'Seeding a Lead':
Exploring the Live Theatre Industry's Reception
of a Pre-Market Canadian Display Technology

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Abstract: This article shares the results of a research project conducted by a multidisciplinary group formed from theatre studies, digital media, and business and technology in 2009. The research story is an unusual one for the theatre. It features access to pre-market digital display technologies for play-making, a combination of industry and federal research funding support, and a combination of artistic and business interrogation of primary stakeholders in the live theatre, its culturally-networked industries, and theatre education communities.

Introduction

On July 6, 2009, at the Lower Ossington Theatre in Toronto, Canada, ninety invitation-only audience members attended one of five consecutive performances of an original twenty-minute theatre piece that featured a Canadian pre-market digital display technology by Christie Digital Systems: MicroTiles (http://microtiles.christiedigital.com). The audience was comprised of members of professional theatre companies in Southern Ontario, both large and small, commercial and experimental, established and new: the Stratford and Shaw Festivals, the Grand and Blythe Theatres, Mirvish Productions, Theatre Passe Muraille, the Factory and Tarragon Theatres, Lorraine Kisma TYP, Elgin Winter Garden, Theatre Gargantua, Nightwood Theatre, Studio 180, and the Fu-Gen Asian, Obsidian, and Driftwood Theatres. Representing these companies were artistic directors, technical directors, general managers and managing directors, directors and associate directors, stage managers, production managers, technical producers, head designers, and lighting and set designers. In addition, several post-secondary theatre program faculty attended the event (Universities of Toronto, York, Waterloo, Brock, Ryerson, Humber and Sheridan Colleges), as well as a small number of theatrical/ installation-minded groups, culturally-'networked' with the theatre industry: the Royal Ontario Museum, Harbourfront, City of Toronto Events, Luminato, the Canadian Opera Company, Opera Atelier, the National Film Board, Sony Centre, and Cirque du Soleil. After each performance, the audience members changed roles, with two-thirds of them becoming research subjects for one of three kinds of primary research data gatherings: a written survey or one of two kinds of face-to-face

interviews that focused on the artistic and business opportunities afforded by the digital display technology.

Two goals, then, drove this performance-research 'event': the first goal was to 'seed' the MicroTile digital display technology – six months before its commercial release – into a promising receptor community of 'lead users'[1]: namely, theatre professionals, theatre educators, and culturally networked users, many of whom face needs and devise technological solutions that are both typical and in advance – or in the lead – of other groups; and the second, to gather data about how this particular technology might extend the industry's artistic vision and business plans. Put simply, could a Canadian technology and a Canadian cultural industry find a mutually beneficial fit? And could this fit tell us something about the theatre's technology shapers, its social networks for disseminating best practices in technology, and potentially, its ability to attract other artistic and business communities to this technology?

To design this performance-research event, a multidisciplinary research team from Ryerson University and the University of Waterloo came together: Gerd Hauck (theatre), Jill Tomasson Goodwin and David Goodwin (qualitative interviews), Paul Guild and Doug Sparkes (repertory grid interviews), and Glenn Stillar (video production and dissemination), as well as numerous graduate and undergraduate students in theatre, digital media, and business and technology studies. What began as an impromptu remark about the MicroTiles by one of Christie Digital's executive officers – ,Theatre might find the technical features here visually compelling for creating presence, – developed into three practical, but key components of the plan: (1) Christie Digital's agreement to loan the pre-market technology for the theatrical piece and provide access to engineering expertise; (2) funding from Christie Digital and the Social Sciences and Humanities Research Council, totaling $250,000; and (3) the assembly of the research team to cover the artistic, technical, and research pieces. Assembling the funding, creating the theatre piece, coordinating the research event with access to the MicroTiles took the better part of one year.

We chose to study the theatre reception of MicroTiles (as opposed to other display technologies) for three reasons. First, we had free access to a pre-market technology for which we anticipated numerous theatrical applications,[2] and were curious about what ideas might be sparked by 'seeding' the technology into the theatre community. Second, our industry partner, Christie Digital Systems (Canada), provided us with the opportunity to collaborate with engineers on a video display system which, to our mind, had wide creative potential in performance environments and which superseded the video display systems employed in performances in the past one hundred years[3]. Third, we were given the opportunity to provide feedback on the design and construction of MicroTiles to Christie engineers in order to accommodate theatrical applications or needs for this device – even though MicroTiles were designed primarily for commercial displays (in shopping malls, airports, and public spaces).

Rather than recount the logistics and development of the event, though, this article treats the research project as a case study with a double focus. First, it lays out the

theoretical question for the project: how might this instance of a technology contribute to experimentation in the theatrical presentation and exploration of 'presence'?[4] Second, it reports on primary field research concerning the artistic and business responses of the audience members from the theatre industry.

I.   Theatrical Presence and Technology

The relationship between theatre and technology has always been rocky, with theatre traditionalists considering technology advances too costly, too easy, too weird, or too distracting. From the first use of pulley systems to facilitate the *mechane* to transport the Greek Gods onto the stage, to the chariot-and-pole system of the Renaissance, to the use of electric lighting in the 19th century, audiences have both applauded and derided the use of technology in theatrical experiences. During the past twenty to thirty years, as a wide range of digital technologies have infiltrated theatre, we find the same tension. Opponents of 'mediatized' theatre commonly argue that technology creates too great a distance from the sanctity of the non-mediatized, ephemeral, 'pure' performance which, according to some theatre scholars, constitutes its ontology (see, for instance, Phelan, 146).[5] By contrast, proponents of mediatized theatre challenge this idea of purity: ,the idea that the theatre's 'liveness' is – in and of itself – a virtue, a source of automatic, unearned moral superiority to film and television, is sheer bourgeois sentimentality.,[6] Of late, most critics accept the inclusion of some form of digital mediatization as the 'new normal' and have shifted their focus to exploring the myriad issues emerging from the 'in-between spaces,' which Freda Chapple and Chiel Kattenbelt elaborate upon in their important 2006 work, *Intermediality in Theatre and Performance*.

The purpose of this article is not to wade deeper into this debate or to claim that MicroTiles have the capacity – or the objective – to out-theatricalize live theatre as we know it, perhaps replacing it with something snazzier, sexier, more reproducible, more accessible. Instead, we wish to demonstrate that the extensive theatrical capabilities afforded by MicroTiles (and similar technologies) are too plentiful to ignore and therefore deserve closer examination, both in terms of their artistic potential and their economic benefits. To focus our investigation, however, we concentrate here on one aspect of the use of MicroTiles – their capacity to enhance significantly the sense of presence (or, in the words of Lombard and Ditton, the ,perceptual illusion of non-mediation,) – when compared with other digital display technologies.

Because generally ,the greater the number of human senses for which a medium provides stimulation…the greater the capability of the medium to produce a sense of presence, (Lombard and Ditton), we need to take a closer look at the characteristics of visual displays which facilitate presence. These include image size, consistent quality of image output, image resolution, colour range, colour saturation, image distance, viewing angle, and dimensionality. To expand this concept: the larger an image size can extend without distortion, the more the display fills the viewer's perceptual field, increasing the power of the viewing experience;[7] the more consistent the image quality, the more 'unmediated' the experience will feel, since fluctuations in quality become 'artifacts' that, by their very nature, point out the mediatized nature of the display; the higher the image

resolution is, the more compelling the experience will be, since dense visualization will appear less pixelated, and therefore less mediated; the more extensive the colour range (i.e. the wider the hues available) and the greater the colour saturation capacity (the ability to represent hues undilated by white, black, grey, or other colours), the more vibrant and real the experience will be; the closer audiences can position themselves to a display without distortion of pixilation, the more immersive their experience is likely to be; the more varied the angle of viewing, the more 'natural' the experience will be;[8] and finally, the greater the range of shapes and configurations of a display, especially if it can transcend the limits of conventional 'rectangular' display, the more 'unframed,' continuous relationship it can have with the display environment.

In combination, these factors determine the audience's visual experience of a performance and thus a very significant part of the total experience. What, then, are the features that distinguish MicroTiles from other display technologies, and what makes them particularly suited to facilitating a high degree of presence in theatrical performances? To describe the technology briefly: in terms of dimensionality, MicroTiles consist of individual digital display units, 16 by 12 inches each, capable of being stacked and joined together like Lego pieces to form a display of any size, which can be arranged in a wide range of shapes, including curves; in terms of colour range and saturation, they have a balance of high brightness (800 nits), deep contrast and a full 115% of the NTSC color range so that their colour reproduction capability exceeds standard LCD displays by over 50%; in terms of angle of viewing and distance, they can be viewed at any distance and up to 180 degree angle (with less colour shift than most other display technologies), and with a 740 x 540 native resolution for each tile, audiences can walk right up to the display without viewing pixilation; in terms of image consistency, each unit calibrates and coordinates its display in conjunction with any others adjacent to it to match colours across the stack, and projects to within 1mm of its outer edges, leaving minimal seams between units to disrupt the visual field.

To test some of the MicroTiles' possible performance applications, especially with respect to issues of presence, we produced a twenty-minute meta-theatrical piece which showed two performers (a Technician and a Presenter) assemble four discreet arrays of MicroTiles into a single, unified display surface for an imaginary presentation to an imaginary group of MicroTile clients.[9]

Production set with four arrays of MicroTiles, Lower Ossington Theatre, Toronto

In the process, the performers introduced the real audience of invited theatre entrepreneurs, Artistic Directors, Technical Directors, and post-secondary theatre educators to some of the MicroTiles' visual display properties. The story involved a less than competent male Technician (live) who finds a female Presenter (pre-recorded) trapped inside the bottom row of MicroTiles in one of the four arrays. He helps to 'free' her from her entrapment by adding more MicroTiles on top of the bottom row until she is able to step out of her pre-recorded existence (using some conventional theatrical sleight-of-hand) into her live presence on stage. Following some arguments about the arrangement of the MicroTiles, their technical specificities, and physical characteristics, the two swap places as the Technician (now pre-recorded) accommodates himself comfortably inside the MicroTiles while the Presenter (now live onstage) assumes full control over the MicroTiles and shows off their technical attributes.

Stephanie Breton as the Presenter pushing the MicroTile array on stage while
Aaron Talbot as the Technician, 'trapped,' looks out

In the process of their dramatic interactions, however, the two characters demonstrate
uses of the MicroTiles which go well beyond the ones indicated in the Presenter's
'business-oriented' demonstration – as masks, for example, as digitally generated
extensions of their bodies, or fragments of their own selves which take on different
identities.[10] The principal conceit, then, was that the performers' (pre-recorded)
'presence' *inside* the MicroTiles was as 'real,' 'believable' or 'actual' as their physical
presence onstage.

Aaron Talbot as the Technician looking at his devil identity in a MicroTile

The opportunities for pioneering visual design opportunities with this digital display technology appear bounded less by technical limitation, or the capacity to create a variety of presence markers, than by cost. The following section provides an idea of how some of the theatre practitioners who attended the performances envisioned using MicroTiles. Note that in providing their creative options, interviewees were not considering the relative costs of their ideas in comparison to their current solution.

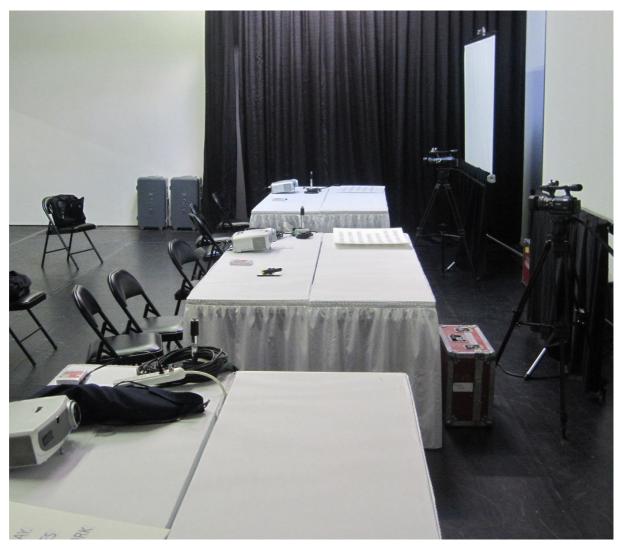II. **Research Instruments and Methods**

Immediately after one of the five consecutive performances over the day, the ninety invitation-only audience members became research subjects, a condition they agreed to in accepting the invitation they received. The research team constructed three different tools: a written survey, which took ten minutes to complete, a face-to-face qualitative interview with scripted questions, which took twenty minutes to conduct, and a repertory grid interview with scripted questions, which took forty minutes to complete. Each kind of face-to-face interview had trained interviewers (two for the qualitative; five for the repertory grid), and all were videotaped. Ahead of the performance research event day, the research team divided the face-to-face interview research subjects into five categories, based on professional role: creative (artistic directors and directors); networked (not theatre); business (business managers and general managers); technical (heads of technical theatre; technical directors), and educators (university- and college-level). All told, thirty-seven audience members completed the survey interview; eighteen, the qualitative interview; and fifteen, the repertory grid interview.

The survey comprised five key areas of questioning with the focus on factors that may facilitate or constrain adoption of MicroTiles by the organizations that employ the lead

users. Specifically, the lead users provided their estimates of five benefits by providing ratings on a seven-point rating scale. The first three question sets began with the gambit, ,If my organization were to consider adopting this technology,, followed by a ranking of benefits, concerns, potential barriers; the fourth, ,If my organization were planning to adopt this technology, I would find it valuable to …,; and the fifth, ,When available, I could see this technology being adopted quickly by my organization., Using the survey results was meant to inform Christie Digital to better anticipate the reactions of their target market in the not-too-distant future. The formative feedback can also assist the company with decisions such as how best to support the user community once the product is introduced.

The qualitative interview was developed for two groups: (1) the theatre (creative and technical) and culturally-networked community (not theatre), and (2) the theatre educators. Each instrument was comprised of two general questions about their role and expertise in their organization and fourteen specific questions. Asked from a prepared script, all questions were constructed as moderately open questions, meant to elicit fulsome and non-directed answers to questions about perceived artistic uses, possible benefits, concerns, other digital technologies, and likely adoption. Post-event, the interviewers glossed the interview answers for common themes.

Like the qualitative interview, the repertory grid is an interview protocol that is rigorous and repeatable but, at the same time, allows subjects to express reactions in their own terms, using their own concepts and their personal constructs of 'meaning'. This interview approach is anchored in what is called ,personal construct theory, (Kelly, 1955). The technique is appropriate for identifying the ways that, in our case, the lead user experts construe – interpret or give meaning to – their experiences. The research team wanted our lead users to articulate their frank perceptions of MicroTiles, to express perceived benefits and concerns through their own expert eyes. In this way, we minimized the inadvertent insertion of our own biases into what the lead users could share with us concerning the rate of adoption of the MicroTiles technology in theatrical and related productions.

Repertory Grid Interview Breakout room, Lower Ossington Theatre, Toronto

Each group of interviews focused on a different aspect of the participant perception of the technology. The first group of five participant interviews focused on their perception of how the MicroTiles technology would be received by their social network. Specifically, they were asked to 'anticipate the reactions to this technology by persons working with digital media in Theatre production.' During this interview, the participants were asked to consider individuals they knew, without disclosing their identities, in the theatre community that may be likely to adopt the technology, and a group who they felt would be unlikely to adopt. This essentially provides a view of their perception of adoption within their social network.

Following the identification of these individuals, the interviewer had them compare randomized sets of the members of their network. Here, characteristics of the early adopters and non-early adopters were elicited. Using this data, the factors which the participants perceived as partitioning their network were identified. While the data collected provides an individual's perception, and hence cannot be easily aggregated,

this analysis does provide us with an initial picture of how early adopters in the theatre industry can be partitioned.

III. Research Findings: Artistic and Business Opportunities Influencing MicroTile Adoption

Three key insights about theatre, MicroTiles, and presence emerged from our research. First, the artistic and business benefits of MicroTiles were best understood by those segments of the Canadian theatre and related industries with the largest budgets and the most pressing need to be au courant. These lead users ranked highly the ability of MicroTiles ,to integrate digital content,, ,their flexible configuration and reconfiguration,, ,their ease of use,, ,the creative possibilities that are enabled, and ,the emerging audience expectations for new media., Among the presence factors cited were ,high resolution,, ,a high contrast ratio (that allows the images to be seen in all lighting conditions), and ,the ability to build non-rectangular sets, props, and displays., Mirvish Productions, the Royal Ontario Museum, the Canadian Opera Company, and the digital media post production studios, for example, all saw the first-mover advantages of adopting MicroTile technology, partly because all of them compete directly with 3D movies, online gaming, and other forms of digitally enhanced entertainments, making the novel 'presence' capabilities of the MicroTiles an important point of competitive differentiation. Interestingly, early adopters (among the lead users) generated the most (and most detailed suggestions) for how MicroTiles might be used outside the theatre – a list that included a mass communication orientation (how could MicroTiles be used in broadcast television news?), creativity and artistic orientation (e.g., in operatic or artistic exhibits?), venue characteristics (e.g., at rock concerts or stadium sporting events?), and commercial orientation (e.g., in retail shopping malls or automobile dealerships?).

Second, smaller theatres and theatre educators were less likely to appreciate the technical and artistic benefits and expressed concerns that MicroTiles would be too expensive to buy, deploy, and maintain. They also thought that MicroTiles' ability to create presence – or what some interviewees called the 'wow' factor – might detract from the actors' performance and undercut the intimate, 'live' quality of smaller productions. Smaller theatres were also concerned about the amount of technical expertise that the MicroTiles might require to configure and deploy versus the limited impact that the technology might have in a small space. Third, theatre educators were the least interested group in MicroTiles – namely, that they would be just 'another, passing' technology that instructors would need to master in order to train students.

Other observations and comments from interview subjects are useful both for our case study in the reception of MicroTile technology, and equally, for the adoption of all new digital technologies. Specifically, the interviewees reported that over the last few years, members of the theatre industry have started using more advanced technology. In their opinion, the use of technology will increase, but its adoption may be slow. As one interviewee commented: ,Lighting is the twenty-year old of the theatre, sound is the teenager, and video is the adolescent child., That said, other networked industries such as opera are very interested in incorporating new technology into their productions.

Participants also mentioned dance as an industry that tends to embrace new technology more readily than theatre.

Competitive technologies such as LED panels, plasma, LCD monitors and projection walls were identified as the primary technology solutions currently being used to display images and video, and generally to create presence digitally. Theatres need to work with technology directly or try it in their own rehearsal hall because they need to see how it's working with their particular production and how it fits in with their other technology (for example, stage lighting). To meet this need, theatres must spend more money and time on technology adoption and integration than they currently budget for.

With few exceptions, the theatre industry and educators within that industry felt that the creative vision drives and should drive the choice of technology solution. If adopted, MicroTiles would become another tool in their toolboxes. Price for cutting-edge technologies – including MicroTiles – is always an issue, and different groups perceived different adoption plans: for larger theatres, the rental model may be most appropriate as they tend to rent as much of their technology, and other equipment, as possible. For the opera, purchase may be more appropriate because they run multiple shows at once and so rental would become expensive. In addition, they run more productions with a technology focus and so may have more use for the MicroTiles. And for smaller theatre companies, this technology will likely not be affordable for purchase or rental in the immediate future. A different model would be needed for the technology to be used. The theatre would have to own the technology instead of it being specific to a production. The technology may also need to come with technical or creative support.

How best can the theatre industry and educators keep current with technology developments such as MicroTiles, which offer creative and training opportunities for the industry? Participants offered several suggestions, which point to an increase in technology company and theatre/education partnerships. For example, some suggested that we migrate the technology to the creative (theatre, performing arts, cultural) world by putting on productions or exhibits that demonstrate the different creative possibilities that can be achieved with MicroTiles. This would work especially well if Christie Digital Systems convinced highly respected creative directors to use MicroTiles in a performance and demonstrate the possibilities in action, primarily those who already use video or projection technology. Suitable target applications might include whiz-bang shows like *We Will Rock You* as well as rock concerts in which the audience wants to see musicians stringing the guitar from 10, back, award shows, opera, dance, commercial applications (display, information, advertising, etc.).

For educators, their priority involved making the next generation of student designers aware of soon-to-be standard technologies and their potential for creative applications. When looking at new curriculum, educators choose technologies that generate a wide range of possibilities, and insist that technology drive creativity, not the other way around. Overall, educators prefer to provide students with the creative skills they need to learn whatever technology they may encounter in the future. In some cases they expect that the technological skills will be acquired in the work world, in other cases they teach more basic technological skills and expect that students can then transfer these skills to other technologies. Learning a new technology requires significant

investment on the part of educators and so they must consider staffing needs, costs, and ramp-up time (for both students and teachers), which is a significant challenge, given tight budgets, long lag times in acquiring older or off- the-shelf technology, and staffing cut-backs. Many would like to be involved with development of innovative products, but simply lack the resources.

IV. Case Study Limitations

To provide rich data, and to triangulate our findings, our team used multiple methods – interviews, repertory grid analysis, and written surveys – applied to all three theatre groups, including theatre professionals, culturally networked industries, and educators. As with all research, however, our findings must be evaluated against the inherent limitations of our research methods and situation. Some of the limitations to be considered include the following. First, the number of participants: an even larger sample of the representative population would increase the general applicability of the results. Second, the limited pre-event access to the MicroTiles: because the MicroTiles were needed by Christie (for pre-market tradeshows and other venues), the team had limited opportunities to explore the capabilities of, or to rehearse extensively with, the MicroTiles. The results of this limited access may have affected some of the audience reception of the MicroTiles and the overall theatrical performance. Third, the early-stage capabilities of the MicroTiles: at the time of the event, the MicroTile technology was not as close-fitting, nor the seams between MicroTiles as optically blended, as they are in their commercial release. For this reason, some of the participants' responses regarding the MicroTile display capabilities may be influenced by the limitations of the prototypes used in the production. Many interview participants wanted to see yet more examples of creative possibilities and how these were created with this technology. Fourth, the conducting of single event research: because this is not a longitudinal study, with multiple data collection over time, our research cannot project any trends over time regarding the adoption of MicroTiles by the Canadian theatre industry. And fifth, the Southern Ontario-centric sampling: Toronto is the fourth largest theatre city in the world (after New York, London, and Chicago), making it an ideal location to draw in theatre experts. However, we cannot extrapolate our findings to make any claims to like-responses across the country, and therefore, to represent the Canadian theatre community as a whole.

Conclusion

As previously described, our research was interdisciplinary, bringing together a team comprised of experts in dramaturgy, user experience, video production, and management sciences; and our methods, multi-instrumental, drawing, as they did, on the results of interviews, surveys, and repertory grid analysis. The overall goal of our research was twofold: first, to 'seed' a new visual display technology, MicroTiles, into the theatre community in order to find 'lead users'– groups interested in both adapting and then adopting display technologies to meet needs that are both typical and in advance of a wider market; and second, to find out if these lead users would not only adapt – and by adapting, refine – the technology, but also serve as advocates for best practices, and as networkers who might seed, in turn, other industries through their connections or performances.

The results of our research identified the Canadian theatre and related industries with the largest budgets and the most spectacle-focused productions as lead users: namely, as early adopters likely to think up, develop, and then disseminate new practices based on early-market display technologies. These research findings are important, academically, for establishing significant trends –concerning who, how, when, and why – technology is adopted within the Canadian theatre industry. For our private sector partner, Christie Digital Systems, theatre was not a market that they had explored in a systematic way. Clearly, MicroTiles have the potential to revolutionize the way in which theatre and performance artists can incorporate digitally created visual assets into their performance, without trading off any of the requisite components of digitally created theatrical presence: image quality, colour range and saturation, image consistency, viewing angle and distance, and dimensionality. These findings are especially important to Christie Digital as they consider the next generation of MicroTiles, which are likely to be interactive: touch sensitive, or proximity, or gesturally triggered. This will allow actors and audience members to interact with the display, thus further enhancing the experience of liveness and presence in the performance.

ENDNOTES

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1 We refer to this research project as 'Seeding a Lead' after a well established approach called the 'lead user' method (von Hippel, 1988, 2005). Lead users are very rare individuals whose creative imaginations are well ahead of the leading edge within their community of professional practice. Lead users are the first to recognize opportunities to solve an existing problem, perceiving benefits from early solutions, and foretell a larger market demand.
2 Initially, we had only limited access to individual beta versions on which the engineers were still experimenting; and even for our July 2009 performance we were able to use only pre-market tiles which were not as 'finished' as they were on the date of their public release in November 2009.
3 This includes film projection (analog and digital), various forms of data projection onto miscellaneous projection surfaces, and television (in the works of Mabou Mines, for example). For a detailed analysis of video display technologies used from the brothers Lumiere's shocking 1895 screening of *The Arrival of the Train* to Simon McBurney's use of large-scale projection onto a cyclorama and the stage floor in his production of *Measure for Measure* in 2004, see Greg Giesekam (2007). One of the greatest advantages of MicroTiles in performance is that the image is of such high resolution, contrast, and colour saturation that is its almost immune to 'wash-outs' resulting from ambient light spilling on the projection surface.
4 Recently, presence has become a much discussed and at times fetishized concept that has grown out of discourses examining the increasing mediatization and virtualization of art and culture. The debate has currency in broader cultural theory as well, where the likes of Walter Benjamin, Martin Heidegger, Roland Barthes, Jean Baudrillard, Peggy Phelan, Susan Sonntag, Michael Kirby, Patrice Pavis, Philip Auslander and others have articulated often diametrically opposed positions for over the

past seventy years. Following Benjamin, cultural commentators have used presence to distinguish the material, auratic, proximal 'real'; and in performance studies, to denote the flesh-and-blood performer, there with you in the same shared physical space. However, ‚presence is [also] about interest and command of attention, not space or liveness…. Mere corporeal liveness is no guarantee of presence‚ (Dixon 131-3). In this article we focused our attention on MicroTiles' capacity to generate the ‚perceptual illusion of non-mediation‚ (Lombard and Ditton), fully mindful of the various and diverse positions scholars have taken on the experience of ‚presence‚, especially since the research in this area has grown synchronous with the ubiquitous creation of VR environments, video games, video gambling, telematic performances, and, most recently, 3D movies and television.

5 Phelan's position is challenged by Philip Auslander and others who attribute 'liveness' and 'presence' to digitally generated works as well (see Philip Auslander (1999, 2008).

6 Varney and Fensham, 91. One example of this dichotomous response to the use of digital technologies can be found in the reception of Robert Lepage's Elsinore. Derided by some critics as ‚wizardry without enchantment, stage management, not theatre‚ (Giesekam, 228), it was hailed by others as a breakthrough in the marriage between theatre and video. The latter group praised Lepage's deconstruction of Hamlet for challenging ‚conventional attempts to constrict it to an 'authorized' meaning‚ (229) and for contributing to ‚more metatheatrical reflection on the way in which action, characters and imagery are always already mediated even in productions which make no use of electronic media‚ (229).

7 One study showed that larger images evoke a greater variety and more intense presence-related responses than smaller images. Lombard and Ditton cite a study in which subjects were shown clips from action films. ‚Subjects who watched on a 70 inch screen…reported significantly greater agreement with the statement 'I felt like I was part of the action' than subjects who watched on a 35 inch screen‚(Lombard & Ditton). MicroTiles are modular in design and can therefore be scaled to any dimension.

8 As with most digital video displays, large or small, the most advantageous viewing point is the centre line, just as it was in the court theatres during the Italian Renaissance (e.g. Teatro Olimpico).

9 The piece was put together with the help of two colleagues from Bradley University – George H. Brown, Head of the Theatre Arts Department and James Ferolo, Director of the Multimedia program – who acted variously as playwrights, story-boarders, directors, and media artists. The performers hired to play the Presenter and the Technician were Stephanie Breton and Aaron Talbot. Their respective contributions to this project were immense and deserve special mention here.

10 At one point in the presentation the Technician moved around the stage holding a single tile on which he himself appeared alternately as angel and devil. In this way the actor was literally split into three personae, all of whom had the capacity to interact with one other.

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BIOGRAPHIES

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Professor Jill Tomasson Goodwin teaches in the Digital Arts Communication program at the University of Waterloo in Waterloo, Canada. Her research interests include user experience design and interview protocols. With David Goodwin, she is working on a new Arts-led initiative, the Research Entrepreneurship Acceleration Program (www.uwreap.com), that supports multi-disciplinary student teams to develop entrepreneurial ideas in the interactive display space.

Professor David Goodwin teaches in the Digital Arts Communication program at the University of Waterloo. His primary research focuses on the design of interactive display environments and applications. Along with Jill Tomasson Goodwin, he is developing the Research Entrepreneurship Acceleration Program (REAP) – a private/public sector initiative designed to foster student creativity, innovation, and new business development within the field of digital media.

Paul Guild is appointed as Professor in the University of Waterloo's Department of Management Sciences and his current research investigates creative uses of the Internet and web-related technologies to foster knowledge mobilization, technology transfer and commercialization of research results.

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