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**THE COLLECTIVE CONSCIOUSNESS OF INFORMATION TECHNOLOGY  
RESEARCH.  
RESEARCH STUDENTS' WAYS OF SEEING INFORMATION TECHNOLOGY  
RESEARCH:  
ITS OBJECTS AND TERRITORIES**

Christine Bruce, Binh Pham, Ian Stoodley  
*Queensland University of Technology*

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# 1 Introduction

## Background

The collective consciousness of a research group is characterised by their shared understandings of their research object or territory (Bowden and Marton 1998, p.196). Information technology (IT) research is a relatively new field that has been subject to rapid expansion, diversification and fragmentation. Since the establishment of IT research, Information Systems (IS) and Computer Science (CS) researchers, for example, have come to focus on very different territories. They investigate areas as diverse as data mining, cryptography, database architecture, multi-media, e-commerce, information management and information science. The focus of CS researchers on technical issues, formal methods and abstract thinking has been broadened to encompass a wide range of issues related to the use of computer technologies, for example management of information systems and social impact, that are usually the domain of IS researchers. New opportunities for multidisciplinary research are also emerging, addressing issues which may be seen as belonging to, for example, life-science, education, management and art, all of which has led to the development of different perceptions, amongst IT researchers of what constitutes significant and valuable research.

Essentially IT researchers' understandings of the research domain continue to transform, and to fragment, in order to account for users' diverse needs. Although the general aim is still to seek better methods, systems and performance, urgent problems include how to transform work practices and recognise opportunities for innovation in other sectors such as business, science, engineering and government. New technologies have stimulated a surge of new approaches for development in industries such as electronic publishing and remote sensing for mining and agriculture. New industries, markets and employment patterns have emerged. Political and economic pressures are forcing university researchers to adopt a more outward-looking attitude, which encourages closer interaction and collaboration with industry and community. Investigating the problems and issues of these new frontiers ideally requires collaboration between different groups of IT researchers. While new research areas have been created to cope with such demands, progress is generally deterred by disagreement, conflict, and a general lack of cooperation between the different research groups. One of the primary causes of this conflict is different views of the territories of IT research. Cooperation and collaboration are further confounded by the adoption of research approaches from across a range of theoretical foundations. Thus, although IT researchers are commonly focussed on the world of information technology, the research interests of the various subgroups rarely intersect. Their differences are not only about what research object it is appropriate to investigate, but also about how such investigations should be conducted. Consequently, joint projects between the different groups and interdisciplinary research are comparatively rare. This threat of fragmentation is serious internationally and particularly in Australia. Australia 'lacks the cohort of experienced IT researchers capable of tackling long term issues' (Goldsworthy 1997, p.88) and there is much fragmentation of funding mechanisms in Australia for IT research (Sara 1998, p. 75). A close investigation of the varying ways of seeing IT research, its objects and territories is needed, to assist in *moving towards* as well as in *reengineering*, a shared understanding of the collective endeavour.

Two complementary studies have already been completed to address this problem. These studies investigated ways of seeing *the significance and value of IT research* and *different ways of seeing IT research objects and territories*. Combined, the Collective Consciousness projects have attracted \$48,000 in ARC and QUT grant funding. Their findings have been presented in three technical reports (Bruce, Pham and Stoodley 2002a,b,c), one refereed conference paper (Pham, Bruce and Stoodley 2002), one un-refereed conference paper (Bruce and Pham 2001) and two journal articles (Bruce, Pham and Stoodley 2004; Pham, Bruce and Stoodley 2005, in press). Completion of these studies has positioned the research team to investigate the perceptions of specific sub groups of IT researchers, in this case research students.

Intellectual precursors to this study include investigations from two lines of research: comparative analyses of the IT domain and investigation of different ways of seeing the world, including research. So far, most investigations which include some comparative analysis of the information technology domain have been in three main categories: social impact (e.g. Williams and Edge 1996; Sahay 1997), education (AVCC 1996; Bruce 1996; Pham 1997), and economic development (Roche 1996). Little effort has been focussed on the comparative analysis of different IT research areas, with the exception of Simon (1999) and Hirscheim et al (1996); the latter organises the sub-discipline of information

systems research into intellectual territories, imposing organising structures on the field rather than seeking them from within the life-world experiences of researchers as will be done in this study. The second line of research has an extensive history of uncovering variation in ways of seeing phenomena in the world around us (Marton and Booth 1997; Bowden and Marton 1998). While to date most of these investigations have been centred on student learning, researchers are now beginning to investigate ways of seeing research (Brew 1998; Kiley 2000) as well as attending to researchers' collective consciousness (Bowden and Marton 1998, Bruce 2000).

## Aim

The aim of the project reported here was to investigate dimensions of the collective consciousness of information technology (IT) research. In particular, the study explored how research students see:

- *research*, and particularly *IT research*;
- the information technology research field, or territory. What are the features of the field? What are its boundaries?; and
- the information technology research object. How do IT researchers see the 'things' underpinning their research? How do they collectively constitute or 'shape' the object of IT research? What kinds of shared understandings do they have of their research object? How do their understandings differ?

Clear understanding of the different ways of seeing these facets of IT research is essential to the development of the field. IT researchers need insights into the *commonalities* and *complementarities* of their endeavour. These commonalities and complementarities essentially form the basis of IT researchers' collective competence and create the distinctive culture of IT research. The significance of this study thus resides in its ability to:

- illuminate the expanding and changing nature of IT research as perceived by neophyte researchers;
- contribute to a systematic framework for research development strategies for novice as well as more experienced researchers;
- provide a point of comparison with other investigations of IT researchers' collective consciousness; and
- reveal the ongoing contribution of neophytes to the emerging field.

The primary outcome from this study is a framework comprising a set of categories, each of which represents significant differences in IT research students' ways of seeing IT research, its objects and territories. These categories represent different ways of seeing IT research from a broad perspective, without directly associating them with specific disciplines or sub-disciplines. The intention is not to classify specific research students or groups of students, but rather to identify different ways of thinking that may change with the context in which they work. This allows researchers from the various groups to interact with the framework freely. Working with a diverse range of research students ensured significant variation was identified.

## Participants

Research students enrolled in Queensland University of Technology Faculty of Information Technology higher degrees were invited to participate in this project - eighteen students responded. Half were male and half female. Most participants were under 40 years of age. They represented a range of sub-disciplines (see Table 1 below). Their research experience varied from novice to advanced. Most of them were full-time students.

*Table 1 Participants*

Gender		Age				Sub-discipline					Research experience				Mode	
M	F	<30	31-40	41-50	51+	CS	IS	DC	IM	Other	0-1	1-2	2-3	3-5	FT	PT
9	9	6	8	2	2	6	9	1	2	2	1	8	3	6	14	4

## **Data collection**

Participants were engaged in semi-structured interviews of approximately 30 minutes' duration. Five core questions formed the basis for the conversation, further clarification being sought through probing questions until the interviewer understood the interviewee's point of view. The core questions were:

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

These questions mirrored those from an earlier study of IT researchers (Pham, Bruce and Stoodley 2005, in press).

Interviews were recorded and transcribed verbatim. The transcripts were sent to the interviewees for information and comment and formed the data pool upon which further analysis was based. Analysis consisted of a thorough familiarity with the data, which led to the identification of i. the breadth of variation in meaning assigned by the participants to IT research and ii. the relationships between these various meanings. All conclusions drawn are the result of defensible evidence in the data.

## **Analysis**

During analysis the researchers immersed themselves in the text of the interviews. Out of this familiarity with the data and critical interpretation of it according to the phenomenographic method patterns arose. Similar views were grouped to form categories of description. These categories are distinguished from each other according to their focus. A change of focus, therefore, signalled a change of category. The meaning evidenced through this process is described below in the section 'Categories'.

The interrelationship between these categories is understood through the consideration of their perceptual boundaries, or the limits of view of participants when seeing IT research from each category's perspective. Any two categories will certainly have different foci but may share the same perceptual boundary. These relationships are represented in detail in the section 'Relationships between the categories'.

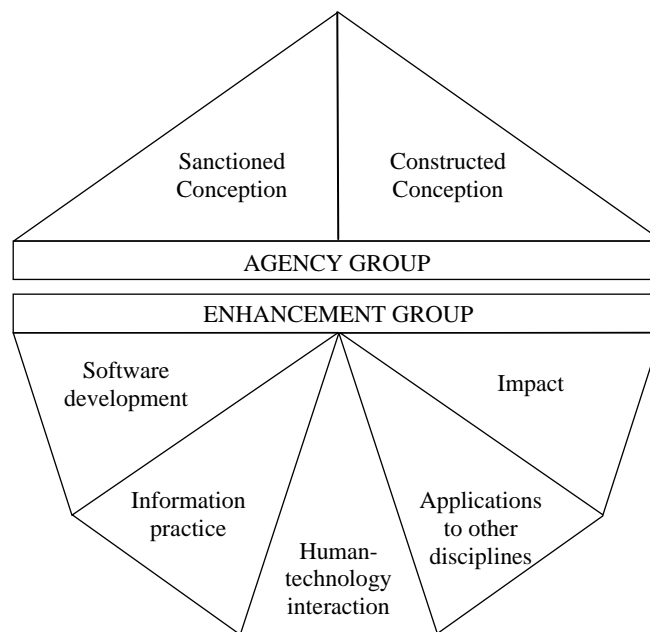
This approach is similar to that used in earlier studies and described in detail in those reports (Bruce, Pham and Stoodley 2002a,b,c; Bruce, Pham and Stoodley 2004; Pham, Bruce and Stoodley 2005, in press).

## 2 Relationships between the categories

In the course of discovering the views of the research students, two distinct groups emerged, the Enhancement group and the Agency group. The Enhancement group interacts with the individual elements of IT whereas the Agency group interacts with the development of IT as a whole.

One goal of this research is to describe the participants' perception of both the object and territory of IT research. It was found that, as in a previous study (Bruce et al. 2002c, Pham, Bruce and Stoodley 2005, in press), the objects of the resulting categories related directly to the territories. For example, an IT research student who sees the object of research as software development will also define the territory of IT research in terms of software development. Therefore, this description of the views of the object of research also describes the perceived territory of research.

The individual categories found are described in detail below under the heading "Categories". The outcome spaces shown immediately below represent the interrelationship of these categories.



*Figure 1 Outcome space for research students' ways of seeing information technology research*



## 3 Categories

### The Enhancement Group

#### Category 1: Software development

In this category IT research is experienced as enhancing software. Core IT is seen as algorithm design, which provides efficient instructions to hardware. Software development is the central element of this view, with much hardware development being relegated to engineering. Central concepts associated with this category are quadratic programming, algorithm, set logic, coding, paradigm, programming language and software engineering.

*straight away just looking at the 'software' I think that falls within IT ... in that it's building information systems ... by re-using software. ... I think that definitely falls within IT. (2)*

*I thought this is an ... IT article, because it is talking about software. (4)*

*it's hardware/software dependent and I consider that to be an IT project. (9)*

*if it involves things like hardware and software, technologies, computing, computational language, computational programs, then I would say yes that is IT research ... (9)*

Hardware-related concepts such as networking, IT artefact, processor and chip also indicate IT research, however predominantly meaning the software that enables these to run.

*for me engineering has a very heavy physical component. ... It's when you start getting into the ... well, where's your actuator? Where's your sensor? Oh well ... it's all happening inside the machine, there it is over there but ... there's no little arm to wiggle or anything like that. That for me is really getting into the IT side of things where most of it's ... software, very little of it is actually physically ... part of the equation ...*

*I So, if you were going to make a new, more efficient CD burner, would that be engineering or ... ?*

*R Yeah that's a grey area ... if what makes it more efficient is a more clever algorithm that you'll eventually burn onto a ROM chip ... that's probably IT. Especially if you're dealing with say algorithmic complexity showing that it's a much faster, much cleaner ... less errors type of encoding. I personally feel that's more IT. If the efficiency is ... how the motor spins, or stuff like that, well ... that's more engineering, if it's ... how the little cogs all interrelate with each other or ... that sort of nature. I guess it's a prejudice - I don't know if your ... engineering student writing the software to get all the little bits to move together would consider that ... where they draw the line. It would be interesting to actually talk to them about that one. But ... for me if the heart of what you're trying to do boils down to being ... I guess instructions to the ... physical components, that for me is more IT flavoured ... (1)*

*Everything has a mix ... because engineering as in the sense that you think of the chip, the circuit layout and the most efficient way to get it and the material to use, in terms of IT, you got to think of ... the algorithm (4)*

*it is looking at ... process architecture ... but ... to me it would be like saying, "Oh ... I'm going to study the way electrons flow through a CPU." ... the CPU could be IT hardware, but the actual study is going a lot smaller ... beyond ... that machine ... So you're actually looking at ... physics or what have you ... (9)*

This view sees information technology as software written to make computers work. IT is seen as positioned essentially in a virtual world. Computing technology is seen as the defining element of IT.

*... that's a ... technical computing issue of computer graphics, so that's pretty much a computing one ... that one to me is pretty obvious.*

*I So that's definitely IT from your point of view?*

*R ... given that my ... research is in computer graphics, it would! Yeah. I can understand that some people mightn't see that as ... computing, but ... it's asking whether someone is wet when they live in water, so to me it's obvious!*

I So - I want to keep going on that one - are you saying ... because it is about computing, it's definitely part of IT?

R ... (sighs) yeah ... I suppose the basis of my analysis is that ... if it's using computing, or is related to computers, then it needs to be addressed - it needs or can be addressed - from IT research. (17)

I think a lot of things can be IT because they all want ... computationally to solve things ... Or they want to make something automatic or have intelligent influence ... (18)

## Limits of view

The scope of this category may be represented in the following diagram.



Figure 3 Category 1: Software development

The focus of this category is software, which is perceived to be the core of IT. The peripheral boundary is virtual technology, which is perceived to be the outer limit of IT. Thus, the perception represented in this category is of IT as essentially having to do with software and anything lying outside the virtual world is not part of IT.

## How this differs from other views

This category contrasts with the next category in its focus on software development without reference to information being processed and in its exclusive orientation towards the virtual world. This view does not see beyond virtual tools.

## Category 2: Information practice

In this category IT research is experienced as enhancing the relationship between technology and information practice. Key concepts included in this category are information storage, retrieval, transfer, processing, access and use. Technology (both software and hardware integrated into a computer system) is seen as a medium for the manipulation of information; both information and technology are seen as essential parts of IT, technology being the enabler of information practice.

*IT definitely is information technology. We need the technology backbone, and also the integration of information with it in order to work together. So it is very essential to see IT as a whole, not separately. (3)*

*I think the technology needs to be somewhat interactive ... provides information processes, as long as it's got a processor in it I suppose we're talking about technology in IT. (5)*

*It's pushing ... whatever that has yet to be, what's out there that we don't even know about or contemplate. ... that will enhance and improve the way an individual or person can store, record, retrieve, access, use information. That's what information technology's about, isn't it? (7)*

*IT ... with a name 'IT' ... it's about dealing with information. Now, information as data that has been input into or is generated by a computer and somehow processed within that computer. And then somehow communicated ... (13)*

*the information technology to me is the transfer of the information using the technology (16)*

*use of ... a computer system ... that's manipulating the information ... or transferring the information. So is it converting it to a format for transfer and then reconverting it back at the other end into a representation to indicate what's happening at the input? So, I would tend to look towards the computer, the computer process involved. (16)*

This view sees information technology as a system which enables the manipulation of information.

## Limits of view

The scope of this category may be represented in the following diagram.



*Figure 4 Category 2: Information practice*

The focus of this category is information practice, which is perceived to be the core of IT. The peripheral boundary is technology, which is perceived to be the outer limit of IT. Thus, the perception represented in this category is of IT as essentially having to do with information practice and anything lying outside the world of technology is not part of IT.

## How this differs from other views

This category contrasts with the previous category in the importance placed on information processing through technology and in its acceptance of physical artefacts as valid objects of IT research. It contrasts with the following category in its relative disinterest in human interaction with the technology. This view does not see beyond the information being processed by the technology.

## Category 3: Human-technology interaction

In this category IT research is experienced as enhancing the relationship between information technologies and human beings. It includes how humans interact with IT artefacts, the skills they need and the way they use them. Humans, information and technology are seen as being part of a unified, integrated communication system.

*if it matters to the end human being, if it changes their interaction with the machine, there may be some benefit in an IT researcher knowing this and I think that it should be included in IT research. (1)*

*So, I think research into IT and my research ... is IT research because it's looking at the way people engage with an information technology, the internet in particular, and how they deal with it. (7)*

*you need to take into consideration the way people use those systems, how people use those systems, are people using those systems? You can't just create a system without considering the user and how that's going on. (7)*

*IT ... it's about dealing with information ... as data that has been input into or is generated by a computer and somehow processed within that computer. And then somehow communicated to ... humans ... (13)*

One participant thought this aspect of IT research made sense of the rest.

*There are a lot of ... ideas being put forward for solving certain problems but very few of them actually go ahead and say, "Well, what would matter to the end human? ... will it work with ... what we know about how people interact with the computers?" ... without the human being and what ... it does to them, and how it changes them, how they change the machine as a result, I don't see any point to it ... (1)*

This view sees information technology as a computer system in relationship with human beings.

## Limits of view

The scope of this category may be represented in the following diagram.



**Figure 5 Category 3: Human-technology interaction**

The focus of this category is human beings, which is perceived to be the core of IT. The peripheral boundary is technology, which is perceived to be the outer limit of IT. Thus, the perception represented in this category is of IT as essentially having to do with human beings and anything lying outside the world of technology is not part of IT.

### **How this differs from other views**

This category contrasts with the previous category in the central concern for the human interaction with technology as they use it. It also contrasts with the previous category, given that 'technology' now embraces hardware as well as software. It contrasts with the following category in its unconcern about where the technology is being applied. This view does not see beyond the technology the end users are interacting with.

### **Category 4: Applications to other disciplines**

In this category IT research is experienced as enhancing IT applications. This includes the application of IT to other disciplines, which is part of the IT development lifecycle. It includes solving problems in other discipline areas using IT artefacts. IT is seen by some as a tool which may be used to benefit other disciplines.

*the other reason why I think it does fall within IT is it's ... research that impacts on application, the application of IT, so that's why I think it does fall within IT. (2)*

*applying or using IT or computer power ... but ... to solve problems which aren't necessarily IT problems ... (2)*

*IT is a very pervasive thing and so consequently ... there's not a lot that people do today that there isn't some IT influence there at least. So regardless of what you're doing you can't really escape it. So most things would have an IT facet to the research. (5)*

*The limits of IT. There are no limits, they can do everything ... because it's ... the acme ... of technology (6)*

Students debated the nature of the relationship between IT and other disciplines. Various images are used to illustrate their points of view - IT is glue that sticks other disciplines together, a blend of other disciplines, an eco-system, and situated within a context. These typically portray IT as spanning disciplines and therefore pervasive.

*IT's like glue. IT is just like a ... virtual component ... which is a glue which glues up maybe mathematics and engineering together ... but ... it is certainly something, it is not as if it's nothing because it's glue, you see. So it is certainly something, but its main job is to pull things together and get things to create a better ... system or better product out. (4)*

*as an IT researcher, you're always influenced by other fields but it doesn't necessarily mean that you're in one of those other fields, because you're influenced by them because we want to take our learning from them ... IT is a very pervasive thing and so consequently ... there's not a lot that people do today that there isn't some IT influence there at least. So regardless of what you're doing you can't really escape it. So most things would have an IT facet to the research. (5)*

*I think of information technology and information technology research as almost being like an Eco-system. ... My little component of research is looking very much at a specific area of the psychology of a human engaging with the internet. ... Anybody else who is doing research in things I wouldn't even understand ... the research that goes on in there is just another little part of that Eco-system and together we sort of create ... (7)*

*I think in IT, it has to have context and IT research, as long as it's contributing to that context, then ... it's got a place, it's got relevance. (7)*

*my perspective of what is IT is you have the hardcore stuff which is the really technical ... the what's inside the computer or whatever and then you have all the atmosphere, the environment activities that we look at in terms of how it integrates and so forth. (12)*

*we can put some sort of border around what we consider to be IT and IT research ... but it doesn't mean that it's not going to take a lot of collaboration with the other faculties and the other fields, like science and engineering and maths and business ... to make a better information technology system. However, ... a lot of ... the collection of data and the display of data is not necessarily information technology. It's ... and the types of informa.. how you want to structure the data, is not necessarily a information technology area, it's more of a business area ... what do you want the information for, what do you want it to produce? And ... so ... it is not an area of research that I think is ever likely to be well defined because there are these blending of the various fields involved in dealing with a homogeneous system. (16)*

This view sees information technology as a computer system applied to other disciplines.

## Limits of view

The scope of this category may be represented in the following diagram.



*Figure 6 Category 4: Applications to other disciplines*

The focus of this category is applications, which is perceived to be the core of IT. The peripheral boundary is other disciplines, which is perceived to be the outer limit of IT. Thus, the perception represented in this category is of IT as essentially having to do with applications and anything lying outside the world of other disciplines is not part of IT.

IT is seen as being distinct from its environment though contributing to it, integrating into it and depending on it for its existence. ???

## How this differs from other views

This view contrasts with the preceding view in the application of technology to the wider environment. It contrasts with the following view in its unconcern about the influence technology has on human society.

## Category 5: Impact

In this category IT research is experienced as impacting human beings, with an implication that it should enhance life for humans. This impact may be felt in the work environment or in the wider community. It may affect an individual or society at large. IT may influence people directly (through their use of it) or indirectly (through its influence on society). This aspect looks beyond the Information-Technology world - it introduces the element of reflection/self-examination and calls for an orientation towards the future as well as the present.

*How things change ... that's the fascinating thing for me ... Our job was effectively to automate many extremely manual processes and ... the culture of the organisation changes overnight with the installation of the software ... goes from being an extremely stressful ... manual environment with all sorts of things going wrong to a much more streamlined thing where ... the average user sits back and really just ... does the bare minimum required and the machine will do the rest for them. To witness it is quite a shock at times to realise ... the before and after shots of how it was. (1)*

*The Business Process Re-engineering is one of the softer ones that I ... personally still consider as being IT ... simply because ... how it actually changes the company by putting this piece of IT ... type things, into the company ... I think is very important (1)*

*So what kind of social implications for the future and ... if we continue to utilise IT to transform organisations ... what would we do, how it would happen, who'll use it and where it happens and what exactly happens in corporations when it happens. So that has a lot to do with ITM or ISM, which is information technology still. (3)*

*I think it's also IT research because of that component that says, "Okay, let's look at the impact information technology's having within humans ..." Because I think IT ... is not just a stand-alone entity (7)*

*The social impact of some of the social explorations ... is out of sync with how it impacts on society. Genetic engineering and ... science changes faster than human interaction. ... And so it's important sometimes for the practitioners to be reflective about, not so much whether it can be done, but should it be done. So, whilst this seems to be a sociological argument, it's relevant ... within IT to publish such a paper to make them reflective about the impact on the people that these things that they're making actually has. (17)*

This view sees information technology as having moral force.

## Limits of view

The scope of this category may be represented in the following diagram.



*Figure 7 Category 5: Applications to other disciplines*

The focus of this category is impact, which is perceived to be the core of IT. The peripheral boundary is the outside environment, which is perceived to be the outer limit of IT. Thus, the perception represented in this category is of IT as essentially having to do with impact and anything lying outside the outside environment is not part of IT.

## How this differs from other views

This category contrasts with the previous category in its concern for rights and wrongs. This view embraces the wider philosophical world and sees itself as accountable to it.

## The Agency Group

The following categories reveal a completely different way of seeing IT research.

The views of this group reflect the extent to which IT researchers see themselves in control of the development of IT research. In these categories the locus of control is seen to rest with the establishment or with the individual researcher.

## Category 6: Sanctioned

In this category IT research is experienced as being defined by others, usually the university faculty or school. The students' current context is thus referred to as having a dominant influence over their perspective. In this category the established view may not be questioned or the institutional processes may be considered to be a more reliable guide than individual researchers' more limited knowledge. Some participants were guided by the question of where the expertise could be found within existing structures to tackle the problem at hand. Some participants included industry as an influencer of what the academy teaches and others included the conferences research projects were presented at as an indicator of what is accepted as IT research.

*I don't know whether I've ever questioned whether it's correct or not, but I've accepted it. ... I'm happy to ... do research as part of IT ... (5)*

*Are they working within the Faculty of IT? This is usually a good indicator ... (5)*

*... if the institutional context is there, why should I be that presumptuous in assuming, "Ok, this is not IT research" or something like that. (6)*

*It is IT, yeah. I've seen many of these in IS/IT conferences ... (12)*

*I think that it is IT research because I come from a creative industry background ... if I wanted to do this kind of research I could not find a suitable supervisor to teach me this kind of study. So I have come to the IT side. I think this is more like my home. (18)*

## Limits of view

The scope of this category may be represented in the following diagram.



*Figure 8 Category 6: Sanctioned*

The focus of this category is others' opinions of IT, which is perceived to be the defining element of IT. The peripheral boundary is the established institutions, which are perceived to define the outer limit of IT. Thus, the perception represented in this category is of IT as essentially having to do with others' opinions as expressed in established institutions and anything lying outside these is not part of IT.

## How this differs from other views

This view contrasts with the following view in that the researcher here is seen as having no personal control over the definition of IT research.

## Category 7: Constructed

In this category IT research is experienced as being defined by the researcher. A lack of clear definition of IT research is seen as positive, because it avoids the exclusion of something which may prove to be important. Personal interest and intention are seen as the defining elements of IT research.

*I think possibly the reality is that because it's so difficult to define what is or isn't, that as long as we feel we justify what we're doing as is or isn't, then we're happy with that. And this fluid line is really ... fluid because we want it to be fluid. Because we don't want to ... get to a point, because of what research is, where we say, "Well, actually, that's outside our scope. We're not going to do that." Because it actually might be quite important to what we're trying to do. (5)*

*But the limitation ... I think I should leave that according to each researcher where the scope they want to go to ... for me I would like to look at the issues that I am looking at, more social and organisational, some others might be looking at something else. For me to confine this research for somebody else ... I don't think that would be fair (10)*

*If the person says "I am now doing art" then they are. ... similarly with computing ... I guess there's a physical thing - you obviously need to use a computer, so you just turn the box on - and if you use a similar definition, it would be the intention - to do computing. (17)*

## Limits of view

The scope of this category may be represented in the following diagram.



*Figure 8 Category 6: Sanctioned*

The focus of this category is the researcher's intention in conducting their research, which is perceived to be the defining element of IT. The peripheral boundary is without limit, therefore encompassing the whole world. Thus, the perception represented in this category is of IT as essentially having to do with the researcher's opinion and nothing may lie outside this and therefore be excluded from IT.

### **How this differs from other views**

This view contrasts with the preceding view in that the researcher here is seen as having complete control over the definition of IT research.

## **4 Discussion**

### **Comparison with Academics' views**

Aspects of most of the concepts underlying categories identified during the study of Academics (Bruce 2002c) have been found amongst Research Students during this research. However, students seem to be looking to differentiate IT from other disciplines whereas academics seem more aware of collaborative opportunities.

'Information technology' has a very clearly defined definition for students, namely software development. Academics appear not to have such a narrow view, some including printing, for example, as a technology. (This may be explained by the fact that the Research Student participant pool lay within the IT Faculty, whereas the Academic participant pool encompassed other faculties in the university.)

### **Differences**

Research Students' conceptions, though following the Academics' ways of seeing, emphasise different aspects or add new aspects to them.

### **Academics' Technology Category**

Research Students emphasised software development and did not include hardware as Academics did. Hardware development was considered by Students to be engineering. A question: Is the student experience an extension of or aspect of the Academic experience?

### **Academics' Communication Category**

Research Students emphasise the interaction of humans with IT artefacts more than Academics. Information exchange is not in view for Students as it was with the Academics. A question: Do Academics see I or T and I+T but students see I+T only?

### **Academics' Ubiquitous Category**

In general, Research Students did not see IT Research as ubiquitous. However, Students seemed to be more concerned than Academics about the relationship between IT and other disciplines. A question: Does this reflect the fact that as research students they are required to focus on methodological issues (rather than the collaborative issues Academics face) – see 'Research' below?

## Academics' Constructed Category

This category was more attested in the Research Students than in Academics, thus endorsing its legitimacy as a category.

## Academics' Dialectic Category

On the whole, Research Students do not seem to be aware of the Academics' Dialectic category. This is likely to be a result of their inexperience in academia.

## Impact on humans

The Research Students articulate much more clearly than the Academics the legitimacy as IT research of the investigation of the impact of IT on humans. Academics who talk about this tend to limit the concerns to their subject area (e.g. the impact of IT on student learning) and mention general social implications only in passing. Also, there was more commentary amongst the Students on the impact of IT than amongst Academics.

Impact is often mentioned by students in relation to business – perhaps prompted by the abstract on the influence of IT on BPR. Nevertheless, students' concerns range beyond the business field.

The Academic category which seems to accommodate Impact is Communication, which introduces the human element. However, in this category information exchange is the focus (rather than the well-being of humans). Impact is also mentioned by Academics under the Ubiquitous category, however this category's focus is on application and impact is only alluded to in passing. Therefore, Academics' thoughts about the impact of IT, though present, do not seem to be in the foreground. It is proposed that this difference indicates a shift of awareness in IT research.

This increased awareness of the impact of IT and its inclusion as legitimate IT research seems to represent a logical progression in the evolution of IT. The development of computer ethics indicates such a progression, with interest in computer ethics only surfacing in Australia in the 1990s (Bynum 2004). The increased awareness of impact may also reflect a greater social consciousness on the part of the new generation of researchers, with more IT researchers now asking not only 'What can be done?' but also 'What should be done?'

## Research

The Research Student responses evidence a concern on their part to make a distinction between 'research' and 'industry investigation'.

*If you're talking about research I would think that once something has been developed and implemented, from that point it's no longer research. It's then applying the end product rather than, yeah. (2)*

*if the result is a new technique for ... IT, then I would classify it as IT research. If the result is taking knowledge from IT and applying it elsewhere I don't necessarily consider that to be IT research, even though it's near IT research, I wouldn't consider that to be core IT research. It's important research, but it's the application. (13)*

*if you're doing research that contributes to the techniques, the methods and the tools that we have within IT that's a definite IT tools research. If we then take our IT as a tool then go out and apply that in some particular domain, and if we're trying to solve a specific problem in that domain, for example, in my work the identification of cancer in cells, if that's the only, if I'm looking for the identification of cancer, that's a domain-specific thing and that's not IT research. If I'm looking at ways of looking at things and showing that this can work in data to help people find cancer, that's a different, that's phrased from the other way around and it's looking at the techniques rather than the application. ... ultimately, IT is about being applied somewhere but IT research is not necessarily just about solving problems in other fields. (13)*

This is less evidenced in the Academic responses.

A possible explanation for this view to have emerged more clearly from the student data is that they are in an environment where they have been drilled with questions regarding their research question and method and so have these issues in the forefront of their thinking. In contrast, Academics are more

removed from issues relating to the theory of research and more concerned with industry collaboration. Therefore, when the question is asked, “Is this IT research?”, the students hear “Is this IT **research**?” and the academics hear “Is this **IT** research?”

An associated observation is the distinction drawn between the development phase of IT and the use/distribution phase. This could be judged to be a very narrow view of research. A possible explanation for this view is some students’ perception of IT as a tool, in which case once the tool is completed, the artefact is dealt with. Another explanation is a possible restricted view of the IT development lifecycle where client feedback and ongoing development are not included. Academics, on the other hand, through their wider experience and ongoing industry contact, would arguably have a broader view of the territory of IT research.

*Having that recorded as research and put forward so that people know this is what to expect if they try it themselves I think is definitely IT research. ... So long as it can be generalised. And that’s always my fear when ... I read something like the abstract on this. I find myself thinking, “Will you tell me something more than just, ‘Here’s an example, here’s what we did with the example. Wasn’t it nifty?’” (1)*

*Definitely IT research has to be something new, to give people new ideas of how to do things, how to improve life (3)*

*That there is benefits there for IT. That would have to be probably the most important factor. Are there benefits for IT in it? And if you can see benefits then it is IT research (5)*

*to me if something is IT research it’s because it extends the body of knowledge within the field of IT. (11)*

*that required ... a lot of analysis and then synthesis of the best solutions, so for me that’s research. (14)*

However, not every student made this distinction. These alternative views fall within the application of IT category.

*I guess I’m trying to think in terms of: Well, how could that be applied? ... What relevance would that have for a business or an individual or an organisation? Would this be improving their ...? Because I think in IT, it has to have context and IT research, as long as it’s contributing to that context, then ... it’s got a place, it’s got relevance. (7)*

*the word ‘application’ of computer technology would point me more towards the fact that it was IT, rather than the scientific aspect of it. More the everyday application of the technology to improve the way we do things. (16)*

## Other observations

Below are some observations which may prove useful for further study at a later date.

Students often referred to IT being layered. This was usually a dual layering, three of the schemes expressed are listed below:

	Inner layer	Outer layer
1.	Core	Peripheral
2.	Technical	Social
3.	Artefact	Interaction with environment

One student referred to four layers (the order within these was not made clear): IT Specific – IT Related – IT Dependant – IT Oriented.

Also, many students considered, as did Academics, that the boundaries of IT were vague, using terms such as ‘grey areas’, ‘blurry’ and ‘fuzzy’.

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