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implications and trade-offs against time and quality factors can be investigated at frequent intervals during the construction period. The possibilities are endless. These scenarios are explained incrementally over the teaching semester to reflect the way that issues are encountered and dealt with. It is intended to progressively use Deakin Studies Online (WebCT Vista) to help manage the scenarios and to enable students to collaborate.

The application of the project to teaching and learning is powerful and engaging. Because the case study of Building T is based on real data it offers learning tasks that are rich in possibilities and requirements. In this way, mirrors the complex interplay of issues that inform the disciplines of architecture and building.

CONCLUSION

Bowden and Marton (1998) argue that quality assurance in teaching and learning programs is both a ‘collective’ and a ‘local’ learning responsibility that implies clear articulation of partnerships (1) between colleagues within the university and (2) between stakeholders within and without the university’s walls and (3) between students, teachers and employers and professional gatekeepers. The Building T CD-ROM is an example of effective collaboration that goes beyond the local and immediate domain of the individual lecturer and his/her students to the broader collective domain. While this first case study is of Deakin and compiled by Deakin staff for Deakin students, we believe that is not a barrier to those outside of the University gaining access to a rich resource and using it in ways that suit their needs — ways that those who designed and developed it may never have envisaged.

The final product could not have been achieved without many people working effectively together. Discipline experts defined the content needed and, with the educational designer, articulated how this could be developed and used. However, without the input of those from the profession and industry who were directly involved in the design, planning and construction of Building T and the users, themselves, the case study would be far less meaningful. The value of this project is that the many voices are heard and the complex and multi-faceted nature of the profession is abundantly evidenced. These voices, however, would not be heard in nearly such a compelling way in print and the contribution of technical experts with the use of CD-ROM technology has played a critical role. The technical staff provided professional audio and video filming and editing as well as web development and interface design. They opened up possibilities to the designer and to the academic teaching staff who, in turn, provided ideas that stimulated the pedagogical and technical experts. Such working together leads to synergy and to a far more sophisticated and useful product than any single group could have achieved.

As the project developed, it became apparent that this would be a proof of concept exercise and, if successful, the first in a series. Now that proof of concept has been realised it is planned to repeat this project for two other, quite different, case studies over the next twelve months. One will deal with high-rise construction (maybe Melbourne’s Kerria Tower) and the other perhaps a large sporting venue (Ric Tollefson Stadium). Irrespective of the choice of building, the salient characteristics that underpin this CD-ROM will be retained and the emphasis will remain on providing an authentic learning experience.

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ANTICIPATING THE UPTAKE AND POSSIBLE IMPLICATION OF DIGITAL IMAGING WITHIN THE CONSTRUCTION INDUSTRY

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ABSTRACT

Photography within the construction industry is merging into a new form of image capture and output that is a mix of conventional photography and digital imagery. As this transition takes place it is anticipated that the credibility of the image may also change with in the communication chain that links the various disciplines within the building industry. The following paper presents the development and results of a pilot survey of building professionals, which addresses the quality, content and authenticity of both conventional photography and digitally produced images used within the construction industry.

Keywords: digital representation, conventional imaging, knowledge transfer/credibility

INTRODUCTION

According to Alter (1990, p.45) "the alexander on steroids, enhanced photographs may perform better, but the bottom line is that [3 pictures, the words, are proof of little]." Given the ease and immediacy with which the digital photograph can be captured, processed, altered and manipulated, not only by the professional photographer, but also by the layperson, it is anticipated that viewer interpretation and acceptance of the medium may also change as conventional photography gradually diminishes.

In an attempt to understand the current landscape of shifting perceptions within the architectural and construction management communities, regarding conventional photography and digital imaging, the following paper addresses the above premise by assessing the degree to which knowledge of the image-source influences viewers’ perceptions of the image. As information transfer links all participants in the construction process, the need for common and integrated information integrity is paramount for all parties.

The paper presents the development, execution and results of a pilot survey of recent graduates drawn from the architectural and construction management disciplines. The survey focused on the transition from the use of single source photographs to mixed medium images in site documentation, and compared respondents’ perceptions of a known built environment that had been captured by both conventional and digitally produced mediums. The survey was conducted over a time frame of two years, 1999-2001, and attempts to take account of the rate of change that appears to be arising in user preference between the two image mediums.

DEVELOPMENT

The participants

The survey involved 150 participants from both the construction management and architectural disciplines. The sample fell within an age range of 19 to 32 years, presenting a 1:3 ratio between the 18-22 and 23-27 age groups, and a gender split of 68% males to 32% percent females.

The breakdown of the respondents comprised 100 architectural and 50 construction management participants, with 50 architect and 25 management respondents being surveyed in 1999 and a further 50 and 25 being surveyed in 2001. All participants were familiar with a broad range visual media, including CAD, internet based media and both conventional and digitally based photographs.

The site

The principal site for the survey was the Jarvis Court at the Deakin University waterfront campus, designed by McGlashon and Everest Associates in 1995. Along with various central administrative services and departments from the Faculty of Health and Behavioural Sciences, the campus is also home to the Deakin University School of Architecture and Building.

1 Given the rate of technological change that is currently impacting the design professions, it is anticipated that the results of the survey will not be an accurate reflection of the status quo at the time of publication.

5 The 18-22 age group consisted of Part 1, Part 2, and BCM full-time students, while the 23-27 age group consisted of recent graduates who were in three-quarter full time employment and/or completing the final elements of Part 2 or BCM program.
While the court has defined boundaries it is not a space of distinctive style or purpose. Located on the primary city/campus pedestrian route, site lines and viewpoints were selected to reflect the journey through the court, which the respondents negotiated on a daily basis.

Being a somewhat open space with large expanses of red brick, and transparent terraces framed by an open area of post and beam red gum timbers, the area offered a flat plane of colours, textures and balanced mass. This almost monochromatic appearance accentuated contrasts between light and shade and facilitated the generation of a picture corpus, which lost itself to simple manipulations of image context.

Survey design

The foundation for the survey was influenced by the investigations into ‘journalistic output’ by Kelly and Nace (1993) and Kelly and Elliott (2000). Their research, undertaken with the assistance of communication students from a number of American universities including the University of Southern Mississippi, concentrated on evaluating whether or not specific knowledge about digital manipulation techniques affected peoples interpretation of photos and videos. Linked to work being developed at the Huston Baptist University communications area, their research culminated with the video release of the Freedom Forum movement in 1995. These investigations were broad and focused on journalistic ethics, truth; and censorship in the light of emerging electronic journalism.

Focusing on the transition from the use of single source photographs to mixed medium images in site documentation, the survey comprised a questionnaire of 19 major questions and a picture corpus of 23 images. These were designed to compare respondents’ perceptions of the Jarvis Court that had been captured by both conventionally and digitally produced mediums with respect to four categories of image source:

- Conventional architectural photographs.
- Digital images.
- Conventional photographs altered during darkroom processing (increase highlights, manipulation 5%).
- Images that originated from conventional photographs but have been slightly altered with digital software (manipulation 5% max).

The separation of the survey into two distinct stages (Part 1, concealed image source and Part 2 disclosed image source) was designed to test and evaluate changes which may arise in the pattern of the responses as participants were progressively made aware of the different image sources utilized in the preparation of the picture corpus.

Assessment categories

Questions were developed to test for six categories of comparative assessment between the two image sources and were distributed throughout the survey in an irregular sequence in order to minimise survey repetition and respondent lethargy. This included:

- Impressive: The quality of the image in conveying and reinforcing the subject matter. Often associated with a higher visual key.
- Realistic: The quality of the image in conveying the experience and reality of the subject matter.
- Representative: How well the image represents a respondent’s recollection of the architecture as built.
- Informativeness: The legibility and readability of the image in presenting and documenting information.
- Knowledge of manipulation: If knowing that the image had been manipulated was important to the reading of the image.
- Understanding Source: If knowledge of the source was important to the reading of the image.

SURVEY RESULTS AND FINDINGS

Two types of graph were utilised in the presentation of the results: a simple line graph which charts change over time and indicates the percentage breakdown of the responses with respect to the 1999 and 2001 survey groups; and a pie chart which attempts to emphasise the perceptive triggers utilized by the participants to inform their decision.

After the survey had been executed, the raw data for each of the nineteen questions was tabulated using SPSS software and presented as a sequence of bar charts and written report sheets. The data was further refined and both professional cohorts, along with their descriptive responses, were presented in a sequence of line graphs and pie charts. The following narrative is derived from the combination of the results of the question sets and corresponds to the six assessment categories defined in subsection 2.4. The combined statistics presented in Summary Survey Data Charts are expressed as percentages. When reviewing the Summary Survey Sheets we are able to make the following observations:

Impressive (SDD1):

When asked to compare images, regardless of whether or not the source type was hidden or disclosed, chart SDD1 impressive, which assessed for the quality of the images in reinforcing the subject matter, indicates a consistently high preference of 70%+ in favour of the conventional photographic image by both professional groups during the 1999 and 2001 survey periods.

When examining the written responses over the three years, the weighting of the perception triggers (see summary pie chart) indicates that whilst personal preference and composition (ie Value Triggers) were significant, contrast triggers such as colour, colour, graphical images, strong definition and details, were the
key indicators utilised by most respondents to inform their selection. This would appear to indicate that the impressiveness of an image was dependent not necessarily on the subject matter but rather the high key definition of the image and the selection of the view-point.

Realistic (SSD3):

Similar to ‘impressive’ yet less idiosyncratic, the respondents in both survey groups, when asked to compare image quality based on conveying the most realistic lighting of the subject matter, also expressed a preference for the conventional image. However while approximately 50% of all respondents favoured conventional imaging and a further 20% of architects by 2001 were accepting of both, we also find that an increasing number of construction managers (40% by 2003) were more discerning and had switched the balance of their preferences to the digital output.

A balance of both contrast and pragmatic triggers were utilised by the respondents when viewing the image sets, this indicates that directed scanning was largely focused on comparing how well image quality and output, with respect to tone, definition, and detail, matched existing lighting conditions.

Representative (SSD1):

Participant reactions regarding how well the two image types represent the architecture as built, appear to be divided evenly between the two source types for both construction management cohorts (47% conventional and 43% digital in 1999, and 40% conventional and 42% digital in 2003).

The architects in 1999 displayed a similar set of preferences, but with a slight bias in favour of the digital image (43% conventional and 46% digital). While the bias switched towards the conventional image in 2001, inline with the construction management preferences, the same cohort also presented a 10% reduction in preference for the digital image to 35%. This may in part be due to an increase in the familiarity with the digital technology and hence a more critical appreciation of the quality of its output.

As with the issue of realism (see SSD 2), ‘pragmatic’ and ‘contrast triggers’, such as natural, and true to sight, were key indicators that respondents appeared to scan for when informing their selection.

Informative (SSD1):

When respondents were asked to make a decision between source types based on subject matter – i.e. the readability of the image in presenting and documenting information – we discover an almost inverse sequence of trends to the composition qualities evident to SSD3 impressiveness. While the 1999 and 2001 cohort for architecture ranged between 63% and 73% in favour of the digital image, a similar sequence of trends was cast by construction management, which presented a range of between 57% and 65%.

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Surprisingly not unlike the high key factors influencing impressiveness (SSD1), contrast perception triggers were the major indicators utilised by the respondents in making their selection. However, rather than choosing richer colours and high contrasts, they appeared to favour the image which displayed more even tones and reduced contrast. This is an inherent by-product of the digital technology, which tends to force tighter contrast ranges and limited colour rendition, lifting out the detail from the shadows.

The final two categories, knowing that the image has been manipulated (SSD5) and understanding source (SSD6), present two very similar sets of results. These not only differ from the reactions delivered in categories 1-4, which focused on image quality, but they also demonstrate the development of quite divergent sets of responses between the two professional groups during both survey periods.

Knowing that the image has been manipulated (SSD5):

Knowing that the image had been manipulated was considered not to be an important factor in image selection by a slight majority of architects in 1999 (48%-41%). However by 2001 the results expressed an inverse relationship with a greater majority of 48%-35% considering it to be a key factor, and a further 18% being indecisive.

The construction managers, on the other hand moved from a position in 1999 where a significant majority of respondents 52% - 31% considered knowledge of image manipulation to be important, to a more convergent set of preferences in 2001 with a near even split of 44%-40% respectively.

Understanding source (SSD6):

Understanding image source was considered not to be a relevant factor in image selection by a significant majority of architects in 1999 (53%-36%). However by 2001 the results once again indicated an inverse relationship, with an increasing majority of respondents, 42%-33% considering image source to be a key issue and a further 25% being hesitant in indicating a preference.

The construction managers, on the other hand, similar to the issue of image manipulation, move from a position in 1999, where a significant majority of respondents 50%-34% considered source to be a relevant factor, to an increasingly convergent set of preferences in 2001, with a close split of 47%-40% respectively and an additional 13% being undecided.

SURVEY CONCLUSION

When examining the results of both image manipulation and the relevance of source with respect to image type, the position of the two professional groups by 2001 were very similar, i.e. both construction managers and architects were indicating majority preferences for both the importance of understanding image manipulation and the relevance of the image source. However if we project the trends indicated in Summary Charts SSD1 and SSD6 it would appear that understanding both source type and image manipulation will become increasingly relevant and important to the architects, as the digital technology further advances the design and illustration process, and less relevant to the construction managers who are more familiar with the immediacy of the medium in speeding up the documentation process.

When advancing through the various assessment categories and comparing the four criteria dealing with image quality, it would appear that when creating a more impressive image, both professional groups clearly favoured a conventional source type. Yet when dealing with subject matter which demanded a high information content, where respondents required a presentation format which retained a maximum of documented material, there was a strong bias in support of the digital capture. This was conditional on the provision that the image presented matched the respondents' recollection of the space.

In some cases manipulation of the image content had taken place, yet some of the respondents tested, in failing to detect these changes, continued to accept the image as a credible information source. This became evident when examining the results to Question 5. When participants were asked to provide directed responses that were grounded from either an architectural construction or an architectural perspective, almost 30% from both professional groups within the 1999 and 2001 cohorts, opted for the digitally manipulated image as being the most informative source. In addition, a further 20% of architects and between 10% and 15% of construction managers were unable to distinguish between the digital manipulated image and the authentic conventional source.

If however as charts SSD5 and SSD6 indicate that some professional groups will become less discerning and more accepting of the digital image as accepted convention in the documentation of built form, then a predicament may begin to arise, where respondents, especially relating to images credited as source documents, fail to detect manipulations of image content which contradict the architecture as built.

Provided key architectural detail and information had been retained, image alteration was accepted given that the enhancement and manipulations had been disclosed (manipulations were kept with in 5% of total visual information and always of a secondary nature). It was also apparent with the 2001 respondents, that due to their increased exposure to the digital medium, there was a corresponding acceptance and confidence with the electronic output. Hence, image ownership and the immediacy of the digital process, as opposed to the third party practices of conventional photography, are factors that directly enhance confidence in the transition to the digital media.

Due to the electronic transfer of information and project details via email, the digital image is quickly becoming the work-horse of an increasing number of practices. Provided image integrity can be maintained, as indicated in SSD 5 & 6, then collaborative opportunities for building professionals will continue to evolve as a consequence of the ease of capture and transfer of information.
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