CONSTITUTING INFORMATION TECHNOLOGY RESEARCH: THE EXPERIENCE OF IT RESEARCHERS

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ABSTRACT: The collective consciousness of effective groups of researchers is characterised by shared understandings of their research object or territory. In this study we adopted a phenomenographic approach to investigate information technology (IT) research, its objects and territories, as they are constituted in the experience of IT researchers. Semi-structured interviews were conducted with researchers representing different sub-disciplines. Analysis revealed the variation in meaning associated with the idea of IT research; and the awareness structures through which participants experience variation in ways of seeing the object and territories of IT research. Eight ways of seeing IT research were found. The outcomes of our project appear to make visible the changes and developments that are an essential part of the character and experience of contemporary IT research.

Introduction

Bowden and Marton's (1998) framework of a learning community involves learning at the individual level, that is learning in the context of studying, and learning at the collective level, or research (p.80). Within their framework learning occurs when there is a change in awareness, when groups or individuals come to see some aspect of the world differently, thus widening the individual or community perspective. Research communities are necessarily learning communities, and we believe that understanding the character of these communities is vital to helping to build them. Bowden and Marton (1998) further suggest that the partnerships and collaborations that are essential to healthy learning communities are possible only when participants share, or understand, each others' ways of seeing their research objects and territories. When taken together these ways of seeing comprise the collective consciousness of a research community. Our paper explores the relevance of some of these ideas to the emerging domain of information technology (IT) research, and points to the benefits of conducting similar investigations in other discipline areas.

A number of studies conducted within the higher education community, and in different parts of the world, reveal the value of investigating researchers' ways of seeing. Baillie, Emanuellson and Marton (2001) examine researchers' ways of seeing material science, and Ingerman (2002, Ingerman & Booth, 2003) focuses on the community of physics researchers. Research students' ways of seeing research are explored by Kiley and others (2002), and their ways of seeing literature reviews, one aspect of their research experience, are explored by Bruce (1994, 2001). Ways of seeing the significance and value of IT research within the IT research community, including industry views, have been examined by Bruce and Pham (2001) and Bruce, Pham and Stoodley (2004).

Two previous studies are of particular interest because they cross disciplinary boundaries, in contrast to the discipline-specific research being reported here. Brew (2001a,b, 1999) examines ways of seeing research from the perspective of large research grant holders. She identifies four different ways of understanding research. The *domino variation* sees research as a series of distinct tasks, ideas or

techniques which may be combined in various ways and which may influence each other. The *trading variation* sees research as a social activity which produces items valuable to the researcher for market exchange. The *layer variation* sees research as uncovering previously unrecognised aspects of reality which exist behind the data or existing ideas and illuminate the surface layer in a new way. The *journey variation* sees research as a transformational journey of discovery in the researcher's experience, particularly with respect to their understanding of research issues or the impact on their broader life. The relationships between these categories are defined by their orientation, whether outwards to an external product (domino and trading) or inwards to internal processes (layer and journey); and by the researcher's presence in awareness, whether present (trading and journey) or absent (domino and layer).

Bowden, et al. (2002), in a study of university academics, detects five different views of success in a research project. Research is seen as successful if it results in: 1. outcomes that are useful to others (for example, finding solutions to problems or increasing people's awareness); 2. publication (for example, a book or journal article); 3. the development of researchers and their organisations (for example, developing new techniques or furthering career opportunities); 4. satisfaction to the researcher from a job well done (for example, through completing all the steps needed); and 5. personal stimulation to the researcher (for example, through participation in the act of discovery or by delivering helpful outcomes from the project).

Studies into researchers' ways of seeing fall into two groups. The first are those which operate across disciplines, such as Brew's and Bowden's explorations of the meaning of research from a range of discipline areas. The second are those which are located within specific disciplines, such as Baillie's work in material science, and Ingerman and Booth's work with physicists. In this way, our growing understanding of researchers' ways of seeing parallels the already well established body of work into ways of seeing learning (Marton & Booth, 1997).

Our investigation reported here is of the second kind. Our paper presents an analysis of the ways in which IT researchers understand or view the character of IT research, its research objects and research territories. The different ways of seeing IT research, uncovered and described, reveal a detailed picture of the ways in which IT research is constituted by the IT research community. They make visible the changes and developments in ways of constituting the research object that have been an essential part of the emergence of IT research.

The primary purpose of our paper is to bring these differences and complementarities into the open with the intention of enriching the collective consciousness of IT research. The pattern of views that has emerged is offered as a platform that may be used by experienced researchers in establishing research collaborations. It also forms a framework through which higher degree research students and their supervisors may be encouraged to explore and understand the complexities of their discipline. These potential benefits suggest that there may be value in similar work being undertaken in other discipline areas.

The Context

The information technology discipline, where our study is located, is relatively new to the university environment. It encompasses fields as diverse as computer science, data networks, information security, information analysis and management, multimedia and information systems. Its roots extend from host disciplines as old as mathematics and logic; and its web interweaves with business, linguistics, psychology, engineering, education, law and the creative arts to name a few. Its researchers use techniques from the scientific method to action research and hermeneutics; their interests focus on the technical, the educational and the social. Its investigations extend across topics as widely differing as data mining, cryptography, database architecture, multimedia, e-commerce and information science. As its researchers attend increasingly to applications, research is becoming more multidisciplinary, addressing issues which may be seen to belong to the domains of, for example, life science, education, management or art.

While this diversity is potentially a strength, it is also potentially a weakness. The varied interests are likely to be accompanied by different understandings of the research domain, and these may either threaten the field through excessive fragmentation or strengthen it, if the diversity of views can be captured and shared. The threat of fragmentation and consequent impact on the development of IT research is serious internationally, and particularly in Australia as Australia 'lacks the large cohort of experienced IT researchers capable of tackling long term issues…' (Goldsworthy, 1997, p.88). The threats are compounded in a situation where funding mechanisms for IT research are also fragmented (Sara et al., 1998, p. 75).

One motivator for our study was the desire to begin a process of strengthening the field through capturing and sharing the diverse views of the researchers belonging to it. Another motivator has been external imperatives towards collaboration. It is rare for the many subdisciplines associated with the information technology agenda to be brought together in one organisational area, as they are at the host institution for this study. Over the last five years, as the university has responded to government research and funding agendas, smaller research groups have amalgamated; and cross faculty and industry sponsored research collaborations have been formed. As we have responded to the well documented changes in the research environment (Jacob & Hellstrom, 2000), we have sought strategies to enable and encourage collaboration. This study forms one piece in a mosaic of strategies, intended to help us understand our research culture better.

Investigating Ways of Seeing IT Research, Its Objects and Territories

Since the early 1970s phenomenography (Marton & Booth, 1997; Bowden & Walsh, 2000) has been used to investigate variation in ways of seeing or experiencing phenomena associated with learning. More recently, the approach has been used to investigate the collective consciousness of research communities (Bowden & Marton, 1998), including academic conceptions of research and scholarship (Brew, 1999, 2001 a,b), ways of seeing the research object amongst

particular research communities (Baillie, Emanuellson & Marton, 2001; Ingerman, 2002; Ingerman & Booth, 2003; Bruce, Pham & Stoodley, 2002; Pham, Bruce & Stoodley, 2002), and research students' ways of seeing (Kiley, 2002; Bruce, 1994, 2001). We have adopted phenomenography as the most appropriate means of exploring variation in ways of seeing IT research, its objects and territories. It allows us to examine variation in the internal relation between researchers and aspects of their world, investigating critical differences in how they are aware of some aspect of their world, and also in how that aspect of the world appears to them. In this investigation, exploring ways of seeing IT research, its objects and territories, involves exploring ways in which IT research, its objects and territories, are looked at, and how they appear. The character of IT research is constituted in the relation between researchers and their research object or objects. The term 'constituted' is used to reflect the holistic relationship as it is experienced.

In seeking participants, a purposive sample was approached to maximise the possibility of uncovering variation. Seventeen IT researchers, working in South East Queensland, Australia, agreed to participate. Twelve were male and five female. They ranged in age from the twenties to over fifty. Five were within five years of PhD completion; twelve were more experienced. Disciplines included Computer Science, Information Systems, Social Medicare, Business and Social Psychology. Participants' research interests included robotics, artificial intelligence, security, information management, multimedia, software engineering, information sciences and IT education.

During semi-structured interviews, participants conversed with the interviewer in response to four core questions which were designed to encourage discussion about the character of IT research:

1. Describe your area of research. Is this IT research? Explain what makes this IT research.
2. [In relation to five abstracts supplied.] How do you decide whether these studies represent IT research or not?
3. What is it about them that would help you decide?
4. How do you in general decide if someone is doing IT research, or not?

These questions oriented participants towards the phenomenon (IT research, its objects and territories) whilst allowing them to structure it according to their own experience. The interviewer developed a trail of further questions, as required, to achieve a shared understanding of the participants' perspectives. The first question focussed participants on their personal research. Attention was then shifted to specific projects representing different types of IT research, captured by extracts from published articles. These projects included research into conceptions of information systems, the social impact of business process re-engineering, and innovative software and hardware development, echoing the range of existing possibilities in IT research. Finally, participants were asked to reflect on how they decided whether projects were IT research or not.

Interviews were transcribed verbatim and a copy sent to each participant for information and comment.

As varying meanings associated with IT research, its objects and territories, were probed during the interviews, the interviews themselves are considered to be an early phase of the analysis. The research team then engaged in an iterative analysis guided by an intention to seek (1) variation in meaning associated with the idea of IT research, and (2) an understanding of the awareness structures, the internal horizon (focus) and external horizon (perceptual boundaries) through which the structure of the participants' experience may be described. We sought to discover and describe the different ways of seeing (or conceptions) amongst the community of IT researchers (the subjects) in relation to IT research (the object). We needed to be able to describe the varying internal relations between the subject and the object. This can be represented diagrammatically (see Figure 1).
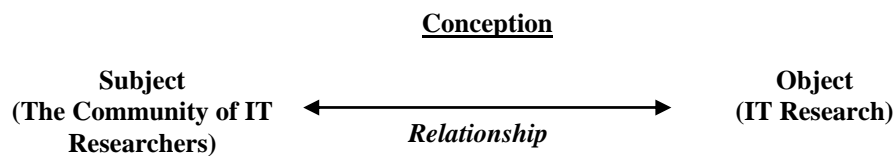
Conception

Subject
(The Community of IT Researchers)
←——— *Relationship* ———→
Object
(IT Research)

Figure 1: Graphical representation of a conception

Participants expressed various conceptions (ways of constituting IT research) during the interviews. These are represented as categories of description comprised of interrelated parts. First, a referential component establishes the meaning of the category through category names and the descriptions accompanying them. Second, a structural component describes the focus (research object); and the object and perceptual boundaries or horizons, representing how the territory of IT research is constituted in that category. Categories are thus discernable through variation in meaning, focus and perceptual boundary.

Ways of Seeing Information Technology Research, Its Objects and Territories

Eight ways of seeing IT research, its objects and territories, are presented: The Technology Conception, The Information Conception, The Information and Technology Conception, The Communication Conception, The Ubiquitous Conception, The Sanctioned Conception, The Constructed Conception and The Dialectic Conception. These categories do not depict the views of individuals, in the sense that individuals cannot be aligned with any one of the categories. Individuals may be expected to adopt one or more of the ways of seeing in relation to a particular project at a particular point in time.

While the categories of description represent varying ways of seeing discovered amongst the participants, the outcome space represents the relationship between those different ways of seeing. It depicts the way in which the parts can be related to form a whole picture of the different ways of seeing amongst the participants interviewed. It represents the phenomenon of IT research as seen by this group

and presents an experiential framework for thinking about the ways in which IT research is constituted in the experience of IT researchers.

Outcome spaces have, in different projects, been found to represent historical views of a phenomenon, a widening awareness or a hierarchy of increasing complexity and sophistication.   The system of categories devised to depict the phenomenon of IT research in this study appears to be logically divisible into two parts (see Figure 2). These two groupings of categories indicate different ways of approaching or seeing IT research. The research focus broadens in the first set of categories. In that first set the relationship between the research community and the object or territory is passive; in the second set the relationship between the research community and the object or territory is active.
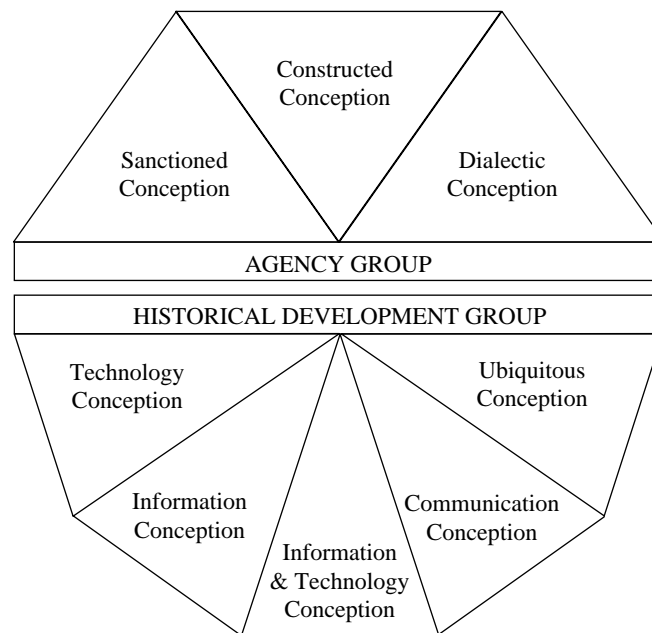

Figure 2: Outcome space for the phenomenon of information technology research

The first group focuses on the constituent parts of IT research and their interrelation.   The constituent parts associated with the first five categories are:

Category One: Technology

Category Two: Information

Category Three: Technology, Information

Category Four: Technology, Information, People

Category Five: Technology, Information, People, Applications

The growing number of elements associated with Category 1 to Category 5 seems to parallel the historical development of IT from its earliest stages through to the present.

> *We moved out of the idea of having stand alone computer systems in the late 60's,*
> *early 70's and never looked back. So the web is simply an extension of a process*

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that started back then when people started connecting computers together and connecting terminals to computers. So having data communications projects under the umbrella of IT is just part of that extension. (3.2c)

In these first five categories, researchers are interacting with the elements of IT. When interacting with the research territory this way, researchers do not see themselves as actively constructing the territory.

... to some extent I guess it's just the status quo isn't it? Because we're there and then nobody else has proven that we shouldn't be there ... we continue to do it. ... people don't really question ... creating the boundaries doesn't seem to be something that we tend to do - not that I've seen, anyway. (3.6a)

This is in contrast to the remaining three categories, in which researchers see themselves as interacting with the meaning of IT research as a whole, and feel responsible for actively constructing the territory.

In these categories the defining agents are:

Category Six: Others

Category Seven: IT Researchers

Category Eight: IT Researchers interacting with others

Researchers express an awareness of how they or other researchers relate to IT research, not just in the sense of being engaged in it but also in the sense of delineating what it is they are engaged in, and see themselves as more or less in control of the research territory and responsible for its construction.

... is the work I do IT research? Well yes, because I might deliberately define it that way, because my end objective is to move research applications which I put in to a different assessment committee, for argument's sake. (4.3a)

... it would be seen by some as being certainly on the cognitive side of computer science and therefore belonging to the field of IT but to me its approach is mathematics. (15.5c)

Both groups of categories constitute various ways of experiencing IT research objects and territories. The first group reflects an interest in content and the emerging historical patterns of the discipline. It articulates a comparatively concrete experience. The second group reflects an interest in control of the research territory and responsibility for its construction. It articulates a comparatively more abstract experience.

The next section of the paper elaborates each of the categories, delineating the ways of seeing IT research and its associated objects and territories. Illustrative quotes are given, more of which are available in the project report (Bruce, Pham & Stoodley, 2002).

Ways of Constituting IT Research, Its Objects and Territories

Category 1: The Technology Conception

In this category, IT research is seen as research that attends to, is oriented or directed towards, technology. According to this way of seeing, research includes

activities such as the manufacturing of technological artefacts, development of new systems, writing of mathematical formulae or creation of programming code. Technology is seen to be the defining element of IT research. For researchers adopting this way of seeing, terms such as 'hardware', 'software', 'computing science', 'systems design', 'algorithm' and 'programming' may indicate that an investigation belongs to the discipline.

The focus of IT researchers in this category, their research object, is technology. Technology is delimited as the artefacts of IT, the programs or languages that control these and the systems they construct.

> *[What helped you decide, "Yes, this is definitely IT"?]*
> *I was looking for the extent to which technology was an integral ... intrusive, almost, part of it, rather than a background, invisible element. (9.4a)*

The territory of IT research in this, as in other categories, mirrors participants' views of their research object. The territory of IT research is seen in this category as constructed solely in relation to technology.

> *I would see core IT as being ... engineering-IT developments of new hardware and software... (17.4b)*

This way of seeing excludes applications of IT from the research territory; and thus contrasts with other categories of description which incorporate applications in their understanding of what IT research encompasses.

> *Information technology ... produces artefacts which are useful in the information environment... - let's be specific ... routers, switches, computers ... It would not be ... a medical information system. That would be an application of information technology ... (4.9a)*

The historical roots of IT are seen as informing the character of the field. This includes foundations in mathematics and engineering and areas of study, such as machine learning, which have been associated with IT.

> *... information technology is ... programming and mathematics kind of mixed together ... because that's how a lot of IT faculties were born ... out of mathematics faculties. (14.3a)*

This way of seeing embraces the foundations upon which information technologies are built; the machinery, software and systems that make information processing possible.

Category 2: The Information Conception

In this category IT research is seen as research that attends to, is oriented or directed towards, information processing. According to this way of seeing, research that attends to information processing includes activities such as the security, organisation and storage of information. The manipulation of information is seen as the distinguishing feature of IT research. Information processing is the focus of attention and technology is in the background, serving as a tool for achieving the core purpose of IT.

> *... if we're talking about technology research, ... or computing or something else, that's different, but IT ... I mean, the very purpose of it is the information, and the technology I see as the means ... therefore if it's just purely technology stuff that*

> *doesn't relate to ... identifying the nature of information, I don't see that it is IT. (9.4b)*

Concerns about the content of the information appear outside the scope of this way of seeing.

> *... IT people are primarily interested in the processing of information, not necessarily what the information is about. (10.5c)*

The focus of IT researchers in this category, their research object, is information, with technology in the background. Technology is seen as a tool for manipulating information at a high level. Thus, for research into technology to be considered IT research, it must relate to information processing.

> *... I couldn't say that it was IT research until I decided to ... apply it to information processing problems. (10.5c)*

The territory of IT research in this category differs from that represented in category one. It is seen as delimited by interest in information processing; research that is not about information processing is not seen as IT research. The use to which the technology is put (that is, the processing of information) is seen as defining or delimiting the essential character of the field.

> *... I'm looking specifically at information, so I'm limiting technology by information. ... I think ... researching programming languages ... researching a piece of software ... looking at the ergonomics of ... how one sets up a system in an office ... is not IT, it's more technology research. So the architecture of the systems within there [points to a computer] is more technology rather than information technology. (9.5b)*

In contrast with category one, here application to information processing is seen as integral to IT research. Categories one and two also differ in as much as technology here is unobtrusive, relegated to a background role as a means to accomplish what is understood to be the central function of IT (which is information processing).

Category 3: The Information and Technology Conception

In this category IT research is seen as research that attends to, is oriented or directed towards, both information and technology. According to this way of seeing, research that attends to both information and technology includes activities such as information collection, information provision and information security. Researchers who see IT in this way consider the convergence of information and technology as integral to IT. Research into technology or information in isolation from the other is not considered to be IT research.

> *... IT is much more than information technologies but as the basic grounding, I suppose, looking at gathering and dissemination and selection of information using technologies. (9.2b)*

The focus of IT researchers in this category, their research object, is the simultaneous attention to both information and technology

> *... because IT is two words ... there's that link between the two - that it can't just be technology per se and it can't be just information per se but one's going to lead to the other. (9.4a)*

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The territory of research in this category combines the territories of categories one and two. The interaction of both information and technology comes into focus to a greater degree. Researchers who see IT in this way consider the convergence of information and technology as representing the central character of the field. Research which disconnects either technology or information from the other is not seen as IT research. This way of seeing contrasts with the previous category in that the application of technology to human pursuits expands to a wider range of activities. It contrasts with the following category in that the application to information processing there includes its impact on people. This way of seeing also contrasts with the previous category in that the information processed is of a higher level. It contrasts with the following category in that the meaning of information in the next category is central.

Category 4: The Communication Conception

In this category IT research is seen as research that attends to, is oriented or directed towards, the experience of communication amongst people. Research that attends to the experience of communication with people may include development of more efficient information exchange techniques, methods of information transfer, facilitation of human thinking and support of learning.

Researchers who see IT in this way see people and communication as central, the mediation of information to people as a critical element. Therefore, enabling effective communication is of core interest to IT researchers.

> *This, again, is fundamentally an IT area, but once more we have to remind ourselves, why is an IS system being developed and who are the intended users? So … it needs also to link back to intended users and develop systems that they can actually apply. (17.3a)*

In a similar way to Category 2, in this way of seeing, technology is viewed as a tool to enhance the communication of information amongst people. However, in contrast with Category 2, here technology is much more a focus of attention for research.

> *… it's thinking tools for man really … So it's not that you're looking at people. It's not that you're programming computers, it's the purpose that you are doing it for … to improve the tool in the long run, and its application … (12.11d)*

Overall IT research is seen to focus not just on information, nor only on the technology, nor even solely on people, rather it targets the interaction between technology and people, in terms of the quality of information exchange that is taking place.

The focus of IT researchers in this category, their research object, can therefore be described as being discerned in terms of the simultaneous attention to information, technology and people. This simultaneous attention results in an interest in communication.

> *It encompasses more than just the software and the hardware … but it also looks at the nature of the information, how the information is … communicated, how that information gets used, how it gets abused, how it enhances learning, how it doesn't enhance learning … (13.6d)*

The territory of research in this category expands to include communication with people. The complex web of relationships between people, technology and information and the impact of information technology on people add richness to this way of seeing.

> *... perhaps we're now working towards a hierarchy here, where we have technology which is the chips and the ... printed circuit boards ... then we have the information technology, so we have technology that is actually able to mediate information and that forms part of a system to provide information to human beings and we're now looking at how human beings interact with it [an information system]. (8.2d)*

Researchers who see IT in this way see people and communication as central and thus constituting the essential character of the field. This way of seeing contrasts with the preceding category in that it includes human beings. It contrasts with the following category in scope, in that the next category sets no limits on the scope of IT research.

Category 5: The Ubiquitous Conception

In this category IT research is seen as research that attends to, is oriented or directed towards, the application of technology to all human endeavour. According to this way of seeing, research that attends to the application of technology to human endeavour includes, for example, algorithm development, technology selection, skills for using technology and legal issues. Researchers who see IT research in this way consider all aspects of initiating and maintaining an IT system to be of interest, whether it be hardware or software development, systems operations or social implications. IT methodology applied to another discipline may also be considered to be IT research.

> *I think it's now the world, so all things, they are all related to IT, so the topic is really broad ... so it could be anything like how to solve ... one small algorithm problem ... or ... teaching IT or ... management in IT. It could be anything ... (6.3c)*

In this category, application of IT to business, medicine and education is seen as valid IT research. In contrast with limiting the application of technology to purely technological problems, which may be acceptable in category one, this category expands the scope of application to include application of technology to disciplines which may otherwise not be associated with technology.

> *Could it fit under business or marketing or economics ... education? (pause) IT services all those disciplines – it's not under any one umbrella. (11.5c)*

In this category, application is seen as a critical feature of IT research and helps delimit it from other types of research.

> *[It would be excluded from IT] ... if there was no ... likely application, perhaps one could go even stronger and if there was no obvious application ... (2.6a)*

The focus of IT researchers in this category, their research object, is information technology and its many applications and uses, in this sense IT is seen here as ubiquitous.

The object of research is the development, maintenance, use and impact of computers in any setting.

> *[… so, what would stop it from being IT … as in, falling within the realms of IT research?]*
>
> *… from what I can see, I don't think that you could ever draw that boundary. The boundaries of IT are just so fuzzy - it permeates everything. (3.7d)*

The territory of research in this category expands to include all endeavours using computers. This view is boundless, representing the broadest possible perspective of what is included in IT research. Researchers seeing this way consider application of technology to be the essential component of IT research and thus the integral element in defining the character of the field. With the existing pervasiveness of the use of computers, this way of seeing is considered to reflect the present state of play in the evolution of IT as a discipline.

Category 6: The Sanctioned Conception

The previous five categories reveal an interest in the content of IT research and the research objects are comparatively concrete, reflecting the changing historical character of the discipline.

The character of the following three categories differs from the preceding five. They reveal an interest in the construction of the territory and the role of individuals and groups in its formation.

In this category what constitutes IT research is seen as determined by others. IT research is seen as that which is sanctioned by others as IT research. Researchers who see IT research in this way consider the views of others as central in defining IT research. This view may be expressed in acknowledging the role of established IT departments, or in acceptance of papers at IT conferences. It may also involve the researcher's understanding of society's view of IT.

> *… there is a computing science school in the Faculty of Information Technology, so I think computing science is acknowledged as a discipline of information technology. (7.1c)*

Researchers adopting this view see themselves in a passive relationship with IT research, responding to definitions supplied by others. However, they see the research community as a body, and others outside the research community, as being in an active relationship with IT research, playing a significant role in defining IT.

The focus of IT researchers in this category, their research object, may vary. Essentially the object will be an acceptable IT research object if it is sanctioned.

> *I would see that this would certainly sit within the computer graphics side of computer science … so there would be a number of people who would say that this is central to those sorts of things and as a result it would be viable as information technology. (15.6b)*

The territory of research in this category is delimited by other people's perceptions of IT research. Other people's perceptions define the character of the field. Deference is paid to the opinions of others. In the following categories a greater level of personal responsibility and empowerment is envisaged for how IT research is delimited.

Category 7: The Constructed Conception

Fragments only of this category were found. However, the available evidence, together with clear contrasts with categories six and eight, suggest that it is worthy of inclusion.

Here, what constitutes IT research is seen as being defined, or constructed, by IT researchers. Researchers looking at IT research in this way see themselves as actively constructing the territory of IT research. They see themselves as defining the character of IT research. In their interactions with each other, and the outside world, they see themselves and their colleagues as dynamically forming the territory of research. IT researchers in this category perceive themselves as definers, innovators, explorers and change agents. They are looking for ways in which they are distinct and different from the rest of the world. Researchers see themselves as being in an active relationship with IT research.

> *… I mean, it is important I guess for IT, it is important that you have a feeling of your identity so that you don't spread yourself everywhere … I guess that makes it important, that you know what your corpus is, what your central – what do you bring to the world that's different from the rest of us? (12.11b)*

The focus of IT researchers in this category, their research object, remains variable. However, the object will be IT research if it is the result of their active construction of the IT research territory. The focus of IT researchers, their research object, appears to be personally constructed.

> *I think there's an orbit, a very loose orbit that we sort of bounce around, almost like a particle, and sometimes we're on the fringe and sometimes we're not and what is on the fringe at one stage suddenly becomes core later on. For example, human-computer interfaces, definitely social psychology, cognitive psychology but now if it's helping me to build better systems, it's definitely seen within the core [of IT]. (15.4a)*

The territory of research in this category is limited only by the perspectives of IT researchers. It is the IT researcher who is in the process of defining the character of the field. Here, others' opinions are subject to the judgement of the individual researcher.

> *… it would be seen by some as being certainly on the cognitive side of computer science and therefore belonging to the field of IT but to me its approach is mathematics. (15.5c)*

Researchers themselves choose what lies within the realms of IT research and what is excluded. They have a clear idea in this category as to what their contribution is. They have an active role in the continuing evolution of the field. This view sees the researcher as being in control of and responsible for what constitutes IT research.

Category 8: The Dialectic Conception

In this category what constitutes IT research is seen as determined in a dialectic between the individual researcher's goals and the views of others. Researchers looking at IT research this way consider both established views of IT research, and their own goals in classifying research, in determining how IT research is constituted. They are influenced by sanctioned definitions of IT research but they

are also influencing the definition of IT research. An individual's purpose in choosing to classify their research as IT may relate to winning funding from a specific panel, being accepted for publication in an established journal, positioning themselves to advance their knowledge, or conformity to the regulations of an esteemed university.

> *… it would be possible to take the same piece of work and you … reword it or sell it in a different way to make it IT or business … (16.4b)*

In this category researchers position their work to their advantage and influence the territory in that way. For example, if applying for IT funding these researchers are hoping that the gatekeepers' approaches to IT research are open to change and therefore able to embrace their project proposal. If the response of the funding committee is positive, then the applicants have influenced the committee to conclude that the project is IT research and they have therefore helped broaden the definition of IT research. If the response of the committee is negative, the applicants have helped the committee draw a clearer boundary between research that belongs to IT and research that does not belong to IT. The researchers are thus actively pushing the boundaries and influencing how IT research is being defined.

> *Now, you can't separate the classification and categorisation from an end purpose. So, is the work I do IT research? Well yes, because I might deliberately define it that way, because my end objective is to move research applications which I put in to a different assessment committee, for argument's sake…(4.3a)*

The focus of IT researchers in this category, their research object, remains variable. However, the object will be IT research if it satisfies both the researcher's goals and established IT research institutions which will allow them to pursue those goals. The focus of IT researchers in this category, their research object, appears to be issues that are both sanctioned by others and personally constructed in an ongoing dialectic.

> *… it's not just our opinion, of course … we don't look at this as a problem in a vacuum – we are swayed enormously by … where you can get published and where you can get grants … You either conform or rebel or try and modify or agree with or whatever, but you can't ignore what the majority or even the dominant paradigm is. (10.7c)*

The territory is being constructed in the relationship between the goals of the individual researcher and the established views of IT research. The research territory is delimited by the purposes of the individual researcher in relationship with the views of others. Thus, it is the interaction between the purposes of the individual researcher and the views of others which define the character and structure of the field.

Discussion and Conclusions

This study has confirmed for us the value of exploring researchers' ways of seeing within the context of a single discipline. It has become possible to see more clearly significant differences in researchers' awareness of their research objects and territories. The clarity of particular foci or themes in each category opens up the possibility of their use for both intra- and inter- disciplinary communication and discussion. In particular they may help us understand potential barriers and

opportunities for interdisciplinary collaboration. The outcome space and associated categories also have significant potential for contribution to aspects of postgraduate supervision; providing supervisors and students with a framework for exploring elements of the IT research territory, and for working through the implications of adopting particular positions within that framework.

The domain of IT research, like any other research territory, could be seen as being continuously constructed by researchers participating in the endeavour. According to Bowden and Marton (1998) the collective consciousness comprises 'what is common and what is complementary' (p. 194). It emerges when people are conscious of the same phenomenon or object of knowledge, and are conscious to a greater or lesser extent of each other's ways of seeing, experiencing or thinking about the phenomenon. The collective consciousness of IT research is in relatively early stages of formation when compared with many other disciplines. Nevertheless, as our analysis has shown, IT research is an interesting and complex domain comprising multiple perspectives.

Our discipline-specific study, in contrast to the cross-disciplinary studies of Brew (2001 a,b, 1999) and Bowden, et al. (2002), was designed to focus on the object of research. It is because of this difference in focus that there is no obvious correlation between our outcomes and theirs. The narrower focus of a discipline-specific study has the potential to elicit discipline-specific detail. Our study, for example, has revealed possible historical influences on researchers' understandings of their field, as shown in the Historical Development Group. This type of relationship was not found in the cross-disciplinary studies where the participants had a more diffuse shared history.

It appears that discipline-specific studies are also able to bring generalisable findings to the cross-disciplinary context. Our Historical Development Group points to a pattern of experience which may exist in other disciplines, with conceptions of research in those disciplines falling within distinguishable eras of that discipline's evolution. Our Agency Group reveals perspectives which may apply in the context of research in any discipline, since they see the IT discipline in terms not specific to the IT research domain.

Both kinds of studies, discipline-specific and cross-discipline, are therefore necessary and complimentary in illuminating the experience of research in higher education.

The primary outcome from our study is a framework comprising a set of categories, each of which represents one of a set of ways in which IT researchers may see IT research, its objects and territories. These categories represent different ways of seeing IT research from a broad perspective; they are not associated with specific sub-disciplines within IT. The intention is not to classify specific researchers or groups of researchers, but rather to identify different ways of thinking that may change with the context in which people work. This allows researchers from various groups to interact with the framework freely.

The two sets of perspectives revealed in our study may be more related than is first apparent. The first, reflecting historical developments, is not uncommon in phenomenographic research. The second suggests the space in ways of seeing IT research, its objects and territories, from which new categories in the historical

development group might emerge over time. In the historical development categories the research objects are artefacts of IT, in the latter categories the objects are variable, perhaps embryonic or surfacing.

Our results offer an explication of different ways of seeing the object of research, and different ways of seeing the territory. We also represent the relationships between these ways of seeing in an outcome space. We have discovered that it is not possible to describe ways of seeing IT research independently of describing ways of seeing the research object and territory. The latter two are an integral element of interpreting variation in ways of seeing IT research. Finally, we have illuminated the expanding and changing ways of seeing IT research. The outcomes of our project appear to make visible the developments that are an essential part of the character and experience of contemporary IT research. The different categories appear to reflect the developing character of the IT discipline.

For experienced researchers, making explicit IT researchers' ways of seeing their research object and territory may illuminate some of the complexities associated with inter- and intra- disciplinary collaboration amongst research groups; and the complexities associated with technology transfer to industry. For neophyte and early career researchers, this project provides a basis for beginning to understand some aspects of the character of the research community which they are exploring and becoming a part of. The experiential framework is available for use by supervisors and research students, providing a point of comparison and stimulus for dialogue.

Insight into the different ways of seeing these facets of IT research is essential to the development of the field. IT researchers need to see the commonalities and complementarities of their endeavour. These commonalities and complementarities form the basis of IT researchers' collective competence and creates the distinctive culture of IT research (Sandberg, 2000). All contributors to the research territory are exploring different parts of the whole, or approaching the phenomenon in unique ways, which leads to particular kinds of contributions. IT researchers are only just beginning to develop a collective consciousness, a consciousness which represents the emerging research territory. The territory is expanding and we do not know what constitutes the unexplored areas until we start moving out into those spaces. The IT research territory does not exist, however, separately from the work of researchers and others interested in it. We, through our human acts, construct that territory and allow it to emerge in our collective consciousness. As that collective consciousness grows, and we begin to better understand each others' ways of looking at and working within the territories of IT research, our understanding of information technology as a unique phenomenon should also grow.

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