Image shows tribunal member, played by actor Dominic Stone, embedded in virtual reality

VIRTUAL COURT STUDY:

REPORT OF A PILOT TEST 2018

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BACKGROUND

This was a pilot study to develop the technological infrastructure for a virtual court or tribunal[1], get a preliminary idea about how potential users might respond and identify limitations of the technology that would need to be addressed before such options become suitable for regular use.

A 'distributed' courtroom is one in which there is a physical courtroom, but several of the participants are located elsewhere; they appear on video screens, arrayed around the courtroom in the 'correct' position (the screen for the judge would be at the Bench for example). Participants can make eye contact with each other and hear the sound from the same place as the screen that presents the image.

In a 'virtual' hearing, by contrast, there is no physical room for the court (or tribunal) at all: the participants take part by multi-channel video link. It is quite different from the 'celebrity squares' familiar to most people who have used video conferencing.

In this particular implementation of the virtual court concept there are screens for each of the other positions, angled so that participants can see each other. This creates an immersive setting, which feels three-dimensional. In the proof of concept stage, the background is a virtual environment. More typical virtual reality setups would have participants wearing headpieces to provide an additional depth perspective, or replacing images of the participants with avatars. These were considered unacceptable for judicial processes, and at any rate would have undermined legal realism. This study was based on two earlier field experiments carried out by the Court of the Future Network.

The Gateways to Justice project[2] looked at video-enabled hearings. Using a modern courtroom in Melbourne's County Court in August 2009, we varied the quality of the environment (video technology and remote room comfort) and the quality of the interaction (orientation and welcome). There were 21 sessions and four experimental conditions (high quality environment and interaction, standard environment and interaction, and the other two combinations).

Four witnesses appeared per session, one per condition, with the order of conditions systematically varied. The study used 64 lay witnesses and 21 professional witnesses, plus 170 mock jurors who acted as observers. The witnesses had been shown a short scene from a Wim Wenders film about an assassination on a Paris subway and were asked to report what they had just seen. The study showed that:

- improving the quality of the environment made a difference to the subjective ratings of both participants and observers

- improving the quality of the interactions also made a difference

- improving them both made the most difference

- the credibility of the witnesses did not vary across experimental conditions.

[1]The term 'virtual court' as used in the subsequent discussion is intended to include tribunals – decision-making bodies that make civil, administrative and protective decisions. Australia makes more extensive use of tribunals than most other countries. In the study reported here the scenario involves a tribunal dealing with an environmental matter.

[2]The full report is on line at the Court of the Future's website: https://courtofthefuture.org/publications/gateways-to-justice-guidelines-for-remote-participation-in-court/

The second major field experiment that informed the current study was the Distributed Courtroom study carried out in November 2015 in the North Sydney Local Court . It used the scenario of a criminal trial in which the accused was charged with contributing to dog fighting. In the fully distributed condition all of the participants except the judge appeared on 75 inch screens which were 'distributed' around the courtroom in the position where the participant would have been if they were physically present. Sound was localised by placing speakers beside the screens. This contrasted with the Gateways to Justice study where only one participant appeared from elsewhere, although the second condition in the 2015 study emulated this with only the accused on the screen and everyone else present in court. This study had four experimental conditions, including two co-present conditions, one where the accused sat at the bar table beside his lawyer, the other where he sat in the dock.

The study could find no evidence of any difference in jurors' perceptions of the accused between the four conditions, apart from the quality of the sound and vision being considered superior when he was on a screen. This may perhaps be regarded as a comment on the acoustics and lighting of older courtrooms rather than evidence that remote appearances are better. There was one clear finding from the study however – that when the accused was in the dock, he was 1.7 times more likely to be found guilty than when he was anywhere else – at the bar table or in a remote room.

[3] This report is on line at: https://courtofthefuture.org/publications-category/reports/

FIGURE 2

Distributed Court study, North Sydney Courthouse , 2015

Watercolour: Michael Blazewicz

FIGURE 2.1

Distributed Court study, North Sydney Courthouse , 2015

Watercolour: Michael Blazewicz

There are two key differences between the Distributed Courtroom study and the current one. The first is that the Distributed Courtroom study used a real courtroom, whereas the principle underlying the virtual courtroom is that no court building is required. If there is a courtroom it is conceived of as an imaginary place located in cyberspace.

The second difference is that the observers in the North Sydney Court House could see the events on large (75 inch) high quality screens, the sort that were being rolled out in refits of NSW courts, and allow observers to get life-size views of the remote participants. The 40 inch screens used in the 2018 study were appropriate for the virtual pods used by the participants, but proved to be too small for a group of witnesses seated several metres away from them. The plan was to have larger screens but budgetary pressures resulted in constraints both on screen size and quality of sound in the observation room. While disappointing, in one sense it allowed us to see if having a relatively inexpensive environment for observers would impact on outcomes, such as the perceived quality of communication or credibility of other participants. The 2009 Gateways study suggested that better technology could make a difference to how the hearing was experienced.

PROOF OF CONCEPT

The first step towards developing a design for the virtual court was carrying out a proof of concept. This involved actors performing a script about a civil dispute involving a tree, with each actor filmed individually in a green screen room. Three positions were used. The room configuration took the shape of a triangle, where the tribunal member is at the tip of the triangle, the defendant is at the base of the triangle to the tribunal member's left, and the applicant and the witness to the tribunal member's right.

The tables of applicant and defendant are tilted 5 degrees off-centre, as seen in the previz diagram of figure 9 on page 11 below. Thus, the applicant and defendant will have to turn their heads 5 degrees to the left and right respectively to look at each other, and about 40 degrees to their right and left respectively to look at the tribunal member. The tribunal member will have to turn his head 40 degrees to the left and right respectively to look at the applicant and defendant.
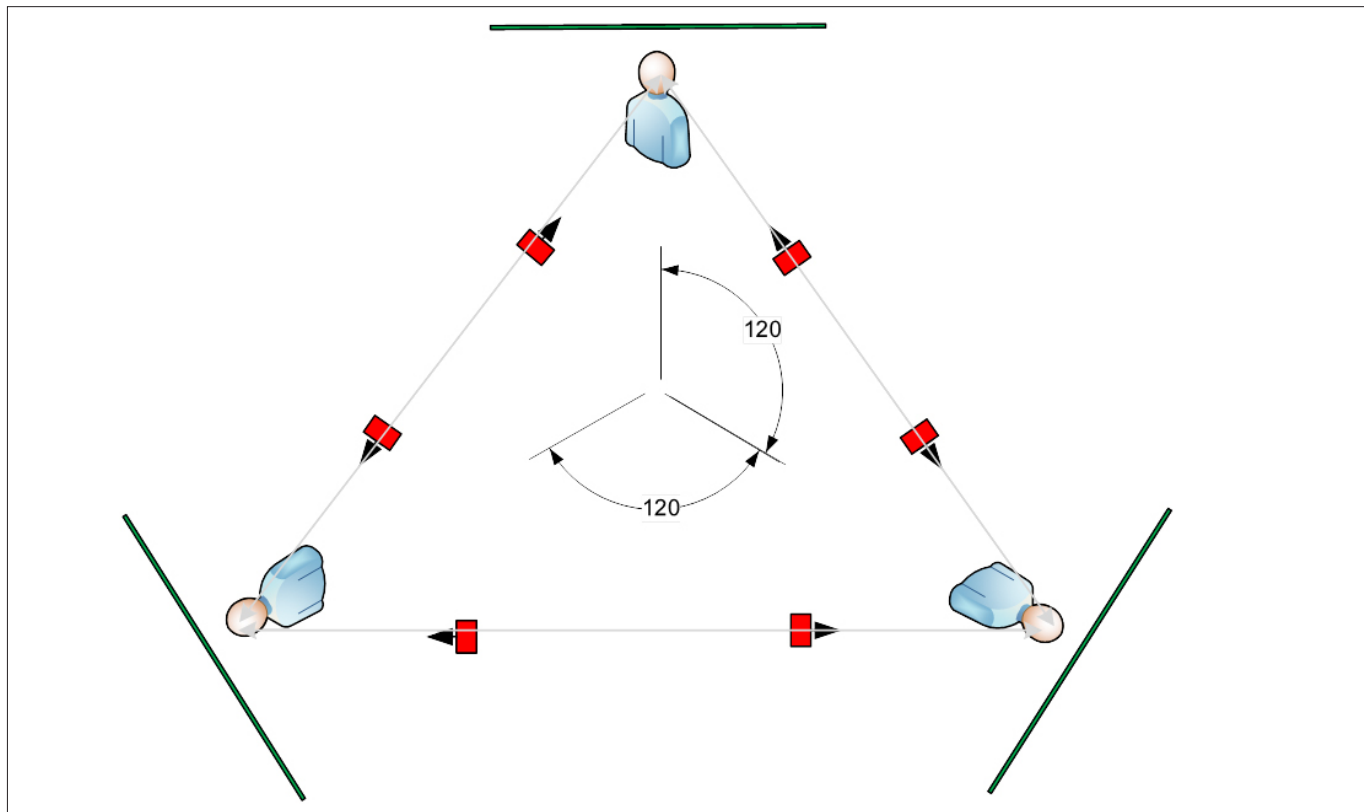
FIGURE 3

Previz diagram by Rod Louey-Gung, ICE Design Australia Pty Ltd

Shooting angles had to be worked out precisely in order to ensure that the footage would composite seamlessly into the virtual tribunal room. Each position needed to be filmed individually utilising two camera angles (the points of view of the other two positions). Up to five takes of each scene were made.

FIGURE 4

Virtual court proof of concept study, 2018.
Photo of film set. Tape on floor marks out distance and precise angles for each camera.

Photograph: Vincent Tay

Each of the three positions was filmed from the perspectives of the other two participants. This contrasts with the standard video conferencing perspective in which participants look straight ahead. In this arrangement the person who is being addressed see the other person turn their head towards themselves; conversely when the speaker is addressing the third party, the speaker's head is seen to turn in the other direction towards the third party.
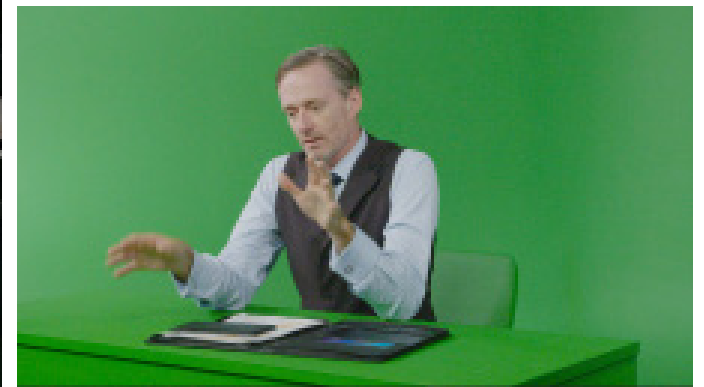
In the studio the green background was replaced by a virtual environment. The virtual tribunal room was created by PTW Architects using the architecture software Autodesk Revit.
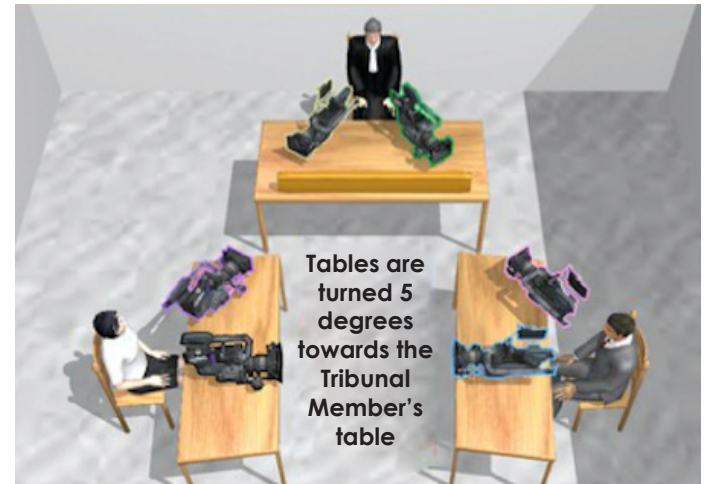
FIGURE 7

Virtual court proof of concept study, 2018.
View of defendant from the perspectives of tribunal member and applicant.

Photograph: Vincent Tay

FIGURE 8

Virtual court proof of concept study, 2018.
View of applicant from the perspectives of defendant and tribunal member.

Photograph: Vincent Tay

FIGURE 9

Virtual court proof of concept study, 2018.
Previz of three positions from above, showing configuration of tables and cameras.

Image: Vincent Tay

FIGURE 10

Virtual court proof of concept study, 2018.

Tribunal member embedded in virtual tribunal room. The rendition demonstrates an elevated Bench, an ergonomic chair, a coat of arms and a view over trees – all produced by software. The actor actually sat in a windowless green screen room on a plain green chair in front of a green desk, as shown in Figure 6.

Rendered by Vincent Tay

One version was a traditional edit of the footage. Choosing the best takes, Vincent Tay intercut between the various points of view, adjusted the sound to improve clarity and consistency, and created a film which can be viewed here:

https://vimeo.com/272475509/
Password: virtualcourt

FIGURE 11

Virtual court proof of concept study, 2018.

The defendant (with witness alongside) and applicant embedded into a virtual tribunal room. The background, chairs and tables were all created by software. The actors were actually sitting on green chairs and resting their hands on green tables. The litigants are provided with a plainer background than that given the tribunal member.

Rendered by Vincent Tay

A second version of the performance was rendered by Volker Settgast of Fraunhofer Austria using a video games engine, Unity. This provided a more flexible application than a film: a viewer can choose which camera to use to see the scene, and move the view around from left to right within each frame – while the video is playing.

This flexibility would allow an external party viewing the live stream of a hearing to take the position of the litigant who is not speaking and either include both the tribunal member and other litigant within the frame, or place the other litigant in the centre of the frame. Alternatively the external viewer could take the viewpoint of the speaker and watch the reaction of the other party to what is said.

FIGURE 12

Virtual court proof of concept study, 2018.

The applicant and tribunal member embedded into a virtual tribunal room.
This rendition allows the viewer to change the framing of the scene, from left to right, and change the camera from which the action is seen.

Rendered by Volker Settgast, using the games engine Unity

Welcome to the virtual court! You will see a tribunal hearing - a neighbourhood dispute about a tree. Litigants glare at each other across the room, interrupt and point at each other, and turn to listen to the presiding member (judge) at the front of the room trying to keep order. Except that each of them is actually in front of a camera somewhere else. They come together into a virtual environment created entirely by software. We see the drama through the eyes of the tribunal member and the litigants.

Please use the buttons below on the left to choose Your point of view. You can start the playback by clicking the play button on the bottom right.

| Tribunal Member | Litigant 1 | Litigant 2 | | 00:00 | | Play | Stop |

FIGURE 13

Virtual court proof of concept study, 2018.

Instructions on use from standalone application. Note the three tabs on the bottom left of the screen listing the three possible camera views. Because this was pre-recorded and not live there is also the capacity to jump to particular parts of the hearing by sliding a bar.

Rendered by Volker Settgast, using the games engine Unity

The point of view is chosen by clicking on buttons at the bottom left of the video, and the camera angle is manipulated by holding down the left mouse button and dragging, which causes the camera angle to be altered. This style of rendition provides an insight into the multiple ways in which virtual environments can be seen; the individual viewer not the filmmaker chooses the viewpoint from which to see the action.

FIGURE 14

Virtual court proof of concept study, 2018.

View of the hearing from the perspective of the tribunal member. Note the empty witness box. To keep the number of camera angles to a minimum the witness position was not used at this stage of the research. It was however used in the subsequent pilot test, increasing the number of camera angles from 6 to 12.

Rendered by Volker Settgast, using the games engine, Unity

FIGURE 15

Virtual court proof of concept study, 2018.

View of the hearing from the perspective of the applicant. The actual distance between the camera and the other two parties was exactly three metres, but the distance looks like about six metres.

Rendered by Volker Settgast, using the games engine, Unity.

The proof of concept allowed us to see how a virtual hearing could be managed, as well as how difficult it would be to do in real time. Getting research participants not to have any green on their clothing and ensuring chairs and tables are identical in height and shape to those created by the software are logistical challenges. The additional bandwidth required to embed the virtual background as well as manage multiple input and output streams might also be difficult without fast and reliable broadband and a dedicated film crew. Since the proof of concept had shown it was possible to create a hearing in virtual reality the subsequent pilot study left aside the virtual environment part of the study and focused on the experience of the participants.

The pilot study itself was carried out over ten days, with 40 performances and 181 research participants. Twenty performances used the virtual condition (N= 94) and twenty the face to face condition (N=87). Each performance lasted from 30 to 40 minutes. The first 15 and final five conditions were in the face to face setting (days 1-3 and 9-10), with the intermediate 20 conditions using a virtual facility . This facility consisted of four immersive pods ([4]described in detail below),connected via a streaming media platform. A civil dispute between neighbours provided the scenario for the hearing, with a member of the (unnamed) state civil and administrative tribunal presiding. Compared to the proof of concept stage, there were now four rather than three positions.

The setup was a square-shaped seating arrangement, with the tribunal member at the top of the square, the applicant (or 'litigant') at the side of the square to the tribunal member's left, the defendant at the side of the square to the tribunal member's right and the witness at the bottom of the square facing the tribunal member. This meant that there were three screens and three cameras for each participant, totalling 12 screens and 12 cameras. This required 12 input channels (cables carrying the signal from camera to the media platform) and 12 output channels (cables carrying the signal from media platform to screen).

The virtual court aimed to create, for the participants, the sensation of sitting together in the same space, even though in reality, each of them sat alone in front of three screens, angled to create an immersive setting which feels three-dimensional. The requirements to achieve this are:

- the images of the other participants on the screens have to be live-sized;

- the participants must be able to talk to each other naturally, hear each other clearly and the live stream should be able to cope with participants talking over each other;

- the participants must have eye contact with each other when interacting; and

- the participants must be able to see the other two participants making eye contact with each other when they are interacting (in other words looking away from the person observing the interaction).

As with the proof of concept stage of the study, the script involved two litigants (an applicant and a defendant), and a tribunal member. Rather than a single witness, the script now called for five witnesses. With four rather than three positions as in the proof of concept, instead of sitting next to the litigant, witnesses now had their own dedicated position opposite the tribunal member.

The experiment also had an alternate face-to-face condition, involving all participants physically sitting in a room together, in the same square-shaped seating arrangement and scheduled to run alternately with the virtual condition.

[4]This allowed for the possibility that the performance of the actors could improve over the 40 performances. It also reflected the reality that the virtual facility was not ready until the end of day 3.
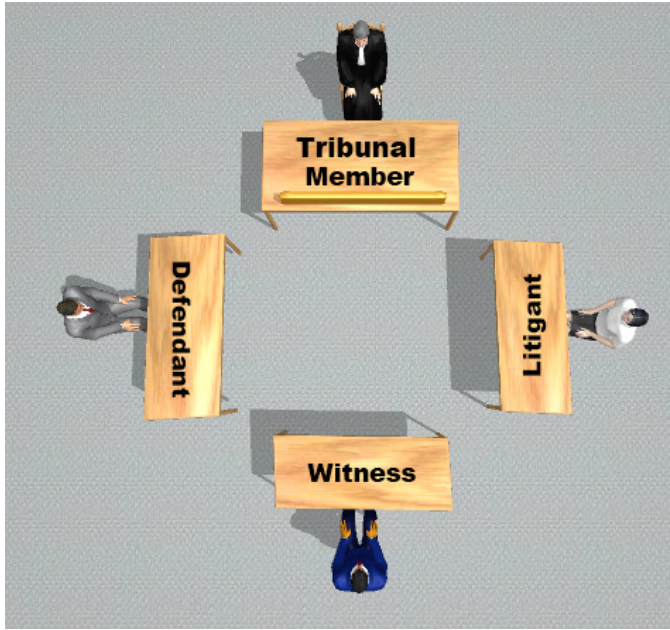
FIGURE 16

Pilot study, 2018.

Square configuration of the tribunal room. This arrangement was the same in both the virtual and physical settings. Note the addition of the witness position to the three-table configuration used in the proof of concept.

Previz by Vincent Tay

FIGURE 17

Pilot study, 2018.

Planned arrangement of each immersive pod. The tribunal member would see the witness on the central screen and the two litigants on either side. Each litigant would see their opponent opposite them and the tribunal member on one side and the witness on the other. The witness would see the tribunal member on the central screen and the two litigants on either side. The participants were to be two metres away from the screen. In practice, owing to the type of cameras that were made available, the distance away was only one metre. This fortuitous accident probably made the experience more immersive than it might have been otherwise.

Previz by Vincent Tay

There were several logistical compromises necessary to pull off such a complex feat. Each screen was planned to have its own dedicated loud speaker, which would carry the audio of the associated live stream to that speaker, thus providing directional sound. (If the person on the left screen spoke the sound would come from the left). In the event each pod received a single sound channel containing a mix of audio from the other three participants. In practice most films use central loudspeakers for conversations, so the plan to split the sound may have been unnecessary.

The Marshall cameras specified for the study had 6mm lenses, the focal length required for participants to sit two metres away from the screen to get life-size images of the other participants. The cameras made available had 3.7mm lenses requiring the cameras to be placed about one metre away from the participants. This required the cameras to be placed slightly off-centre to ensure that the images of other participants included only the pod, not the background of the room. The camera at that angle made direct eye line contact difficult to achieve, particularly between a participant and those on their left or right screens. For the witnesses, it was the tribunal member who asked them questions, and he was on the central screen for which eye contact was largely achieved.

Rather than embedding the participants in a virtual environment (as in the proof of concept stage) the witnesses and litigants sat in front of plain, light-coloured cloth. The effect of this was quite similar to that of the virtual environment background for the litigants. It was only the tribunal member who no longer had a symbolically rich background. The background for the tribunal member was cloth of a similar colour to that of the litigants but of better quality, and with the addition of two black fabric strips framing him to add a sign of authority.

Recruited by a market research company, research participants were assigned either to be the defendant (second litigant) or one of the witnesses. The tribunal member ('Mr Pratt') and applicant or first litigant ('Mr Karim') were both actors, so the defendant position ('Ms Kaye') was filled by a research participant, the first woman to turn up to each performance. All the other research participants became witnesses –this varied between two and five (Mean = 3.9).

Ideally the same number of witnesses should have been present at each performance, but the availability of research participants was affected by difficulty experienced by some participants in finding the location in Werrington South the and sometimes wild weather. The length of performance varied between 25 and 35 minutes. When the number of witnesses dropped below four, members of the research team played the additional roles, to ensure research participants had a roughly equivalent hearing time. (Data about responses to the performances of members of the research team were not collected).

Half of the hearings took place in the face-to-face environment (illustrated above): a medium-size (12 by 8 metres) class room set up as a tribunal room. Participants sat at desks in a hollow square configuration. The witness faced the tribunal member, three metres away. The two litigants sat at right angles to the tribunal chair, facing each other, also three metres apart. The witnesses, while they were waiting, sat just behind and to the side of the witness box. This meant they were about five metres away from the tribunal member and the applicant, but only three metres away from 'Ms Kaye', the defendant, and two metres away from the witness box.

FIGURE 18

PIlot study, 2018.

An immersive pod seen from above. The tribunal member is turning to his right to address the applicant. The defendant sees him looking away from her. The touching screens are angled to create a seamless view of the virtual court.

Photograph: Digital Futures team, Western Sydney University

The virtual condition involved four pods, each with three 40 inch screens about one metre away from the pod's occupant. The two side screens touched the central screen at an angle of about 45 degrees. This provided an immersive experience with screens covering 120 degrees of the participant's vista, so that the participant had a constant visual reminder of the presence of the other participants, but nobody else. The long cloth screen behind participants added an additional sense of privacy. Even if the short distance between participants and screens restricted the apparent eye contact between participants, it is likely this was countered by the additional sense of immersion it provided.

The three screens provided an image of each of the other participants, each with an associated decoder, a camera on top of each screen with associated encoder, and studio-quality microphones and lighting. The virtual court emulated the hollow square configuration of the physical court – the tribunal member faced the witness and the two litigants faced each other. The tribunal member for example had one camera mounted on top of the screen facing him: this provided the image for the person 'opposite' him in the hollow square, in this case the witness. The camera on top of the right-hand screen of the tribunal member provided the image to litigant 1, while the camera on top of the right-hand screen sent his image to litigant 2. With screens one metre away from participants other participants appeared to be about two metres distant.

FIGURE 19

PIlot study, 2018.

The control condition – a face to face tribunal room, with the tribunal member questioning a witness. The room is configured as a square, with the two litigants three metres away from each other. The witness is four metres away from the tribunal member owing to the size of the desks available.

Photograph: Vincent Tay

The technology infrastructure brought together items from several different companies: a Cisco router, the media platform and associated encoders and decoders from Haivision to manage the video streaming, Marshall cameras for the vision, a Biamp audio bridge (for the sound distribution and echo cancellation) and JBL studio monitors for the audio. This configuration produced HD quality images and clear sound quality, with very low latency. A video walk around of the configuration is available at:

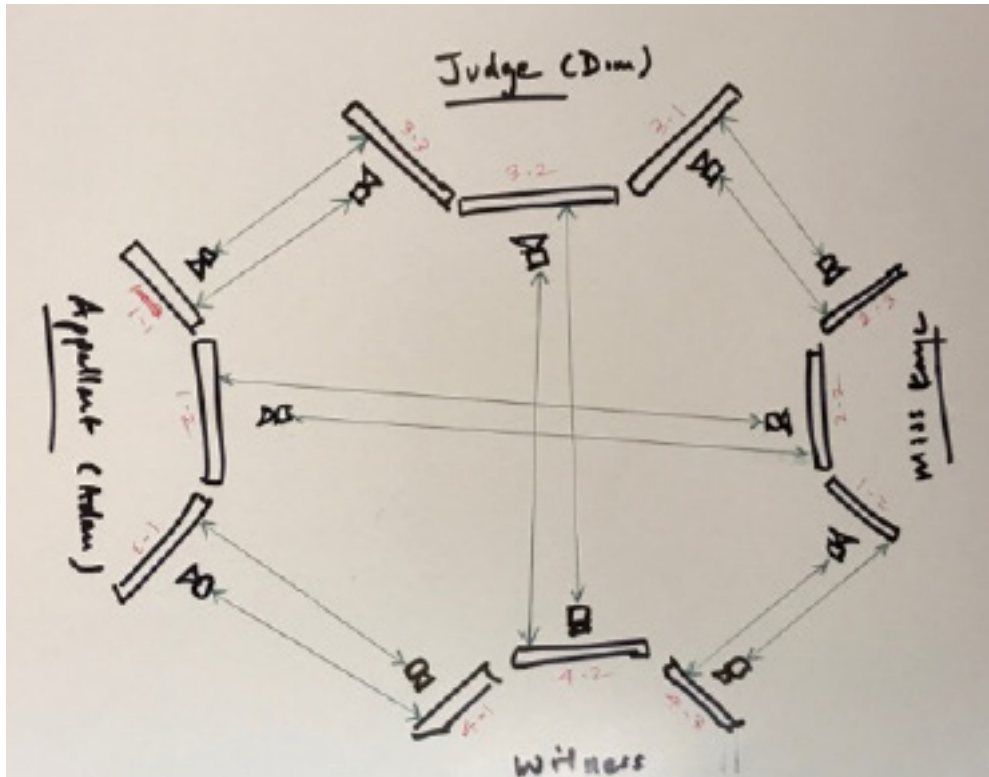https://vimeo.com/302408055/
Password: future

FIGURE 20

PIlot study, 2018.

Diagram showing the relationship between the 12 cameras and 12 screens that form the network that makes possible the virtual court.

Drawing: Vincent Tay

'Ms Kaye', like 'Mr Pratt' and 'Mr Karim', had her own pod. Witnesses meanwhile used the witness pod in turn during their testimony, i.e. for about five minutes each. They began by sitting in a control room watching the performance of the two litigants on 3 x 40 inch screens on a table in front of them. They sat about five metres away from the table, and the screens were almost in a straight line rather than angled as they were in a pod. They would have been conscious of the other witnesses watching with them, as well as the film director monitoring the technology, or research staff walking in and out of the room. Unlike the pod, this was clearly public space. Of the research participants 'Ms Kaye' was the only one who experienced a fully immersive condition for the duration of the performance.

FIGURE 21

PIlot study, 2018.

The view of a virtual pod from the side. Note the cloth hanging behind the pod, the microphone above, the speaker on cardboard boxes at the back, cameras on top of each screen, encoders and decoders associated with each screen and metres of cables. This was a temporary installation put together in two days and dismantled in an afternoon.

Photo: Vincent Tay

When witnesses were called to testify they were taken to an adjoining room along a corridor, where they entered the witness pod. Here they were questioned by the tribunal member who appeared on the screen facing them; on the screens on either side they could see the two litigants. They then were escorted back to the viewing room to watch the remaining witnesses. Any individual witness therefore spent about 80 per cent of their time in the viewing room.

In retrospect it would have been useful to ask them to comment separately on their experience of the pod and their experience in the viewing room, so their reactions to the two different environments could be compared.

Immediately after taking part in the hearing, research participants completed a questionnaire. This asked them to rate the quality of communication, engagement and environment as well as give their assessment of the tribunal member, 'Mr Pratt', the first litigant, 'Mr Karim', the second litigant 'Ms Kaye' (for witnesses only), the witnesses (for witnesses, other witnesses only).

Items from the questionnaires were grouped based on common themes, summed to form scales, and the scales standardised (with means of 0 and standard deviations of 1) so they use the same metric.

The number of witnesses (N= 140) was enough to detect a medium-level effect, of .3. With the smaller number of litigants (N=40) it was possible to detect only large effect sizes (of greater than approximately .75, for comparisons between litigants or .5 for comparisons between litigants in virtual condition and all participants in face to face conditions). This was a pilot test, so was not expected that many of the differences would be large enough to allow us to conclude whether or not there would in fact be a real difference if we repeated the study an infinite number of times.

COMMUNICATION

One of the key outcome measures was communication. The scenario involved verbal interactions, not navigation or design tasks, or some of the other activities typically conducted with virtual reality environments. Of the six items in this scale, three refer to how other participants came across – being to see and hear them and tell who was speaking; two referred to the person's ability to follow the process or the conversation. Only one refers to the person's own experience of communicating – how easy it was to tell their own story. The communication measure (unlike the participation measure below) mostly gives us information about how well others communicated.

The following six items were used to create a communication scale:

• How easy was it for you to follow the process?

• I could follow the conversation easily

• I could hear the other participants clearly

• I could immediately tell who was speaking

• I could see the other participants clearly

• I found it reasonably easy to tell my story.

Witnesses who took part in a face-to-face environment gave significantly higher ratings to the quality of the communication (Mean =.11) than those who were in the virtual condition (Mean = -.31, t = 2.4, df = 137, p = .02) . On the other hand, litigants (research participants playing the role of 'Ms Kaye' gave higher ratings when they were in the virtual condition (.55 vs .21, Mann-Whitney U test = .07) [5]. Since we do not expect that the virtual condition is really better than the face to face one, the most appropriate inference to draw from the comparison for 'Ms Kaye' is that the quality of communication experienced by the litigants in the pod was no worse than that of their counterparts in the physical tribunal room. [6]

[5] Because witnesses provided information on one or more of their colleagues, these observations were not statistically independent. (In other words, witnesses may show more consistency between their scores than would be expected if the measures came from different people). There was also a group effect, since each performance was necessarily different given the different composition of participants. A mixed methods analysis was performed, adjusting for both types of group effects. None of these additional effects were significant and it had no effect on the estimated fixed effect parameters.

[6] The small number of persons in each cell for the litigant positions (20 in each of 2 cells) is generally regarded as too small to carry out a valid t-test – 30 is the generally accepted minimum size. Because this is a pilot test, the direction of the difference is of interest, so the differences are generally reported, without significance tests. In this case a more appropriate test is used, the Mann-Witney test, but even with this large difference between the two conditions in the sample, the differences do not quite achieve statistical significance.

For the witnesses however, we can reasonably conclude that they experienced the quality of the communication as worse in the virtual environment. Which virtual environment the person was in therefore made a difference – an immersive pod for the whole performance seems to be better received in terms of communication quality than an open observation room (with a short experience in a pod). It should be noted that the length of interview of 'Ms Kaye' was equivalent to those of the other participants; what distinguished 'Ms Kaye' from the others was that she observed all the rest of the performance from the privacy – and immersive environment- of her pod. As noted above, the communication scale largely measures observations of how others performed or were treated. The participation scale, by contrast, examines how the participants felt about their own role in the process.

FIGURE 22.1

Pilot study, 2018.

Configuration of second courtroom in Brisbane Supreme and District Courts, view from behind prosecutor towards judge (on the middle screen) and defence table (on the screen in the far right of the room.)

Photo: Paul Katsieris

PARTICIPATION

As well as commenting on the formal aspects of the communication, research participants assessed how they felt when they were taking part themselves: their sense of involvement, level of comfort, distraction or concentration, stress and anxiety, whether the experience was threatening or challenging, and whether they were treated respectfully. Unlike the communication measures, the research participants are reporting on their own experience of the process.

The 11 items are listed below:
- Did you feel uncomfortable during the process?

- I felt anxious when I was asked a question

- I felt that my participation was valued

- I was treated respectfully by the tribunal member

- Overall it was a positive experience

- To what extent did you find the experience challenging?

- To what extent did you find this experience threatening?

- Did you "zone out" or lose concentration at times?

- Were you distracted by anything during the hearing?

- I felt completely involved in the process.

As with the communication scale, witnesses in the virtual condition (-.24) rated participation significantly lower than those who took part in the face to face condition (+.25, t = 3.04, df = 137, p = .003). Litigants, however, rated it slightly (but not significantly) higher than their counterparts who took part in the face to face condition (.12 vs-.05). Why would the experience for witnesses be worse if they took part in the video condition, while for litigants it would be the same or better? The litigant had a relatively quiet private space where it was easier to concentrate, so it is easy to see why they should report lower levels of distraction and greater recognition by the tribunal member than witnesses who were in a busy room with several others. Even if they might have found the experience a little daunting to start with, they had longer to get used to it.

ENVIRONMENT

Research participants were asked how they experienced different aspects of their environment, including how natural, relaxing or intimidating it seemed, the adequacy of the space they were given, and their own comfort. Like the participation measure this asks them about their own experience, but about the space rather than the process.

The seven items are listed below:

- I found the environment relaxing
- I felt comfortable in my space
- I felt trapped in there
- I found the environment intimidating
- I had enough personal space
- The distance between me and the other participants was about right
- The environment seemed natural to me.

As with both of the other scales, witnesses clearly preferred being in a face to face environment to the virtual one (.28 vs -.30, t = 3.6, df = 138, p = .0001). However, those who stayed in the immersive pod for the whole performance, the research participants who played the role of Ms Kaye, seemed to prefer being in a virtual environment (.25 vs -.11, difference not significant).

The pattern for all three hearing quality measures – communication, participation and environment – was fairly similar. Witnesses gave higher ratings on these measures to the face to face environment (by an average of .50), while litigants preferred the virtual environment (by an average of .29).

One observer (in the shaded box) talks about how he experienced the immersive pod. He compares the consistent images of the three other participants with the shifting images he was accustomed to in a videoconference. On the other hand, he points to the aspects of the temporary installation that made the setting less convincing.

It was a striking experience to sit in the prototype Virtual Reality Dispute Resolution booth and to talk with fellow attendees at the demonstration. The booth convincingly recreated the look, sound and feel of face-to-face communication. The key dimension was eye contact. Because of the placement of screen and camera, attendees appeared to look at one another when they were spoken to. It was possible to make side glances, to gaze with steely determination in another person's face, to look away in embarrassment or observe when other people weren't paying attention. In the usual teleconference situation, the image of the person talking enlarges, or the border of the image is highlighted. In the booth, the person simply spoke and we would all turn to look at them. The result was a rich, natural, emotionally subtle form of communication. There were nonetheless differences between sitting in the booth and meeting in a physical dispute resolution centre. But these differences were not caused so much by the technology as by the location of the demonstration. We were sitting in repurposed classrooms, surrounded by exposed wires and drapery. I would be intrigued to experience the system in a more official setting, with more of the technology concealed.

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RESPONSE TO AUTHORITY

The authority figure in the room was clearly the tribunal member. He decided the order of speaking, conducted the enquiry, summoned and thanked witnesses and announced the end of the hearing. To demonstrate his authority the script had him engaging in a fiery exchange with the first litigant (a fellow actor), resulting in a reprimand. In the face to face environment, the tribunal member had no visible signs of authority – he was at the same level as everyone else, and had the same furniture. In the virtual condition, the tribunal member was given a slighter brighter (and more expensive) background fabric behind him as well as two black strips behind him. The actor who played the tribunal member was tall and chosen for his ability to present a judicial demeanour.

The tribunal member was rated more highly when research participants sat in the same physical room as him than when they saw him on a screen. If research participants were assigned to the face to face condition, they were significantly more likely than those assigned to the virtual condition to consider the tribunal member to be effective (.29 v -.27), credible (.20 vs -.18) and fair (.22 vs - .20)[7].

Litigants and witnesses showed a similar pattern (unlike for the hearing quality measures, where they appeared to show different responses). While a fully immersive environment gave the litigant a more positive view of the quality of communication, participation and environment than witnesses who had a less immersive experience, it seemed to have no impact on how they felt about the person who chaired the proceedings.

A justice system is more likely to be considered legitimate if the person who manages the process and makes the decisions is regarded as fair or at least neutral.   This study suggests that a fully virtual hearing may be less fair – in the eyes of participants - than one in which all the parties are physically present. This could mean that the decision is less likely to be accepted, particularly if the competency and credibility of the decision-maker is called into question. Putting strips behind the tribunal member was clearly not enough to compensate for any loss of authority resulting from the on-line environment. A comparison of the same actor playing his role in the elaborate virtual environment of the proof of concept stage with his performance in the pilot stage could see whether a more powerful background could make a difference to the perceived authority of the tribunal member.

[7] Effective=Effective, Well-informed, knowledgeable, well-prepared
Credible=Confident, Convincing, credible, believable, honest
Fair=respectful, polite, friendly, likeable, fair, neutral

RESPONSES TO OTHER PARTICIPANTS

The tribunal member was not the only participant to be seen more negatively if they appeared on a screen. Witnesses found other witnesses less credible when they saw them on a screen than in the physical hearing room (Mean=-.25 vs .13, t = 2.3, df = 139, p = .02). They also found 'Ms Kaye' (their fellow research participant) less credible when she was in the virtual condition (-.25 vs .28, t = 3.3, df = 139, p = .001). However, 'Mr Karim', played by an actor, was rated almost the same in credibility between witnesses assigned to the different conditions (Mean=.02 face to face, -.08 virtual).

For the litigants on the other hand – the research participants who played 'Ms Kaye' – being in the virtual condition did not seem to reduce credibility. Witnesses were seen as equally credible in the two conditions (.24 vs .24), while 'Mr Karim' may have even been more credible when seen on the screen (.25 vs -.01).

FIGURE 23

Pilot study, 2018.

Example of what a witness sees when in an immersive pod.

Photo: Digital Futures team, Western Sydney University

CONCLUSIONS

Conducting justice hearings in virtual environments may have important impacts on how participants experience the quality of communication, level of participation and the comfort of the environment. What this pilot study suggests is that there is likely to be no disadvantage for those who take part from the immersive environment of a virtual pod (in this case those who acted as 'Ms Kaye'). However, for those who spend most of the hearing in an observation room looking at relatively small screens, occupying a relatively small part of their vista, there is a clear and significant disadvantage.

On all of the key features of the hearing communication, participation and environment – witnesses give significantly lower rankings than their counterparts who experienced hearings in a face to face environment. They also are more likely to distrust the evidence of witnesses or of the respondent, all of whom were also research participants. This contradicts some previous research which suggests that the mode of hearing does not affect the perceived credibility of witnesses[8].

Observing the hearing from the observation room could be seen as similar to observing a typical video conference in which three images are presented on a flat screen; the difference here was that the three images were in a line rather than arrayed in a triangle (or three squares on a square grid) on a single screen. On the other hand, the small size of the screens relative to the distance meant it was less immersive than a Cisco telepresence suite, with three large screens presenting life-size images of people looking forward, and an apparent distance of about two metres.

Indeed, the virtual pod used in this study is in some ways a variation of the telepresence suite, with the addition of the additional sightlines to allow the viewer to see others turning to talk to one another. Whether the additional bandwidth required to achieve this makes a difference to the experience of the lay participant is a matter for further testing. It might be argued that in a civil law system, or a tribunal hearing where the presiding officer asks most of the questions, the witness experience would be similar using the two technologies: they just look ahead to make eye contact with their questioner. However, in jurisdictions where lawyers on either side ask questions, being required to turn to face the questioner would probably create an environment for the witness that better replicates the courtroom situation.

How to provide as immersive an experience for observers as for participants is therefore one of the challenges emerging from this study. It would have been possible to get the witnesses in this study to sit in a waiting room and go into their immersive pod for five minutes of questioning, thus avoiding the less impressive observation room altogether. (In the face to face condition, witnesses would also have had to sit outside the hearing room until called, and then retire). This could have increased our ability to generalise about the impact of the immersive pod, since that was the primary object of our study. On the other hand, it would not have been possible for them to offer responses about the two litigants (since they did not speak for the most part during witness interviews), or to offer strong conclusions about the conduct of the tribunal member (since his only vigorous interactions were largely scripted ones he had with the applicant).

Based on one of our previous studies, the Gateways study described above, we assumed it would take at least ten minutes for a participant to become accustomed to the environment, so unless we halved the number of witnesses and doubled the length of their interview, we thought we were unlikely to get reliable results.

In the event, having a strong negative reaction to the observation room was a valuable, if unexpected finding. It made us realise that a video-enabled hearing could in fact be measurably worse, in terms of key measures, than a face to face hearing, regardless of what previous literature might suggest. This points to the importance of developing strong guidelines to ensure that any implementation of a virtual court does not cause harm either to the lay participants or indeed to the credibility of the process[9]. It is quite possible that many current uses of video links in court are indeed harmful, if the findings of this pilot study are correct. Some outbursts from remote participants that have been previously attributed to the 'disinhibiting' effect of the technology might better be characterised as the 'authority undermining' impact of a poorly implemented technology.

[8] Taylor, Natalie & Australian Institute of Criminology (2007). Juror attitudes and biases in sexual assault cases. Australian Institute of Criminology, Canberra

[9] This is consistent with the claims made from the qualitative Ph.D. study by Carolyn McKay in The Pixelated Prisoner: Prison video links, court 'appearance' and the justice matrix (2018) Routledge.

The immersive pods are likely to require considerable fine-tuning to improve their comfort and look, but as far as the participants in this study are concerned, the experience seemed to be equivalent to a face to face one. The replacement of the specified cameras, requiring shorter distances between participants and screens than planned, may have produced the ideal distances for a hearing pod, almost by accident. Cameras that better produce simulated eye contact and sound systems that communicate the direction of sound could possibly enhance the realism of the experience, but the fact that visitors (like prosecutors and judges) did not notice a problem could mean that the study reached a critical threshold that does not actually warrant much further technical enhancement. Whether the low latency and high-quality sound and vision achieved in this study can be reproduced over internet links of varying quality is perhaps a more pressing issue for research in the short term.

For future court and tribunal hearings there are likely to be a mixture of different technological configurations. Some will require simple two-way links between a courtroom and a remote witness room   or video room in a detention facility. Guidelines for improving the design of these spaces and the technologies to connect them were provided in our 2009 Gateways study (although the guidelines need updating).

Some hearings will privilege access over quality, for example family violence applications, and permit applicants to use simple devices like tablets or even smartphones. There will, however, be an increasing number of matters where multiple participants may take part from different locations, coming together either into a physical courtroom (the 'distributed courtroom' of our 2011 study) or where no physical courtroom is required (the virtual courtroom). Which of these is more appropriate will be a matter for the relevant judicial officer or justice system to determine, so having a range of spaces available will allow the demand for the best mix of hearing spaces to be determined.

An important issue will continue to be open justice: allowing the public to be present at a hearing. This might be satisfactorily addressed by streaming the video, if 'presence' is understood broadly. Alternatively, the pods could be sufficiently large to accommodate a number of members of the public; the standard remote witness rooms in most Austrian courts could provide a model for this. However, the situation where family co-location with one of the participants is most in demand is where the person is in custody. This is a current issue, not one raised by multi-channel video technology.

What was unexpected in the study was the apparent undermining of authority that came with the virtual environment. For a judicial (or quasi-judicial) officer to be considered less fair and less credible than they would otherwise be seen is a cause for concern. The minor adjustments we made to the virtual pod for the tribunal member was clearly not enough. Whether larger chairs,

robes or symbols of authority (like a coat of arms) would remedy the situation remains to be seen. Fortunately, in the proof of concept the tribunal member was in a particularly impressive setting, one that was in fact rather grander than a tribunal would actually use. A future part of this project could compare the apparent credibility of the tribunal member in the two settings, using the films already made.

The pilot study demonstrated the technical possibility of a high-quality live streamed hearing with 12 input and 12 output channels, using immersive pods that participants seemed to agree were as good on all key measures as an equivalent face to face setting. It also identified possible flaws in a video-supported hearing where the environment is less than immersive. The study raised serious questions about the way the process itself and the institutions of justice might potentially be diminished by an overly-eager take-up of virtual court technologies without ongoing user testing and a systematic implementation strategy.

VIRTUAL
COURT STUDY:

REPORT OF A
PILOT TEST 2018