is not frequently used in a shared white board, because designers tend to use it like a sketch paper.	Designers move around the objects after they are created. This is to align them, change their arrangements or to carry them for using in another location.
Erase	Select a drawn entity and delete it	Select a created object and delete it.
Inspect	--Looking at the representation and refer to its parts/aspect --Using hand gestures over the representation --Attending to a visual feature of the representation --Zooming in and out --Scanning	--Looking at the model and refer to a design object. --Using hand gestures over the representation --Attending to a visual feature in the environment --Changing the view point in the environment

4. Interpretation and Discussion of Results

Our analysis of the data for communication content is summarized in Figure 8. The analysis shows that the communication content in face to face sketching sessions is predominantly about the design rather than about the tools they are using or where the other person is located. During the face to face (FTF) sessions, we observed that designers were intensively engaged in exploring and creating design concepts interactively while drawing on paper. This is explained by the familiarity of this environment for the designers and the physical access they have to each other. We noticed a similar phenomenon in the remote sketching environment, where the designers primarily talked about the design rather than the software features or the awareness of actions of each other. However, in the 3D virtual world we found that much of the conversation was about awareness of other designer's location and action. The discussion on awareness of others is due to the significance of the information about the other designer's location in the 3D

virtual world and their actions with respect to the design model they are creating. In a 2D sketch, both designers have the same view. In a 3D world, the view of the designer depends on his location in the world. However, in all 3 sessions, the designers spent most of the communication time on design tasks.

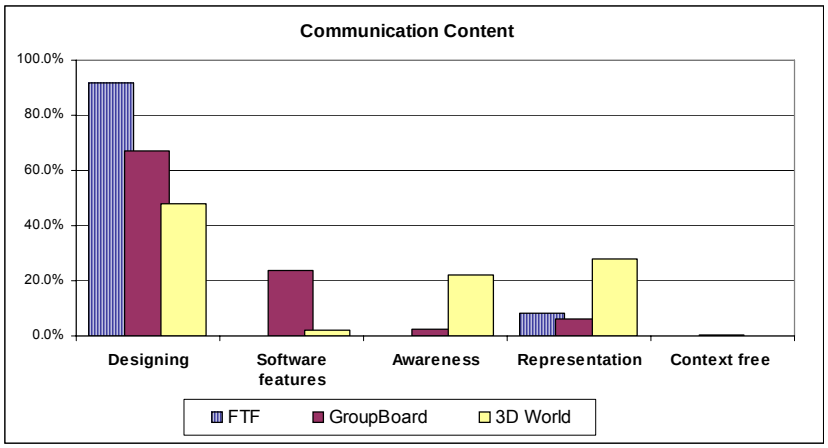


Figure 8 Analysis of communication content

A summary of our analysis of the working modes category is shown in Figure 9. When the designers were working face to face, they were always engaged in "meeting" mode, during which they were communicating and acting on the same aspect of the design. When the designers were working remotely, there was a small percentage of the time during which they were working on their own, focusing on different aspects of the design. We have observed that this percentage can vary greatly from one design pair to another. In the design pair we are reporting on in this paper, the percentage of individual working mode is similar for remote sketching and remote 3D virtual world. An interesting interpretation of these results is that while working remotely, the presence of the other designer is not as strong, allowing the designers to think privately for a portion of the time.

A summary of our analysis of the amount of time the designers spent attending to function vs structure is shown in Figure 10. In the face to face session the designers spent an almost equal amount of time on the considerations of function as structure. In the remote sessions the designers spent significantly more time on structural considerations than on functional considerations.

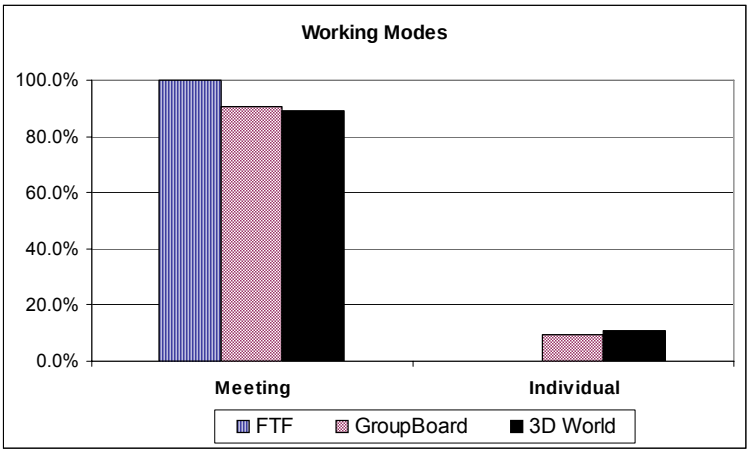


Figure 9 Analysis of working modes

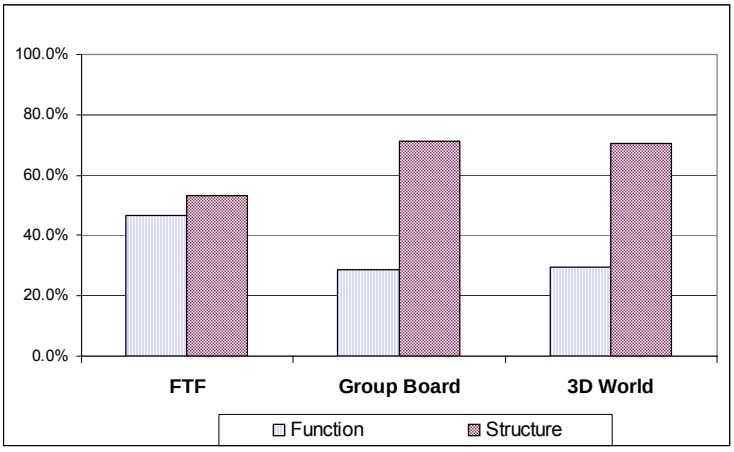


Figure 10 Analysis of function and structure categories

The analysis of the operations on external representations is shown in Figure 11. This analysis is interesting because the three sessions look very similar. The operations of inspection on the brief and the representation of the design dominated, with the other operations being comparatively small in percentage of time.

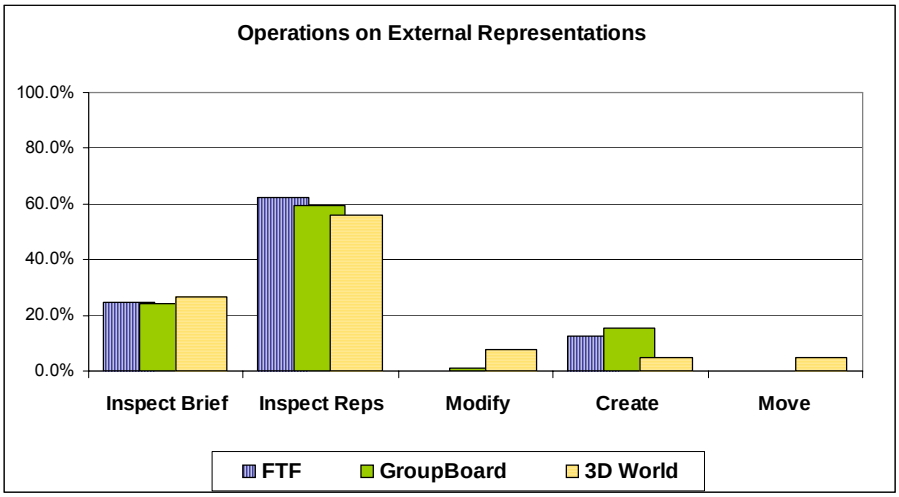


Figure 11 Analysis of operations on external representations

For the design process codes we show the results for each design process code along a time line, as shown in Figure 12. The beginning of the session is on the left, and the length of each segment indicates how long the designer spent on each design task. Each code is applied separately for each designer, indicated by the numbers 1 and 2. From the analysis, we see that the two sketching sessions have similar patterns in the design tasks and the 3D virtual world looks very different. In the sketching sessions the designers cycled many times through a pattern of analysis followed by a pattern of propose. In the 3D virtual world the designers spent the initial time analyzing the problem and then spent a major portion of the remaining time setting up goals. The propose tasks in the sketching environments were usually associated with talking about ideas and sketching. The set up goal tasks in the 3D virtual world were associated with talking about and creating 3D models to build a portion of the design. These differences follow from the differences inherent in the expressiveness of the entities drawn in a sketch and the expressiveness of the 3D objects in the virtual world model. The entities in a sketch can take on many meanings that may be associated with the structure of the design, or not. The 3D objects in a world model can only be associated with an aspect of the structure of the design.

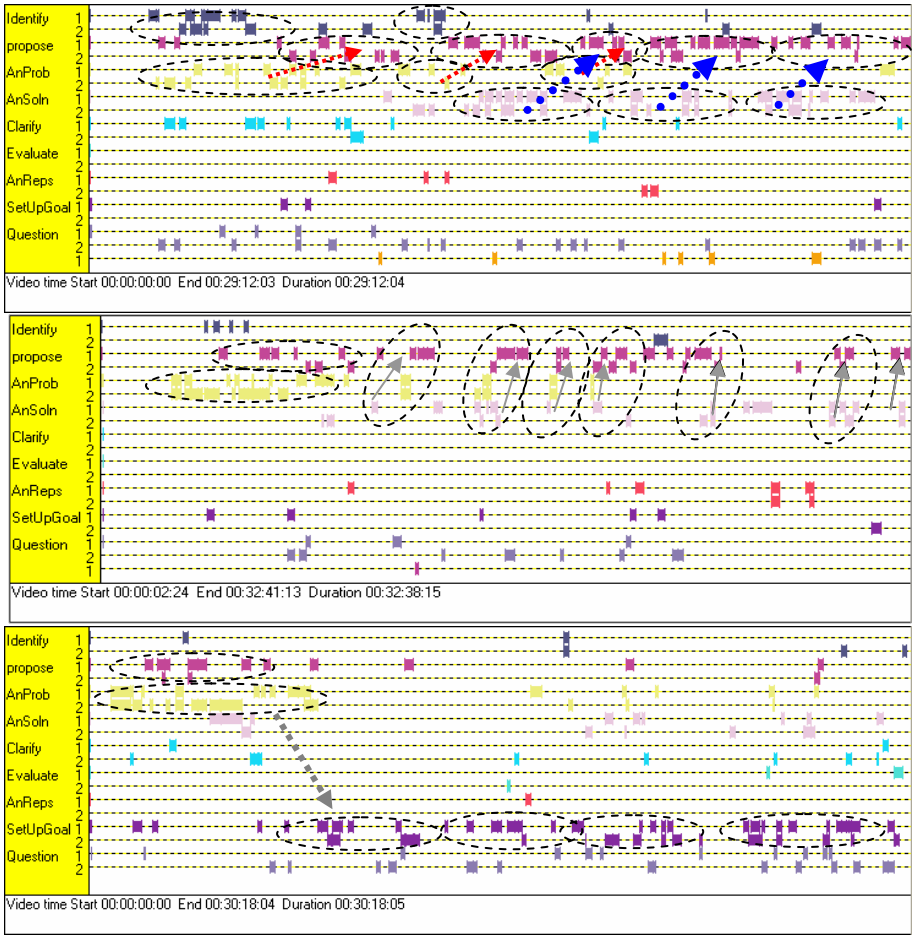


Figure 12 Design process in FTF, Group Board and 3D virtual world sessions

5. Conclusions

Introducing new tools to the design process requires understanding of what purpose they serve. A design environment could be beneficial either for conceptual phase, detailing phase or modeling phase; however analysis of design behavior is needed for understanding the impact and benefits of the tools/environments. The experiments described here characterize and compare the design behavior of two architects using three different tools/media for designing. We demonstrated architects developed abstract concepts, analyzed synthesized and evaluated them when they were involved sketching and the same architects focused on synthesis of the objects and the making of the design, when they were involved in 3D modeling via the extended virtual world.

In this report the nature and benefits of the three design environments are revealed by analyzing the design behavior of a pair of designers. The results show that the designers' behavior was different when they were engaged in sketching and when they were engaged in 3D modeling. In the 3D virtual world they focused on the details of how objects come together and are synthesized. In the sketching environments they are engaged in the design process on an abstract level i.e. through design exploration.

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Appendix

Sydney University Students' Union Gallery

• THE PROGRAM
You are asked to design a contemporary art gallery to house the Sir Hermann Black Collection

and to provide space for temporary exhibitions for the University of Sydney Students' Union,

which is being expanded, and is being moved from the the Wentworth Union as a result of the

University of Sydney's Masterplan.

• YOUR CLIENT
Your client will be the University of Sydney Students' Union, represented by Mr Nick Vickers,

who is the Director of the new Union Gallery and the Director and curator of the Sir Hermann

Black Gallery currently housed on the top level of the Wentworth Union.

• THE SITE
The site is on the corner of City Road and Darlington Street, and is part of the Darlington campus. The site is currently occupied by the University Regiment and is defined on the accompanying plans.

Approval for any building on this site would be influenced by the University of Sydney Masterplan, and governed in the regulatory environment by the Local Environmental Plan and the Development Control Plan of South Sydney Council.

We have provided you with 2 x A3 of the site at 1:500, and 1:200

Approval and regulatory requirements
The site area is approximately 1800 sqm.
The maximum site coverage is 33%. That is, 594 sq mt , the building 'footprint', or built coverage of the site, excluding any external courts, sculpture display areas, unloading docks, service areas, etc. Building height limit is *three storeys*, and the building height and mass should enhance the urban context and respond appropriately to surrounding buildings and streetscape.

• THE BRIEF
Discussions with Nick Vickers, the Director of the Union Gallery and advice from Jan Feildsend, architects Paul Berkemeir and Colin Still have produced the following general brief.

The Union Gallery – the client's aims

The Union Gallery will encourage the public to enjoy and engage with the art works in the exhibitions of both the permanent collection and the temporary exhibitions, and will present the works in the best way possible.

The Union Gallery is to have a *community focus*. The major aspect of this will be the connection made by the Gallery and the art it houses with the University and wider community, both in terms of the physical fabric of each, and in terms of the varying communities of people in each - living, working, studying, visiting.

The Union Gallery will be a *public building*. It will be open to the public and to University of Sydney students and alumni.

The Union Gallery will have a *commercial aspect* and must be self-supporting.

The Union Gallery will form a link between the University and the community, physically and conceptually, through both its location and its program.

Spaces	**Description**	**Size**
Galleries	There are two types of exhibitions to be shown: permanent and temporary	
	•Permanent collection of the University of Sydney Union-	200 sq mt (50 mt hanging space)
	•Temporary exhibitions-	300 sq mt (75 linear mt of hanging space)
	The total exhibition gallery area of 550 sqm should include circulation space, wall thicknesses, services.	Total: 500-550 sqm
Sculpture	•Sculpture space is also required for acquisitions by the permanent collection and for temporary exhibitions. This should be outdoor / indoor space.	
Associated areas (with galleries)	Activities associated with the galleries:	Total – approx. 450 sqm
	•Artwork Store	200 sq mt (50 linear mt)
	•A workshop: for setting up exhibitions, curatorial work, repairs etc	100 sq mt
	•Exhibition Catering: kitchen facilities adjacent to exhibition space for catering for exhibition openings.	
	Services: •Loading dock and possibly service court with good access to the galleries. •One or two lifts are required for both service and daily passenger use. Maximum allowable is two lifts.	
	•Offices for Director (large), for a curator, administrative office and a receptionist. •A boardroom with a large table for meetings of	

	the ten members of the University of Sydney Students' Union Board meetings, pre-exhibition invited gatherings, etc, with adjacent small kitchen. •Storage. •Staff toilet, cleaners store [the size of a cubicle].	
Commercial /merchandising Areas	This is the commercial generator if the gallery and the interface between visitors, artists and the gallery. Foyer space must be provided, and security must be considered for after-hours activities.	300 – 350 sqm
Outdoor areas	NOT included in the building footprint requirements.	
Public Toilets	public toilets must be provided Visitors – on average 300 for an exhibition opening, and 1000 per exhibition, with twelve exhibitions annually.	Toilets approx 40 sqm –
Car parking	Not required	

Sydney University Architecture Library

Site – City Road – Darlington Road.

• THE PROGRAM
You are asked to design a new contemporary Library for the Faculty of Architecture for future architects. Sydney University, as part of its 2010 project requires the relocation of the Sydney University Architecture Library, currently located in the Architecture Faculty.
As it has outgrown its space, a new stand alone structure is required and the site is perfect, just 100m from the Faculty.
Faculty of Architecture has a series of key aims for the new Library.

It will be a public building as well as meeting the student's needs.
It will be inspirational for future architects.
It will have a commercial aspect.

And most importantly, it will form a link between the University and the community, physically and conceptually, through both its location and its program.
• YOUR CLIENT
Your client will be the University of Sydney Faculty of Architecture.

• THE SITE
The site is on the corner of City Road and Darlington Street, and is part of the Darlington campus. The site is currently occupied by the University Regiment and is defined on the accompanying plans.

Approval for any building on this site would be influenced by the University of Sydney Masterplan, and governed in the regulatory environment by the Local Environmental Plan and the Development Control Plan of South Sydney Council.
We have provided you with 3 x A3 of the site at 1:500, 1:200 and 1:2000 ortho-photo prints

Approval and regulatory requirements
The site area is approximately 1800 sqm.
The maximum site coverage is 33%. That is, the building 'footprint', or built coverage of the site, excluding any external courts, sculpture display areas, unloading docks, service areas, etc. will be 500 - 550 sqm
Building height limit is *three storeys*, and the building height and mass should enhance the urban context and respond appropriately to surrounding buildings and streetscape.

• THE BRIEF

The library must have the following components.

Foyer – Information Area	150 m2
Offices – for Library staff	150 m2

Loans Desk	40 m2
Open access book shelves	100-120 lineal mt of shelves
Workspaces/ Reading area	For 80-100 people(2.5 mt sq per person)
Theatrette	Seating for 60 people
Audio Visual Library	42-50 sq mt
Storage	100 sq mt
Staff car spaces for 10 cars – underground preferable	100 m2
W/C – 5 m/f public / staff 2	50 m2
Courtyard - cafe	100 m2

The services included are:
Inter-library loans
Photocopying equipment (in separate rooms)
Reading/ printing from microforms
Online Catalogue terminals/ Desktops for online literature search

- Facilities inside the controlled area: Workspaces/reading rooms, reference books barrow/ return desk, copying equipment (in separate rooms), open access book shelves.
- Facilities outside the controlled area: Cloakroom, courtyard cafe, information desk (general enquiries), online catalogue terminals, book return and collection area, seminar rooms, theatrette.

Sydney College of Fine Arts Contemporary Dance School

• THE PROGRAM
You are asked to design a contemporary building for a new Contemporary Dance School which is about to set up as part of University of Sydney College of Arts.

College of Arts has a series of key aims for the new Dance School
It will bring together the dance classes held in other locations
It will be the first school teaching contemporary dance in Sydney
it will be the only fine arts related school in Camperdown Campus

• YOUR CLIENT
Your client will be the University of Sydney College of Arts.

• THE SITE
The site is on the corner of City Road and Darlington Street, and is part of the Darlington campus. The site is currently occupied by the University Regiment and is defined on the accompanying plans.
Approval for any building on this site would be influenced by the University of Sydney Masterplan, and governed in the regulatory environment by the Local Environmental Plan and the Development Control Plan of South Sydney Council.
We have provided you with 3 x A3 of the site at 1:500, 1:200 and 1:2000 ortho-photo prints

Approval and regulatory requirements
The site area is approximately 1800 sqm.
The maximum site coverage is 33%. That is, the building 'footprint', or built coverage of the site, excluding any external courts, sculpture display areas, unloading docks, service areas, etc. will be 500 - 550 sqm
Building height limit is three storeys, and the building height and mass should enhance the urban context and respond appropriately to surrounding buildings and streetscape.

• THE BRIEF
The Dance School must have the following components:

Spaces	Area
Generic Studio Space 4 studios	200 m2 each
Set Store / Workshop	280 m2
Boardroom	18 m2
Office Space	75 m2
Amenities – Public / Private	2 x 50m
Foyer	250 m2

Café	75 m2
Sound Control Room	6m2
Courtyard – Terrace – roof top space?	Undefined
Dressing Room	70m2
Gym	70m2
Class Room	40 m2
Health Spa – Treatment Room	25m2
Plant Room – Auditorium	20m2
Plant Room – General	10m2

A car entry point is required – not so much as a loading dock. A pull-off point.

Questionnaire

Could you suggest items that might help you to collaborate successfully in

- Face to face sketching session?

- Net Meeting session?

- 3D World session?

How would you rank the effectiveness of collaboration with your partner in

- Face to face sketching session? (High/ Medium/ Low)
- Net Meeting session? (High/ Medium/ Low)
- 3D World session? (High/ Medium/ Low)

How would you rank the speed of your progress in

- Face to face sketching session? (Fast/ Moderate/ Slow)
- Net Meeting session? (Fast/ Moderate/ Slow)
- 3D World session? (Fast/ Moderate/ Slow)

How would you rank your design solution in

- Face to face sketching session? (Very good/ Satisfactory/ Not satisfactory at all)
- Net Meeting session? (Very good/ Satisfactory/ Not satisfactory at all)
- 3D World session? (Very good/ Satisfactory/ Not satisfactory at all)

How would you rank your productivity (in terms of what you aimed for in the beginning and what you ended up with) in

- Face to face sketching session? (High/ Moderate/ Low)
- Net Meeting session? (High/ Moderate/ Low)
- 3D World session? (High/ Moderate/ Low)

Do you think the use of technology had an impact on your designing approach? If yes please explain.

Do you think the use of technology had an impact on how you communicate with your partner? If yes please explain.

Do you think the use of technology had an impact on the design outcome? If yes please explain.