New Immersive Workflows for Design and Production

Improvements to Distributed Collaboration for Ideation, Sketching, Simulation and 3D Printing

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Today, there is a lot of hype about new technologies such as immersive virtual reality (VR). After more than five decades, the unfulfilled prophecy that VR would be available to everybody seems to be nearby. These development raises the need to find out how is that design and its education will be influenced by technological change and how they can also benefit from it. The aim of this workshop is to collaborate, share and discuss on how traditional and new means for ideation, sketching, simulation and production can form a better design workflow. The participants will be invited to contribute analogue or digital concepts (e.g., pen and paper, tablet). A selection of sketches will be transferred to a virtual reality program and developed into a 3D simulation for later 3D printing. The team of presenters will work in flexible and distributed locations in Australia, Netherlands, New Zealand, Spain, and the United States of America. Participants will be invited to share their own circumstances, views, and aspirations in relation to the implementation and potential of new technology in their own design education.

Keywords: design education; distributed collaboration; interaction design; user experience; virtual reality

Aims of the Workshop

The aim of this workshop is to collaborate, share and discuss on new forms of ideation and co-design based on recent developments on flexible and distributed technologies. Participants integrated by academics and professionals from the areas of architecture, design and industrial design will be invited to brainstorm and discuss together on the potential benefits of VR for digital sketching, simulation and production. The presenters from Australia, Netherlands, New Zealand, Spain, and the United States of America will demonstrate how a selection of sketches (pen and paper, tablet, and stylus) can integrate a workflow that uses 3D VR simulation and 3D printing output. The practical collaboration among presenters and participants intends to also gather views on the influence and implications relating to the implementation of new technologies for design and its education in different parts of the globe. Workshop participants' feedback will be evaluated and be made available with the hope of starting a community of practice (CoP) on new means for sketching, design and visualisation following the conference.

Background

Visionaries have promised that immersive and virtual environments would become an affordable reality and a tool for design (including architecture and other fields of design) and innovation for the last fifty or more years. After a slow start in the 1930s with the description of *stereopsis* (Bowers, 2001), the 1950s with the invention of the first virtual reality (VR) experience theatre *Sensorama* (Heilig, 2018) and the first VR headsets in the 1960s, such as, *The Sword of Damocles* (Sutherland, 1968), technology is now catching up with their aspiration of digital immersive experiences in the form of extended realities (XR) that include augmented (AR), mixed (MR) and virtual (VR) environments (Milgram, Takemura, Utsumi, & Kishino, 1995). These technologies seem closer to becoming a creative and communication tool for designers and people in general. However, in general, design education seems to be slow in their adoption. Recent economic pressures created by

globalisation and the Covid-19 pandemic have thrust the interest in this type of technologies further since more work is increasingly done in *working-together-apart* scenarios that are distributed (synchronous and asynchronous). Many design projects also do not sleep as these keep progressing concurrently 24/7 in different concurrently coordinated global locations towards the production of *design artefacts* (e.g., objects, services, systems).

Workshop Methodology
The workshop will integrate
- The practical contribution by participants in the form of sketches and their design and education perspective on the potential for implementation of new technology in their own parts of the planet
- The practical demonstration by presenters that is open to the audience's active participation
- The collaboration among presenters and participants that intends to brainstorm on
  - The influence and implications relating to new technologies for design and its education in different parts of the globe
  - The challenges for technological transformation and/or enhancement of design education based on a Substitution, Augmentation, Modification, Redefinition (SAMR) Model for technology innovation (Puentedura, 2006, 2010)
  - The means to promote change and adoption of digitalization and new forms of education and practice based on a Reach, Act, Convert, Engage (RACE) Framework for technology perception and change of behaviour (Chaffey, 2010)
- The start of
  - A cadastral map on potential implementation and use of new 3D VR and 3D printing and manufacturing technology for the design profession and its education.
  - Future Community of Practice (CoP) on immersive technologies and workflows for design and production (Lave & Wenger, 1991; Wenger, 1998)
  - The use of an ongoing and open digital point of connection (MIRO board) that will stay open through and after the conference to support the CoP

Workshop Outline
This workshop is divided in two sessions and requires participants' preparation before them. The workshop pursues the collaboration, sharing and discussion on new forms of ideation and co-design based on recent developments on flexible and distributed technologies. Participants will be invited to brainstorm and discuss together on the potential benefits of VR for digital sketching, simulation, and production. The presenters from Australia, Netherlands, New Zealand, Spain, and United States of America will demonstrate how a selection of sketches (pen and paper, tablet, and stylus) can integrate a workflow that uses 3D VR simulation and 3D printing output. The practical collaboration among presenters and participants will be the base to collect views on the influence and implications created by new technologies for design and its education. The Workshop also intends to set the foundation to start a CoP with the participants on new means for sketching, design and visualisation following the conference.

Before Workshop
Participants: Preparation before workshop. Please
- Download the Miro and sign up to the app. You can run Miro from your Desktop or, alternatively, from a browser of your preference https://miro.com/login/
- Familiarise yourself with Miro and how to use it
  - https://academy.miro.com/courses/getting-started-with-miro
  - https://www.youtube.com/watch?v=pULLAEmhSho
- Sign in or sign up to Miro and enter our working space at:
  - https://miro.com/app/board/o9J_lvs4lA4=/
- Please upload your sketch contribution to MIRO and send it to m.novoa@westernsydney.edu.au
  - Remember to send an image at low resolution (75 to 120 dpi) and not at high resolution for printing (300 to 600 dpi) since VR works at screen resolution

- o Regardless, make sure that your image is legible before sending it.
- Contribute and indicate
  - o Sketch samples on pen and paper or digital format. You can email them or upload to this MIRO board before the first session
  - o Do you have any experience on VR?
  - o Would you participate actively while wearing a VR headset or simply as audience through Zoom?
- If participating actively, please
  - o Remember that the Gravity Sketch app works with 6 DoF VR headsests (e.g., Rift, Rift S, Quest 2, HCT Vive)
  - o Either,
    - ▪ Sign up and log in to Steam VR: https://store.steampowered.com/steamvr, or
    - ▪ Sign up to Oculus site: https://auth.oculus.com/login/?redirect_uri=https%3A%2F%2Fwww.oculus.com%2F
  - o Download and install Gravity Sketch app (education) via Steam VR or Oculus to your PC or headset
  - o Sign up to a free Gravity Sketch LandingPad.Me account: https://landingpad.me

First Hour

Introduction (20 minutes – lead Mauricio)

Presenters will introduce the workshop and its format with a brief contextualisation on how the digital tools landscape for design is changing. They will also promote their SIG for Sketching and Visualisation at the Design Society and propose the opportunity to start a similar SIG at the Design Research Society but with its own angle. The breakdown of this section is as follows

- Setting up: Miro, Zoom
- Presenters' expertise (Bryan, Jan Willem, Jose Manuel, Wendy, Mauricio)
- Audience introductions (e.g., where are you from, what is your field in design education)
- Rationale for the session:
  - o Aims and background
  - o Quick overview of new workflows for design and production
    - ▪ Technology evolution from 2D to 3D and singularity of CAD
    - ▪ VR and 2D graphic design (lead Wendy)
    - ▪ VR and 3D printing and production (lead Wendy)

Participation, Discussion and Q&A (40 minutes – lead Mauricio, Wendy, Jose Manuel)

Participants are invited to ideate and discuss with the tools recommended prior to start the workshop. Please download them before the first and second workshop. Sketch contributions prior to the first hour can be done with analogue (pen and paper) and/or digital means (e.g., Autodesk Sketchbook, Photoshop, Procreate). Participation and discussion will be greatly based on two interrelated theoretical frameworks for new technology and digitalisation as recommended by Kramer (2020). First, Puentedura (2010) SMAR model. The acronym stands for four key factors that affect the introduction and use of technology in education: substitution, modification, augmentation, and redefinition. The biggest impediment for the introduction of innovation in education is not technological but cultural. The challenge is how to persuade educators and students to risk and try the new to later modify and create new habits. The SAMR model identifies a process for technological change and implementation in two stages. Through redefinition and modification of education and habits, and technology implementation either as enhancement of current technology or simply as its replacement with a better one. Second, Chaffey (2010) RACE framework. This acronym stands for the concepts of race, act, convert and engage. This framework was firstly used for digital marketing. However, it is useful here as it helps to unpack four key phases to promote digitalisation with effective behaviour change (Figure 1).

SAMR/RACE		Reach	Act	Convert	Engage
Transformation	Redefinition	🟨			
Transformation	Modification				
Enhancement	Augmentation				
Enhancement	Substitution				

Figure 1. SAMR - RACE Framework (Kramer, 2020) based on (Puentedura, 2010; Chaffey, 2010)

The breakdown of this section is as follows

- 10 minutes: Personal details and SAMR/RACE model. Please select one of 20 boards available. You are welcome to
    - Fill information in the personal details' slots
    - Add your own views with post-it notes
    - Connect post-it notes to create relationships
    - Work with the queries provided
- 20 minutes: Discussion with Miro, Q&A. Based on your post-it notes and
    - Puentedura (2010) SAMR model on the role of technology to support learning,
        - Do you use digital and immersive technologies?
    - What do you use them for?
        - If you do not, do you see a need for them?
        - What would you need for their
            - Implementation
            - Modification of the current system,
            - Augmentation of it
            - Substitution of habits and technology no longer fitting?
    - Chaffey (2010) RACE framework to improve digitalisation,
        - How can we reach educators, practitioners and students to promote change?
        - What activities can promote redefinition of education and practice?
        - What would it take for students and practitioners to change habit and embrace digital transformation?
        - What process would secure their continue engagement in a culture of learning and change?
    - Q&A

Second Hour
Introduction (10 minutes – lead Mauricio, Wendy, Jose Manuel)
Presenters will give a brief introduction to Gravity Sketch as an immersive tool exemplar for VR sketching, ideation, design, and production in this workshop (e.g., menus, NURBS, mesh, sub-D). They will demonstrate how to import both pen and paper sketches and digital images into the VR environment.

Sketching Collaboration (30 minutes – lead Jose Manuel)
Based on selected sketches provided by the audience (e.g., raster, vector), the presenters will show how to bring them into the VR environment for 3D VR development and save them for additive manufacturing. The breakdown of this section is as follows
    - Practical demonstration

- o Selected sketches 2D, 3D in Gravity Sketch
- o Collaborative experience within the immersive VR environment

Discussion (20 minutes – lead Mauricio, Wendy, Jose Manuel)

Presenters will moderate a discussion on the outcomes of the first session and the second session's VR demonstration. Participants are invited to share their views about their VR experience and the new immersive workflows for design and production presented. We welcome their ideas, suggestions, and feedback on the workshop (e.g., table, open questions) and to continue the conversation to form a CoP on this emerging area for design education and research (Figure 2).

Figure 2. Participants feedback form

Expected Outcomes

The outcomes of the workshop will be

- To bring into the discussion the challenges of new technology for design education and practice and how to figure them out on a field that generally runs design courses with tight or minimal budgets

- The opportunity to form a community of practice (CoP) that with time can evolve into a culture of learning (CoL) that can facilitate the use and work with new technology for the benefit of its members regardless of location, access, and wealth (Thomas & Brown, 2011).

- Demonstration on VR immersive technology for using
  - o Traditional skills with new technology
  - o New technology to increase benefit for academia, industry, and final users.

- Demonstration and practice of VR immersive technology for
  - o Substituting dated technology
  - o Augmenting current practice
  - o Modifying design education to improve learning
  - o Redefining design education and practice per current co-design collaboration and digitalisation of innovation and production

- To start a cadastral map for the potential implementation of new technology and persuade behavioural change by design

Minimum and Maximum Numbers of Participants

The workshop can run well with as little as 15 and as many as 30 participants. It might run with the attendance of more participants on condition that most of them are either audience or participate through Zoom.

Workshop Benefits for the Participants

The workshop brings to the table the discussion on how technology mediates the generation and diffusion of knowledge and practice in design education and the profession (Tarde, 1903). As a matter of speaking, the

challenge is still whether the tool makes the designer, or the designer makes the tool. With this, the workshop creates a good opportunity to start tracing a cadastral map of how technology is implemented and influence change in different parts of the planet. Also, whether design education and the profession are experiencing a global geographical reversal of fortunes because of diffusion of technology; rather than simply thinking that technology change follows a *haves and have nots* phenomena across the economic divide. The workshop intends to start a conversation on learning beyond technology as just technical skill.

Workshop Relevance to the Track's Aims

The workshop is relevant to Track 07 Sketching and Drawing Education and Knowledge because new immersive technologies present a challenge for traditional education but also opportunities for co-design in flexible and distributed environments, and the realisation of new user experiences, realities and simulation that can streamline workflow and join together process flows (e.g., ideation, design and production) and the void among designers and users with an agile human-centred design approach.

Technical Consideration

The workshop will be delivered through a Zoom session, MIRO, and a VR experience. The latter will be enabled with an immersive experience for the participants if they wear a 6 DoF VR headset and enter the collaborative space in Gravity Sketch app. However, that opportunity will depend on participants' compliance with technical requirement, Gravity Sketch installation and collaborative features prior to the workshop. Alternatively, they can watch the session through Zoom.

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