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Learning from Media Studies Theory and Design Practice: Using the interpretive nature of film media for the communication of tacit knowledge in design research

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Abstract

This paper investigates the interpretive nature of film media as a format for tacit knowledge communication in design research. Film is already utilised in this capacity for documentaries and fictional films and the theory of tacit communication is well understood in the field of media studies. Lessons from the use of film in design practice, although more typically used for explicit communication, are also considered.

The paper sets the historical context of film theory covering narrative, documentary types, aesthetics, and drawing on semiotics and rhetoric in design. The author describes two case studies: extensive design research was summarised into a short film for communication to an executive audience of decision makers at the University of Technology Sydney in 2008-9; and looking at the impact of introducing a film summary requirement for graduate project research in the Innovation Design Engineering department at the Royal College of Art from 2006-8.

The author's conclusion is that there is merit in design researchers understanding film theory and practice to better leverage the medium for both tacit and explicit design research communication and the research process.

Keywords: *design research, tacit knowledge, film theory, design communication, visual communication, media studies*

Introduction

This paper investigates the value in the communication of tacit knowledge in design research through film. In the last 20 years, the advent of affordable multimedia computers, video cameras and high definition mobile phones has eliminated the barrier to entry for film as a tool for design researchers. As a result, film is a common medium in research for purposes that include documentation for discovery, exploration, consultation and presentation. The advantage of using film in design research are described by Arnall and Martinussen (Arnall & Martinussen, 2010), who use film to communicate interactive technology and provoke an internal discourse among themselves through the process of making the film:

‘The form of film – that embodies both a highly reflective design activity and communicative qualities – is an ideal medium for interaction design research, where it can coalesce knowledge around practices and processes and project towards potential futures. Film allows for a degree of probing, explanation and reflexive understanding of emerging technologies, but through its communicative qualities, also opens up for participation in broad social and cultural discourses around technology.’

Ylirisku and Buur (2007) advocate film use for design research and innovation, highlighting the advantages of being able to edit social events and activities to make meaning. Filming to observe everyday activities is also valuable in the exploration and discovery period of research (Raijmakers et al, 2006). Joost and Scheuermann (Joost & Scheuermann, 2006) consider audiovisual rhetoric in design for both production and analysis:

‘Rhetoric can be consulted as a description model for the design process since it names categories both for the production and analysis of media. There are two approaches: on the one hand, the question aims at the influence of rhetorical strategies on the productive process of design, on the other hand it aims at the application of rhetorical categories for the analysis of media.’

Film is well suited to rhetoric in design research, ie: the art of persuasion. Aristotle’s work on written and spoken rhetoric is considered to be definitive (Golden et al, 2007) and his theory of rhetoric maps onto the medium of film because the medium is versatile enough to fulfill Aristotle’s three audience appeals of 1) *logos*: order and knowledge; 2) *pathos*: emotion; and 3) *ethos*: beliefs and ideals (Aristotle, 384 BC - 322 BC). More controversially for research, providing there is a target audience film also works for the ‘new rhetoric’ (Perelman & Olbrechts-Tyteca, 1969) of non-formal arguments in which arguments are framed for a specific audience to best achieve audience adherence, a process that in itself determines what constitutes reasonableness and facts. In a visual context, Barthes (Barthes, 1990) and Eco (Eco, 1972) considered the rhetoric of the image, and the importance of rhetorical argumentation in design was highlighted by Buchanan (Buchanan, 1985). Rhetorical methods are very important for tacit knowledge communication in film media, though they are not exclusive in this role, and are represented within some of the defined documentary film types that are discussed in this paper.

Thus, in terms of tacit knowledge communication the literature in design research confirms the value of film as a tool for this. The case is also made by the broader philosophical and semiotic literature on visual semiotics, as well as the much longer history of rhetoric. The paper further investigates the specificity of the interpretive nature of film media in design research for the communication of tacit knowledge in design research by formally setting out and applying media studies theory to the analysis of a

professional case study by the author and the analysis of a group of graduate design research case studies that each span foundation research, ideation and prototyping for a diverse combination of products and services. These investigations are complemented by a consideration of film in design practice.

Tacit knowledge

In the literature, Polanyi's (Polanyi, 1967) important work on tacit knowledge in the fields of social science and philosophy of science argued that creative acts, including scientific discovery, draw on personal knowledge and feelings in addition to more formal knowledge that can be stated in explicit propositional terms. Polanyi argued that both tacit and explicit knowledge are present together within an individual's thinking as a kind of dynamic tension as they engage in exploration or an attempt to understand something. Furthermore, Polanyi wrote that motivation and passion drives us to discovery and that the process of discovery involves the holistic use of all our faculties.

Polanyi emphasized the importance of tacit knowledge across all areas of research, from analytical science through to more qualitative social research. The challenge is that the communication of tacit knowledge is not always suited to being codified through text or verbal media: imagine reading a manual on how to walk the tightrope, or how to win at chess using an instruction book that specifies how to play creatively for somebody that has never encountered chess before.

Sol Worth, film maker and arguably founder of visual communication (Worth, 1974), described how tacit interpretation was intrinsic to the medium of film and evoked either *natural* or *symbolic* sign-events (Worth, 1981):

'Natural events.. are those which we interpret in terms of our knowledge (or belief) about the conditions that determine their existence. The meaning of these events for us, in fact, can be said to derive precisely from those existential conditions. In contrast, symbolic events are events that we assume to have been intended to communicate something to us. Further, we assume that these events are articulated by their "author" in accordance with a shared system of rules of implication and inference. That is, they are determined not by physical or psychological "laws" but by semiotic conventions.'

Within the domain of tacit knowledge is the hunch, instinct, or values. Tacit knowledge exists within individuals or groups as personal knowledge that may be held in diverse formats such as imagery, concepts or feelings. As such, tacit knowledge poses the challenge of how it might best be communicated. D'Eredita (2006) considers three propositions for the cognitive proliferation of tacit knowledge. These are: (i) episodic, through experience; (ii) the result of constructive collaboration, such as within an organisation; and (iii) the construction or relating of episodes.

In evaluating which of D-Eredita's propositions could be adopted for the communicating tacit knowledge, the first two are both problematic outside of a learning environment context with the right time and resources. The third, the construction or relating of episodes, is feasible with a viewer or an audience situation. The audience situation would typically utilise film, or perhaps an interactive web page, but could include theatre or other performance types. In any of these formats there are still challenges in getting transferral of the specifically intended tacit knowledge.

It is significant that D-Eredita writes about cognitive proliferation as opposed to communication, effectively setting out the importance of this process as one that impacts on our deep knowledge. In film making, this is in alignment with Mamet's ideas about leveraging the sub-conscious of both the director and the audience (Mamet, 1992). This

cognitive proliferation is hard to analyse: McLuhan's position from a media studies perspective is that reverse engineering this kind of transfer to establish cause and effect is all but impossible, writing that "program and 'content' analysis offer no clues to the magic of .. media or to their subliminal charge" (McLuhan, 1964).

It is possible to create films that are free of tacit knowledge. Mamet rails against these films as being the norm rather than the exception in terms of commercial output from Hollywood, with such films majoring on endlessly explained narrative techniques and excessive use of dialogue that bores the audience with information and leaves them with little for the imagination.

From the described literature investigation of tacit knowledge, it is clear that tacit knowledge must be considered an important part of both quantitative and qualitative research which includes design research in its many manifestations. These points are further investigated through the author's use of case studies set out in this paper.

Film aesthetics and the syllogism

Buckland (2010) notes that, in the first half of the last century, two competing theories emerged that argued for film as an art form. The formalists – among them Eisenstein and Arnheim – believed that the value of film lay in its inability to exactly imitate our normal visual experience of reality. The realists – including Bazin and Kracauer – argued that the recording capacity of film meant that it perfectly captured our visual experience.

Although these two theories have evolved and expanded, many films are hard to categorize in this way. Films which favor the long shot place an emphasis on allowing events to unfold and veer towards realism. With short shots, it is the assembly of the shots and their juxtaposition which give meaning, satisfying formalism. Where editing becomes very expressive in order to apply symbolic and metaphorical meaning, it becomes montage.

Mamet clearly argues for the short shot as the best way of achieving a cause-effect syllogism, in which meaning is created from the juxtaposition between two shots, as the method by which a film-maker can communicate to their audience. Mamet also makes a case for short shots to give an audience a more immersive engagement that differs from 'watching a play'. The long shot and the short shot both offer modes for tacit communication.

Further, Mamet writes that when shorn of dialogue a film its robustness in terms of the syllogistic mode of communication is evident, even claiming that a good film script should be able to do completely without dialogue. Mamet argues that fairy tales, our own dreams, spoken jokes, and even children's cartoons, are good syllogistic formats in which simple 'shots' combine for deeper meaning.

Film narrative

A narrative comprises a series of events that depend on each other through cause and effect. In film-making, if an event doesn't impact on a subsequent event then it can often be left out – it is effectively extraneous in narrative terms. Exceptions are descriptive events that may describe a space, for example. Cause-effect logic is the foundation of narrative. The theorist Todorov (1969) sets out three narrative stages: a state of equilibrium; the disruption of this equilibrium by an event; and the successful attempt to restore the equilibrium. Each stage goes through a turning point to get to the next stage and involves a transformation. Although this is predominantly the format for fictional

films, some of the case studies described herein also made effective use of this narrative structure in staged fictional scenarios within documentary formats.

Narration may follow a protagonist exclusively, and this is termed 'restricted narration', whereas narration that follows many characters, or uses the director's viewpoint, is 'omniscient' (Bordwell, 1985). Restricted narration can generate mystery, and omniscient narration can be good for suspense. Accordingly, films will often switch between these types of narration.

Bordwell (Bordwell, 1985) seeks an account of narrative activity in film through representation, structure, and process. He promotes the view of the Russian Formalists of the 1920's that filmic narration involves the two principal formal systems of 'syuzhet' which is plot, and 'style' which is film technique, to cue the viewer to frame hypotheses and draw inferences. Bordwell considers film viewing to be a cognitive Constructivist dynamic psychological process manipulated by perceptual capacities, prior knowledge, and the material and structure of the film itself. The viewer will attempt to construct an intelligible story from the film, and in their drive to anticipate narrative information a confirmed hypothesis readily becomes a tacit assumption.

Film offers a number of narrative types, categorized by Bromhead's examination of documentary film's relationship with reality and cinema (Bromhead, 2009) in terms of four modalities: linear-storytelling, discursive-information, episodic-juxtaposition and poetic-visual.

The French philosopher Bergson (Bergson, 1907) first associated thought process with the form of the movie, implying that the ease with which particular movies can be understood is related to our cognitive processes. According to Kermode (Kermode, 2010), the film critic:

'cinema has such a profound effect upon the viewer because it substantially mirrors the function of memory. When we look at the world we allegedly see a linear narrative assembled with invisible old-fashioned Hollywood continuity editing rather than nouvelle vague European [films].'

Directors risk alienating audiences when they deviate from a linear narrative, although there are plenty of examples where it has worked in cinema and avoided Kermode's 'nouvelle vague' criticism.

Mamet too complains that European art films can veer away from a coherent juxtaposition of scenes that then loses the audience because although they will try to make sense of the sequencing, it effectively becomes like looking for pattern in chaos. Mamet is unrelenting in his conviction that a director does their job well if their concepts are accurately conveyed to an audience and not left open to interpretation, with such conveyance working for both explicit and tacit elements.

Documentary types

Buckland (Buckland, 2010) gives three conditions for a documentary: events must be unstaged; they must be non-fiction; the documentary film-maker's role is to observe. Buckland notes that the film making process makes the role of film-maker strictly that of observer impossible because of the need to 'shape' a film through editing and camera work. He considers it acceptable for a documentary maker to 'shape' events, but not to 'manipulate' events by hiding the processes used to shape those events. The latter becomes propaganda.

The five types of documentaries (Nichols, 1989) are:-

Expository: using an authoritative voice-over to complement the image with additional abstract information or to comment on events in the image. This is a classic approach that creates a sense of objectivity.

Observational: unobtrusive recording of people's activities that are not addressed to the camera. While intimate, it excludes interviews. This is very direct at capturing unfolding events.

Interactive: the film maker is present on-screen and conducts interviews and conversations with people being filmed. The film-maker because an active participant in events, and edits the film to present an argument.

Reflexive: this examines the way events and people are filmed, allowing the viewer to understand the whole film-making process, and making the conventions of representation apparent.

Performative: the focus is on the expressive and poetic aspects of the film, typically presenting the subject in a stylized, subjective way that may include re-enactments. For the viewer, it is more experiential and can distort events.

Narrative is important in many documentaries, either for scenes within them or for the entire film – the latter is particularly so in the case of performative documentaries.

Case studies

Professional documentary: 'The shape of things to come'

The 'shape of things to come' was a short 4 minute professional film that was produced in 2009 (view at <http://youtu.be/eumpJknzI4s>). The film was created to communicate the essence of a 12 month design research project to investigate the emerging field of UDM, or Urban Digital Media (Barker & Haeusler, 2010), and its potential for application across the campus of the University of Technology Sydney through a site-wide strategy. The field of UDM relates to digitally-enhanced public spaces and was part of the university's objective of being a leading technology campus. UDM includes integrated digital-physical spaces for creative working, collaboration, leisure, and social interaction. The research work was commissioned by the University of Technology Sydney and was headed up by the author. There were three other outputs from this work: a text-based 100 page book of research summarizing user workshops, consultation, and stakeholder feedback from the city of Sydney in Australia; a similar book encapsulating consultation with additional experts in the city of London UK; and a 20 page glossy color booklet containing the executive summary of the research with explanatory diagrams, and photomontaged hand-drawn illustrative design concepts for a number of campus locations. The research involved detailed consultation exercises with over 100 participants through interview and workshops. Participants ranged from staff, students, experts, industry, university partners and other stakeholders. The film-making involved a crew of 18 people working over a 4 week period.

The author created the film as a way of communicating the design research and a futurology vision of where an implemented UDM strategy could lead the university. The film was used twice: once to get final feedback from the 100 people consulted during the research, and once for communicating to an executive audience of 15 decision makers at the university that included the vice chancellor and his management team. The management team was also provided with the other research outputs.

The initial reason for creating the film was because based on past experience it was felt that the busy university managers would struggle to read and absorb the printed research

outputs. However, because the film making was initiated near the end of the research activity, the author realized that it also had the potential to communicate a vision of the university set in the near future, in which the UDM recommendations had been implemented. A performative documentary method was used with a poetic-visual narrative in order to really engage the audiences imagination and carry them along with a real sense of how the UDM campus experience would feel. The author wanted to generate the same sense of excitement and energy that had taken place in the user workshops as people described how they would feel about experiencing the implemented versions of ideas that they were scoping. With the user-centered design aspect to the work, there was evident value in the tacit knowledge that the users communicated to the researchers: about feelings, atmosphere, and senses of value. To capture and convey this, the author revolved the film around expository interviews that were set about 5 years in the future with several imagined and successful graduates who were describing personal user scenarios of how the UDM campus had impacted on their time at the University of Technology Sydney and their subsequent careers. Within 'The shape of things to come' there were essentially four cause-effect narrative syuzhets, each told by a fictional graduate. To reinforce the spoken narrative, and switch between restricted and omniscient narration to create a more expansive feeling, these natural event interviews were intercut with animated versions of the hand-drawn illustrations that were used in the booklet. Interviewees were clearly located in their imagined places of work. With little movement or action by the actors on screen, long shots dominated the cinematography. The film opens with a high speed film sequence of the campus and surrounding streets going from night to morning, a symbolic event for a busy 'new dawn' of UDM as the roads filled with cars. The film concludes with a similar scene but going to night time and achieving closure as the credits roll.

After both film showings, through questionnaires the audience confirmed that the film gave them a real sense of how the new campus would feel, that they felt an emotional empathy with the fictitious interviewees, and they shared the sense of how the success that the interviewees articulated had a lot to do with the UDM experience. Hence, the audiences were convinced by the rhetorical method used. The questionnaires showed that over 90% of the audience were in favor of the UDM plan proceeding. The senior managers of the university subsequently approved the pilot phase of the UDM strategy. Importantly, the value of the research documents was also highlighted as essential for providing supporting evidence. Hence a rhetorical film method was effective at capturing and conveying participant's vision from the workshops.

Design research documentaries by graduate student groups

Group industrial design research projects were introduced into the second year curriculum of the graduate Masters program run by the author at the Royal College of Art in 2006. The scope of investigation included foundation research, ideation and prototyping for diverse products and services. Previously the students had worked alone and produced a written thesis of their work. Moving away from the written thesis model, a requirement was introduced for the groups to each produced a 10 minute film to communicate their design research. The research projects took place over a very intense 3 month period, with film work running continuously during this period along with a more intense editing stage in the last two weeks. The film and an exhibition of the work was then used by the course examiners to assess the work, and the films subsequently exhibited to the public along with any physical artifacts. Students continued to produce a thesis for a separate design-based project.

From 2007, students were given an introduction to the technical aspects of film making as part of a short design module prior to the group design research work. The students were not given any back grounding in film theory. The rationale behind the switch to film media was driven a number of factors: students were increasingly showing 'raw' film clips to illustrate parts of the research in presentations; highly visual and interactivity research was proving increasingly difficult to summarize in written reports even with illustration; examiners and staff were finding that the written format was not always well suited to conveying user centered design, user studies, interaction design or design futurology. It had also been noticed that when students had previously chosen to use well edited film in their presentations to communicate tacit knowledge, the audience had been more responsive and examiners agreed that they were getting a better understanding of the work.

The film theory analysis of the 25 films created in 2006-8 by teams of 3-4 people is shown in Table 1 below. This analysis was undertaken when all the films had been made. The films were examined by the author according to the types described in this paper, namely: narrative modality, documentary type, viewpoint, syllogistic syuzhet, and events. Some films were mixed-mode, in which case the dominant or most relevant category is used. Viewpoint was often not applicable (N/A) because there wasn't an actor in the film.

Research project	Type	Narrative modality	Documentary type	Viewpoint	Syllogistic syuzhet?	Events
2006:						
B patient	Product	Discursive-information	Expository	Omniscient	Yes	Natural
Intervent	Product	Episodic-juxtaposition	Expository+Performative	Omniscient	Yes	Natural
Madsounds	Interaction	Poetic-visual	Expository+Performative	Omniscient	No	Symbolic
Performance	Exhibition	Poetic-visual	Observational	N/A	No	Natural
Revolution	Product	Discursive-information	Expository	N/A	Yes	Natural
Vehicle luggage	Product	Discursive-information	Expository	N/A	Yes	Natural
2007:						
Bullion	Art installation	Discursive-information	Observational	N/A	No	Symbolic
Cabin Fever	Architectural	Discursive-information	Observational	N/A	Yes	Natural
Dot	Product	Episodic-juxtaposition	Observational	N/A	Yes	Natural
Hera.miko	Fashion footwear	Discursive-information	Expository	N/A	Yes	Natural
Plastique	Exhibition	Episodic-juxtaposition	Observational	N/A	Yes	Natural+Symbolic
Presence	Interaction	Discursive-information	Expository	N/A	Yes	Symbolic
Robots	Interaction	Poetic-visual	Observational	N/A	No	Symbolic

Snapshot	Service	Discursive-information	Expository	N/A	Yes	Natural
Urban edge	Product	Discursive-information	Expository	Omniscient	Yes	Natural
2008:						
Always on	Product / interaction	Poetic-visual	Observational	Omniscient	Yes	Natural
Aquahood	Product	Discursive-information	Expository	N/A	Yes	Natural
Artico	Product	Discursive-information	Expository	N/A	Yes	Natural
Imagine a phone	Product / interaction	Episodic-juxtaposition	Expository	Omniscient	Yes	Natural
Longplayer	Art installation	Poetic-visual	Expository	Omniscient	Yes	Natural
Malaria must go	Product	Discursive-information	Expository	Omniscient	Yes	Natural
Sense	Interaction	Discursive-information	Expository	N/A	Yes	Natural
Verticulture	Product	Discursive-information	Expository	N/A	Yes	Natural
Yumi	Product	Discursive-information	Expository	N/A	Yes	Natural
Zoas	Product	Discursive-information	Observational	Omniscient	Yes	Natural

Table 1

Analysis of graduate group research projects at the Royal College of Art, London UK

The design research was diverse, covering the exploration of product, interaction, art, exhibition, architectural, service, and fashion footwear. Some example projects included 'Imagine a phone: investigating the future mobile communications (view at <http://youtu.be/TrFfCzT2s8A>); 'Malaria must go': malaria prevention in the third world (view at <http://youtu.be/oqqyLr9ZF0c>); 'Plastique': public interactive conceptual exhibit for the Science Museum in London (view at <http://youtu.be/4e6Zsn6RTWl>); and 'Dot: a digital interactive childrens' playground (view at http://youtu.be/r7qNt97_4Fk).

There are a few notable trends in the data, although it is a relatively small sample set. Many of the product categories use a discursive-information narrative, an expository documentary style, a syllogistic syuzhet, and natural events. This was a straightforward approach that was information rich but not always engaging for the audience or very good at tacit communication, although the latter was not always needed. Some of the more experimental and conceptual research made use of symbolic events. Exhibition and interactive research included more observational documentaries.

The film theory analysis shows that many film typologies were used by the students. These were chosen intuitively and on the basis of their own experience of film making as well as their observation of other research films: after 2006, students were able to view work from previous years. The grades of the work, as assessed in conjunction with external examiners, improved notably and the examiners' reports noted the value of the medium for both explicit and tacit communication. The examiners still met with the

graduate groups to discuss the work and see any artifacts, but the quality of the discussions improved dramatically in terms of critical analysis. Additionally, the public response was very positive when the work was exhibited. The system introduced a virtuous circle: graduate students could learn from their peers' efforts. The external examiners reports also noted improvements year on year. Although the data from 2009's films was not analyzed, the quality matched 2008. Further improvement in the quality of the design research communication would be encouraged by an introduction to film theory as well as professional training in film making and a better understanding and allocation of the roles of a production crew.

The communication of design research through film media in all of the paper's case studies was through a documentary approach. A key difference between the two case studies previously described is that the first was professionally created and the second comprised films by relatively untrained graduate students. However, they both demonstrated that the film media could be very effective to convey knowledge. The cost difference was dramatic: the professional film budget, with many favors drawn to keep it well below commercial rates, was about £10,000. The student films essentially had no budget. The professional film had a dedicated production crew and used high quality lighting, sound and cameras, as well as good locations and real actors. There is a role for both extremes. Further, based on the author's personal experience, an understanding of film theory and practice should improve the research communication by the graduate students even if they still use basic equipment.

Film use in design practice

Many films used in design practice are explicit functional presentations. The use of film media is reasonably well established as a tool in design practice for communication of information with clients, just as it is in business for investors, and in marketing and advertising for customers. An attribute of film media used in such a context is the way in which it lends itself to summarisation since the explicit communication component of film media is necessarily restricted by the format; even an in-depth 40 minute television documentary is typically limited to a 3-4 page script of double-spaced type. When successful, the distillation of the complex findings of a research activity into film does not have to diminish the value of the original information.

Other practice-based films are more tacit. Early examples include much of the film work of the designers Charles and Ray Eames (Eames & Eames, 1950-1982), who made over 100 short films from 1-30 minutes. These were highly diverse in their nature, ranging from explaining mathematics and computers, to the nature of photography, and the production of fiberglass chairs.

Contemporary design practice can cross over into marketing and branding, either at a strategic or object level, or both. The use of film as a means of tacit communication is a common language between design practice, marketing and branding. In contrast to the sometimes laborious modern Hollywood style of exposition, McLuhan pointed out that the advertising agencies in the USA realised in the 50's and 60's that they got better audience traction by creating positive brand and corporate identification through communicating compelling abstract ideas as opposed to a direct sell of a specific product features or functions.

This was illustrated in the television series 'Mad Men' (Weiner, 2007), set in the 60's and in which the Maddison ad company pitches the 35mm Kodak slide projector as a time machine for memories. They rename the slide holder 'wheel' as the 'carousel' to draw on the association with the pleasure and nostalgia of childrens' fairground rides. Hence, the

ad companies are often selling dreams. In a real campaign, Apple showed how sociable the iPod was. They told the narrative of a girl and a boy on a bus getting their iPod earphones muddled up and becoming partners because they discovered they liked each others' music. In reality the iPod is the opposite: it is arguably an anti-social way of hermitically sealing users from engagement with others (Orlowski, 2005). But the friendly face of the brand has stuck.

In design practice, presentation films at client meetings are usually accompanied by the presence of the practitioners. Design practice typically uses film media intuitively and based on experience as opposed to film theory.

Interestingly, design practitioners and design researchers can be self-stereotyping in terms of their distinct approaches and methods (Design Research Society, 2010), with the former being about creativity and predominantly qualitative, and the latter being analytical and quantitative. This makes it harder for the research to bring value to the sphere of practice. Because tacit knowledge is important to both practice-based and theoretical research methods, it can act as a basis for understanding and collective values in both domains. This is essentially in alignment with Glanville's (Glanville, 1998; Glanville, 1999) compelling argument that research should be intrinsic to design and vice versa.

Conclusion

The argument has been presented that film media has a useful ability to convey tacit knowledge for design research. This does not mean that film has exclusivity to that function, but as McLuhan's 'rich' medium it is suited to this purpose. The principles of film theory and practice are the same regardless of whether the audience comprises researchers, clients, or user groups. It is the decisions of the film maker that will determine the effectiveness of the knowledge transfer. Kress (Kress, 2003) points out that as a prospective enterprise designers must choose a medium that best shapes that which they wish to make, given the audience, available resources, and the various constraints.

There were multiple advantages for film making in the design research case studies described. The main advantages are summarized:

- Communication of tacit knowledge and recording research that is hard to capture in a document
- Visual exploration of present or future scenarios
- Improved observational processes through film making
- Documentation of design process to improve design process – a positive feedback loop for researchers
- Quality of design outputs – qualitative improvement compared with previous documentation approaches
- Effective and efficient engagement with audience

The film making by researchers was generally using standard consumer equipment which has fallen in price and improved in quality to the point where good results can be achieved for research presentation purposes. The case study in which a film crew was assembled was better suited to a corporate presentation. However, advances in video filming options such as the use of Digital SLR cameras is narrowing the difference down to sound and lighting limitations rather than visual capture, depth of field, or resolution.

The author also found that researchers under the age of around 30 have already undertaken a lot of film making for recreational or personal use and were familiar with film editing techniques and basic production. This has been helped by the abundance of video capture devices such as smart phones, and free or cheap editing programs on personal computers.

Researchers do however benefit from learning film theory to take their work beyond an amateur level and offer them more range and capability, allowing the researcher to take advantage of the bullet points set out above. Film making benefits from film theory, training and practice. Designers generally have an affinity for narrative and visual communication and learning film making is relatively easy to accomplish.

Communicating design research to a research community as opposed to a client may or may not necessitate tacit knowledge transfer. This depends on the research. Practice-based research will also variously demand a tacit approach. The proximity and overlap of practice based design with marketing and branding and the shared medium of film has enhanced the professionalization of film making techniques in design practice.

As with all creative media, success is not guaranteed with tacit knowledge transfer in film. In caution, not all the interacting factors that influence knowledge sharing are necessarily fully understood and described in the literature (Alony, 2006).

The risks of narrative in film include incorrect or uncorroborated evidence, spin, misleading representation – accusations not infrequently made of advertising and marketing. So to fully communicate design research film sometimes needs to be supplemented by a text document or an expert may need to be on hand. Tacit knowledge communication can also give rise to ambiguities which can risk ineffective use of design (Dumas, 2000), in contrast to safer explicit knowledge formats.

To conclude, the understanding of film theory and its relationship to design research creates opportunities to better leverage the medium's value for the application of tacit knowledge communication in the contexts of research, education and practice. Furthermore, there is value in both tacit and explicit knowledge communication and these are complementary and not contradictory.

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