Informal learning in the workplace

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Electronic technicians' informal learning in the workplace

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Table of Contents

List of Figures

Acknowledgements

Abstract

This professional practicum is concerned with what informal learning is happening in the workplace and how the underlying forces and tensions at work produce barriers to learning, as well as facilitate that learning. The practicum used a theoretical framework based on a social constructivist paradigm and the concepts of situated learning and communities of practice. This framework worked well in this study because "learners inevitably participate in communities of practitioners and ... mastery of knowledge and skill requires newcomers to move towards full participation in the sociocultural practices of the community" (Lave & Wenger, 1993, p. 29). A pilot study was conducted with a group of eight electronic technicians prior to the main study and provided a different picture from that of the group of eleven technicians in the main study. This provided a rich source of comparative data and both the pilot study and the main study were of fundamental importance to the outcome of the practicum.

The implication is that informal learning at work is important for all stakeholders: workers, supervisors, managers, the organisation and the wider community. I found that the way the workplace is structured and work is completed has a significant impact on the level of informal learning that is allowed to occur in the workplace. A basis for a supportive environment for informal learning is provided when all stakeholders understand the importance of informal learning at work, accord workers basic respect and value workers' skills and knowledge. If workers can form communities of practice under a supportive organisational structure, mutually beneficial learning will occur and there will be an increase in the potential for workers to be happy and productive in their work.

Declaration

I certify that the substance of this *professional practicum* report has not already been submitted for any degree and is not currently being submitted for any degree or qualification.

I certify that any help received in preparing this report, and all sources used, have been acknowledged in this *professional practicum* report.

....(R.D.Westlake) Dated ....

I hereby permit the Dean of the Faculty of Education and Creative Arts at Central Queensland University to make available a hard copy or electronic version of my *professional practicum* to others as she/he so deems warranted.

....(R.D.Westlake) Dated ....

Chapter One: Introduction to the research

What informal learning occurs in the workplace and the value of that informal learning are poorly understood. This research focused on a particular group of electronic technicians in an Australian workplace and was concerned with gaining an in-depth understanding of the informal learning that occurs in the context of the workplace. This practicum report provides a better understanding of what informal learning is happening in the workplace and how the underlying forces and tensions produce barriers to informal learning, as well as facilitate that learning.

This chapter establishes the significance of the research, describes the workplace environment, poses the research question and describes the layout of this professional practicum report.

Significance of the research

Research concerned with the make up and value of informal workplace learning is important. Informal learning is important for individuals because it comes from day to day work activity and provides a vehicle to improve an individual's performance at work as well as facilitating a better working environment. Informal learning at work provides a better working environment for the individual by improving self-esteem and providing a connection with other workers and the organisational product. Informal learning at work is important to the organisation because informal learning is specific to the workplace and provides a pathway to innovation and a way to do things better in that workplace.

The intention of this professional practicum report is to describe, for a particular group of electronic technicians, the informal learning experiences that happen in the workplace. Informal learning in the context of my research is learning that is not planned or structured and takes place outside a dedicated learning environment (Smith, 1999, p. 3).

The research environment

I am the Training Officer in a division of a large organisation and one of my responsibilities is to facilitate the professional development of eleven technical staff. Recently, delays in a number of processes were responsible for unforeseen costs that were of sufficient concern to the organisation's hierarchy to warrant investigation. Engineering staff investigated the reasons for those delays and found that the lack of technicians' understanding of the reasoning behind the processes led to the delays in almost every case. In an effort to improve the technicians' level of understanding, money and resources were allocated to allow technicians to complete short courses, including the Train Small Groups course for workplace trainers.

As I noted above, informal learning in the workplace is not programmed; it is incidental and may be borne out of crisis or dilemma. Workplace trainer courses are inconsistent with this and courses such as Train Small Groups have an "almost overwhelming emphasis on training rather than learning" (Harris, Simons & Bone, 2000, p. 2). Learning does not start and stop as the workplace trainer comes and goes; learning happens as members of the work group participate in everyday workplace activity. That activity may be experienced alone or in the company of others and the presence of a workplace trainer is not essential for learning to take place.

The workplace trainers are part of a group of technicians engaged in working to provide maintenance support of a technically complex system that is an operational defence asset. The technicians have a sound grounding in electronic theory and hold diploma level qualifications and are considered to be para-professionals. All are male, aged from late 20s to early 50s and born in Australia of parents born in Australia. They are located at one site, work shiftwork to cover a seven day, 16 hours per day program. The technicians' work is "tightly linked to formal bodies of scientific and technical knowledge" (Barley, 1996, p. 413) and requires them to participate in a number of communities of practice. Communities of practice are produced when people form informal groups or networks that emerge from a "common sense of purpose" (Sharp, 1997, n.p.).

The technicians provide an interface between the empirical, highly technical reality of the operational system and the scientists and engineers. They also insulate the system operators, who have little technical background, from the highly technical, operational system. The technicians use sophisticated instruments to conduct tests and experiments and to make observations. They also work with their hands and build and maintain equipment, sometimes getting 'dirty' (Barley, 1996, p. 413). The technicians' status in the organisation is poorly defined because they sit between the clean professionals and their formal bodies of knowledge and the low-level technical world of the operators and workers with 'dirty hands'. The technicians' status may even change because of context but it remains the case that the technicians are highly skilled, well educated and essential for the day to day operation of the system.

Understanding the impact of an operational defence asset on the working environment is important in understanding the context of the research. The Department of Defence considers the asset to be valuable, and that it is essential that it remains online and operational for seven days per week, 16 hours per day. To that end the maintenance support contract has financial penalty clauses for system downtime. The technicians' performance and system downtime are directly related; less knowledgeable technicians are slower to restore the system to operational status. This increases the possibility of financial penalties and brings pressure and stress into every technician's working day – a sword of Damocles. When the system fails the pressure and stress for the technicians are amplified as the worried Department of Defence representative and the organisation's hierarchy monitor progress.

Tensions are manifested in the workplace when managers are seen, by technicians, to view the completion of inane, and seemingly unimportant, tasks as a measure of performance. Furthermore learning effort does not appear to contribute to measurement of performance and appears to reduce the efficiency of the workforce. Tensions are also apparent when access to the system is limited to maintenance activities although it is known that the level of system knowledge has the potential to impact on operational performance. The technicians perceive that the organisational hierarchy considers that learning experiences are not an investment, do not appear to contribute to workplace performance and are overheads that are not tolerated. The way work is structured and organised affects the learning that happens in the workplace and it is often the governing factor in what and when learning happens.

Technicians say they value informal learning and acknowledge it to be gained by participation in the workplace and to have a positive impact on their view of self.

The technicians value the informal learning that happens in the workplace because it is relevant and timely and has immediate application. As Barley (1996, p. 426) says, when talking of technicians generally, "technicians value experience over formal training" because formal training lags too far behind the workplace to be relevant. This is particularly true in this work environment where the technology employed is immature and continually evolving under the direction of scientists. The technicians admit that they do not have mastery of all aspects of the large and complex system. The technicians could be seen to rely on peers to fill the gaps in their knowledge or skills, which demonstrates an understanding that "the knowledge that enabled effective practice was distributed among technicians" (Barley, 1996, p. 427).

The research question

The question to be explored in this study is: How do electronic technicians learn informally in the workplace? The following subordinate questions have refined the focus of the research question:

- What resources do workers utilise to effect the informal learning that happens in the workplace?

- How can the organisation provide better learning resources to improve the effectiveness of informal learning for technicians?

The next chapter is a literature review that will place this study in a contemporary Australian workplace and provide a theoretical framework to aid in the understanding of the informal learning that occurs at work. Chapter Three describes the qualitative orientation, describes what case study method means in the context of my research and investigates trustworthiness and ethical and political considerations

in this research. Chapter Four analyses the research data and, informed by the current literature, reports the findings. The final chapter discusses the implications of these findings for the stakeholders. The remaining parts of the report list references and appendices.

Chapter Two: Review of the literature

Overview

This literature review provides a theoretical framework for the study in the context of the contemporary Australian workplace. The theoretical framework is based on a social constructivist paradigm and the concepts of situated learning and communities of practice. The theoretical framework allows for an appreciation of the needs of individuals, of community and of the long and short term needs of the organisation, all under an umbrella of compelling economic forces. Learning at work is value laden and if embraced at the expense of other forms of learning is prone to pitfalls, pitfalls VET practitioners struggle with on a daily basis. A shift to workplace learning in Australia, while appearing to be a reasonable goal based on a solid theoretical foundation and a natural course to follow, has a fundamental impact on the structure and nature of work and the shape of educational institutions. Learning for work is not limited to workplace learning and a 'training mix' is required to meet the needs of the worker, organisation and community.

Binaries

The training mix is described by binaries such as structured/unstructured, accredited/unaccredited, formal/informal and work based/institution based learning. Binaries are, by nature, oppositional: one part of the binary is valued over the other, and interpreted by different people to mean different things, resulting in a limited definition of a complex environment. This chapter views these binaries as continua, rather than oppositional, making them more flexible and a more useful conceptual framework to describe the learning necessary for work (P. A. Danaher, personal communication via e-mail, 9 April 2002). I will identify a contemporary VET

perspective and my position in relation to that perspective by discussing what I understand these binaries to mean.

Formality in training and learning is an important part of my practicum and to find an overall neat definition is problematic. Figgis, Alderson, Blackwell, Butorac, Mitchell and Zubrick (2001, p. 31f) in a paragraph entitled "the issue of formal versus informal training and learning" consider the informality in training and learning to be a "slippery idea". Figgis *et al.* (2001, p. 32; emphasis in original) go on to say that "formality in learning and training or the inverse of it, informality, can refer not only to the specificity of the learning *outcomes* expected but also to the amount and style of *guidance* given to the learner". I understand formal learning to refer to learning that is structured and planned, has measurable outcomes and may be accredited. Informal learning is incidental, happens in the background, and is often the result of dilemmas or crises and is not accredited.

The apparently simple concepts of structured and unstructured and accredited and non-accredited are difficult to place in neat packages. Unstructured learning may appear to be consistent with informal learning, but so might structured learning if delivery is flexible and presented in informal ways and settings (Smith, 1999, p. 3). Dumbrell (2000, p. 8) estimated that "structured vocational learning beyond the formal VET system amounts to more than 70% of the formal VET system". This is consistent with my experience and sheds some light on the meaning of structured and unstructured. Structured learning is not limited to universities, Technical and Further Education (TAFE) colleges or Registered Training Organisations (RTOs). Structured suggests some sort of planned logical steps towards a goal or series of goals, while unstructured does not have planned steps. In my work structured

15

learning has logical steps, visible goals, measurable outcomes and a set format. Unstructured, on the other hand, may be unplanned without logical steps and possibly with no measurable or planned outcome. Unstructured may also have planned and measurable outcomes; for example, I have conducted handskills training that has been unstructured, but where there has been a measurable and planned outcome. The handskills training was unstructured because the pathway had to be negotiated by the learners as they gained a feel for the skills they wished to learn. That is, structured and unstructured describe the pathway for learning and it does not immediately follow that this learning will be formal, informal, accredited or non-accredited, or that it will occur externally to or at work.

Accredited seems to be straightforward, but confusion arises out of the question: accredited by whom? Hoggard and Bloch (2000, p. 23) ask "what factors legitimise or recognise some forms of vocational learning over others within a particular industry?". The VET practitioner must understand these factors to allow effort and resources expended on training and learning to facilitate the outcomes desired by the workers and organisation. The following is an example, from personal experience, in the telecommunications industry that helps to provide a pragmatic definition of accreditation. Manufacturers' warranties may rest on workers completing the manufacturers' accredited training course, regardless of whether they may have completed an equivalent generic course offered by TAFE colleges or some other RTO. The equivalent TAFE course has value, is accredited and leads to workers being eligible for licencing by the industry regulatory body, while the manufacturer's courses were not recognised and did not lead to licencing. This example demonstrates that learning may be accredited from one perspective and not

accredited from another perspective; being accredited in the workplace relates to what the worker and the organisation wish to achieve.

Learning in the workplace is becoming more valued and strategies are being employed to take advantage of learning opportunities at work. A symptom of this shift of value to workplace learning can be seen in the formalisation of learning in the workplace, or workbased learning. The definition of workbased learning used in the Australian National Training Authority (ANTA) Reframing the Future Project is "an umbrella term that refers to structured learning that is organisationally managed and provided in association with paid or unpaid (voluntary) work" (Mitchell, Henry & Young, 2001, p. 4). I understand workbased learning to be a term that describes the formalisation of learning at work, where learning is organisationally managed and may lead to accreditation or recognition through partnerships with educational institutions. The need for the inclusion of educational institutions is that the shift to workbased learning has a fundamental impact on the structure of the workplace and the nature of work that will evolve only as mirrored changes are seen in the structure and shape of educational institutions working with VET.

Workbased learning is a part of the training mix, a mix that is affected by many factors including: global economic issues, industry structure and size, corporate strategies, quality issues, technology change, regulatory requirements, safety issues, and government policy and incentives (Hoggard & Bloch, 2000, p. 6ff). This makes for a complex environment for the VET practitioner to navigate when attempting to provide learning resources efficiently and effectively. VET practitioners can use a social constructivist paradigm and the concepts of situated learning and communities of practice as a basis for a theoretical framework that can take formal, informal,

17

structured, unstructured, accredited, non-accredited, institution based and workbased learning to produce a mix of training and learning strategies that meet the needs of workers, the organisation and the community.

Social constructivist paradigm

Constructivism considers that individuals create knowledge based on experience and allows for construction of multiple realities. Knowledge is not an unarguable fact and changes "because new situations, negotiations, and activities inevitably recast it in a new, more densely textured form" (Brown, Collins, & Duguid, 1989, p. 2). Social constructivism "stresses the socially and culturally situated nature of mental activity, and defines learning as getting acquainted with cultural practices, their particular exigencies, limits and possibilities" (Vandersraeten & Biesta, 1998, p. 2).

The "social constructivist paradigm views the context in which learning occurs as central to the learning itself" (McMahon, 1997, p. 3). "The interest is in how knowledge is created, not in uncovering or making clear the facts of the world assumed to exist independently of human experience" (Henning, 1998, p. 96). The concept of situated learning "is embedded in constructivism" (Kerka, 1997, p. 1f) and has emerged out of a shift from the behaviourist and cognitive theories "toward social, situated perspectives" (Elmholdt, 2001, p. 5).

Situated learning

The concept of situated learning "is a theory about knowledge, claiming that knowledge is dynamically constructed as we conceive of what is happening to us, talk and move" (Clancey, 1995, p. 1). Knowledge is not a thing, it cannot be held in one's hand and it is a product of activity and the context of that activity (Brown,

Collins & Duguid, 1989, p. 1). Knowledge is a complex, fluid mix that is somehow

formally structured, tacit and difficult to frame completely in logical terms

(Davenport & Prusak, 1998, p. 5). The difficulty with defining knowledge or

adequately framing knowledge stems from the fact that knowledge exists "within

people, part and parcel of human complexity and unpredictability" (Davenport &

Prusak, 1998, p. 5).

The concept of situated learning while relatively new sits under a social

constructivist paradigm, and situated perspectives have "been advocated in

psychological literature for many years by researchers" (Elmholdt, 2001, p. 5).

Hillebrand (1999, p. 4) could be describing situated learning when talking of social

constructivism and how it builds on the models of Vygotsky when she describes

"where meaningful knowledge" is constructed within sociocultural contexts where

"shared understandings" develop through interacting with more knowledgeable

others in the "zone of proximal development".

Lave and Wenger (1993, p. 48f) say that they "are aware that Vygotsky's concept of

the zone of proximal development has received vastly different interpretations".

They express their interest in extending the study of learning into a societal

interpretation and "the changing relations between newcomers and old-timers in the

context of a changing shared practice" (Lave & Wenger, 1993, p. 48f). Lave and

Wenger's account of situated learning appears to be based on Vygotskty's work and

this is particularly evident when Vygotsky's theories of scaffolding and the zone of

proximal development are seen side by side with Lave and Wenger's idea of moving

from novice to master in a community of practice. The individual, her/his

perceptions, participation in work and the underlying social discourse are essential to

understand that "the production of meaning is a social effort and that meaning is produced by everyday, ongoing actions of a community of practice" (Henning, 1998, p. 97).

Communities of practice

Communities of practice are groups of people brought together through a "common sense of purpose" (Sharp, 1997, n.p.). People participate in many communities of practice in their lives, finding communities of practice at work, during out of work activities and through social interaction with others. "Novices enter at the edge – their participation is on the periphery" (Smith, 1999, p. 10). The novices learn through participation in the community of practice, guided by masters from the edge to the centre and to mastery in the community of practice. The concepts of situated learning and communities of practice do not mean that learning must be done in context. It is more complex than that: it may cost too much to have a competent worker's output limited by an apprentice, it may be unsafe and/or a novice may need some preparatory learning to access a community of practice (Reder & Klatzky, 1994, p. 8). It is worthwhile to note that an individual's preparatory learning also occurs as he/she participates in a community of practice.

Negative aspects of communities of practice

The concept of situated learning has been criticised for failing to take the individual into account. "The active subject with a life history is not conceptualised and disappears consequently in a community of practice" (Elmholdt, 2001, p. 14). Participation in a community of practice does not mean that participants lose all identity and that they conform to the common will. A social constructivist paradigm allows for multiple constructions of meaning and the concept of situated learning

20

allows for an understanding of how an individual might construct meaning as he or she learns through participation in a community of practice. That having been said, that the concepts of situated learning and communities of practice do take the individual into account; if communities of practice are groups of people brought together because they "share a concern, a set of problems, or a passion about a topic" (Young & Mitchell, 2002, p. 1), then they may tend to remain bounded by the concerns, problems or topics that brought them together. Understanding that an individual may seem to disappear in a community of practice is worthwhile and may be seen better as a characteristic of a community of practice than as a general criticism of communities of practice.

Definition of terms – 'social' and 'situated'

Situated learning recognises the importance of cultural and social aspects in understanding learning and the construction of meaning. Reder and Klatzky (1994, p. 5) identified one claim of situated learning as being that "instruction needs to be done in complex social environments". This is not the case and the claim leads to criticism of the concept of situated learning based on a simplistic definition of the terms 'social' and 'situated'. This is a claim accepted by many, including Anderson, Reder and Simon (1996, p. 6), who criticise the concept of situated learning because they see this claim "as sometimes exaggerated to assert that all knowledge is specific to the situation in which the task is performed".

Lave and Wenger (1993, p. 32), in an effort to define situated learning better, distance themselves from the idea that situated learning "seemed to mean merely that some … people's thoughts and actions were located in space and time" and that learning could happen only in the company of other people. Lave and Wenger

(1993, p. 33) consider situated learning to be a "general theoretical perspective, the basis of claims about the relational character of knowledge and learning, about the negotiated character of meaning, and about the concerned (engaged, dilemma driven) nature of learning activity for the people involved". Learning is situated in that it "is not just an independent internal mental process, but is fundamentally situated as a product of activity, context, and culture" (Hansman & Wilson, 1998, p. 4). That is, knowledge is unique to the individual and "humans construct meaning idiosyncratically, based on their personal experiences or ontogenies" (Billett, 2002, p. 7).

Situative versus cognitive perspectives

The concept of situated learning has generated significant interest in the last 15 years with the "most extensively developed, coherent account of situated cognition theory as advanced by Lave … based upon attacks on cognitive psychology" (Cornford, 1999, p. 3). While it is accepted that context affects learning and that this effect has been demonstrated in many domains, there is significant and sometimes heated debate about situated learning (Reder & Klatzky, 1994, p. 5). This debate grows out of what is seen as an attack on the "cognitive models of learning" (Elmholdt, 2001, p. 15). The cognitive perspective is that knowledge is something that is stored and retrieved for use in new situations, while the situated perspective "focuses on consistency or inconsistency of patterns of participatory processes across situations" (Greeno, 1997, p. 12). Certainly, the concept of situated learning is not consistent with a cognitive perspective when it is the claim of the situated perspective that "knowledge is not a thing or set of descriptions … [but is an] analytic abstraction, like energy, not a substance that can be in hand" (Clancey, 1995, p. 2).

Articles about the concept of situated learning in *The Educational Researcher* including those by Anderson, Reder and Simon (1996, 1997) and Greeno (1997) initially appear adversarial but culminate in a collaborative article "Perspectives on Learning, Thinking, and Activity" (Anderson, Greeno, Reder & Simon, 2000). The thrust of this article is to compare, rather than attack, cognitive and situative views and gain maximum value from a comparative process:

> ... a goal toward which this competitive process can progress is a more inclusive and unified view of human activity in which dichotomies such as individual versus social, thinking versus acting, and cognitive versus situative will cease to be terms of contention and, instead, figure in coherent explanatory accounts of behaviour and in useful design principles for resources and activities of productive learning. (p. 13)

While attacks and threats are not helpful the struggle and controversy between the differing viewpoints are essential to gain maximum value from the debate and add to the growing and developing body of knowledge.

Transfer of learning

The debate on situated learning, between the cognitive and situative perspectives, is largely about the issue of transfer and generalisation of knowledge. "Situated learning has been associated with criticisms of the transfer model of learning" (Elmholdt, 2001, p. 15) and situated learning has been criticised for arguing that knowledge does not transfer. Lave and Wenger have been criticised for arguing that transfer is not possible, whereas "Lave's point is not that transfer does not happen. Her point is rather that knowledge does not transfer as symbolic representations of theoretical generalisations in the head of individuals" (Elmholdt, 2001, p. 15). Greeno (1997, p. 11f) refutes the view that the concept of situated learning claims

23

that knowledge does not transfer, and leaves us with the concept of situated learning as a framework for explaining the generalisability of knowledge.

Workers' performance and the success of the organisation are directly proportional to the level of workers' knowledge and skills. The value of learning, in a VET setting, is therefore established by how successfully learning transfers to practice. "Transfer of learning from school to work settings is a chronic concern of vocational education" (Kerka, 1997, p. 1). The ability to transfer between the training and application contexts is the crux of the frequently made distinction between learning and performance. The concern with transfer is magnified in a VET environment where learning and training choices are limited by:

- availability,

- appropriate accreditation,

- cost in time and money,

- what the enterprise will finance,

- whether an in-house course can be provided, and

- what the people/organisation value.

A social constructivist paradigm and the concepts of situated learning and communities of practice help the VET practitioner understand the construction of meaning and what constitutes knowledge. Knowledge is tacit and takes on "human complexity and unpredictability" (Davenport & Prusak, 1998, p. 5) and the issue of transfer of knowledge takes on the same characteristics. Are there patterns that are consistent across situations that allow transfer among those situations? Are those patterns evident to all individuals? The situation and context are fundamental and

the only effective strategy that can be employed in *all* situations is to locate learning in the actual situation and context in which it will be later employed. It is often not possible or desirable for people to learn in the situation in which they will later use that learning; simulation and abstract learning may be required to provide learning experiences.

The concept of situated learning does not deny the value of abstract learning, but it does recognise the increasing complexity with the issue of transfer of abstract learning to practice. "In the situative perspective, use of abstract representations is an aspect of social practice, and abstract representations can contribute to meaningful learning only if their meanings are understood" (Greeno, 1997, p. 13). Abstract learning is rarely completely abstract and "it is important to emphasise that abstract instruction in the absence of concrete examples is a bad idea" (Reder & Klatzky, 1994, p. 10). The concept of situated learning provides a theoretical framework for the VET practitioner to understand the generalisability of knowledge and to design and conduct or coordinate learning experiences that allow learning, including abstract learning, to transfer to practice.

Plethora of forces

There is a need to broaden the debate on situated learning to include socio-historical-economic contexts, as situated learning may "be serving as many capitalistic economic goals as concerns for more effective learning and education" (Cornford, 1999, p. 1). "For well over a decade the educational policies of most OECD countries, including Australia, have been dominated by economic discourses" (McIntyre, Chappell, Scheeres, Solomon, Symes & Tennant, 2000, p. 2). "VET in Australia is now a highly complex system that operates in an increasingly complex

25

socio-economic environment" (Chappell, 2002, p. 2). It is important to understand the forces that might promote situated learning as this allows for an understanding of the value of situated learning based on solid theories of learning and teaching and not on measures of organisational performance and profitability. This does not mean that economic and social forces are in opposition to theories of learning and teaching; as Mournier (2001, p. 1) says, "better education and higher skills would be the new conditions of economic growth". The provision of VET must contribute to the success of the organisation and "contribute to the national economic imperatives" (Chappell, 2002, p. 1).

The traditional view of the workplace as a place of informal learning and as such the perception of an inferior environment for learning must be overcome for these economic imperatives to be met. The perception of inferiority stems from the aims and goals of the workplace that are characterised by productivity and profit and not teaching and learning. An apparent "absence of a written curriculum document to direct teachers and learners alike, qualified teachers and teaching practices found in educational institutions all raise concern that learning in workplaces ... will be weak, *ad hoc*, concrete and incidental" (Billet, 2002, p. 2). The concept of situated learning may support a shift to workplace learning but it is certainly not the driving force. Workbased learning is a "policy solution ... [that is driven by] the forces of globalisation, which are impacting on national economies, through politics and the social institutions" (McIntyre & Solomon, 1999, p. 2).

Learning at work has many positive outcomes and there are more than economic forces promoting workbased and workplace learning. Learning needs to be accessible, transfer easily to practice, have immediacy of application, be flexible and

26

be cost efficient and learning at work appears to meet these criteria. This makes coordinated programs crossing the traditional boundaries between educational institutions and industry essential to the health of those programs (Radloff, 1999, p. 3). "The appeal of workbased learning is multiple and indeed workbased learning awards are simultaneously seductive for employees, their organisations and the academy" (McIntyre & Solomon, 1999, p. 2).

The organisation, the workers and the educational institution all gain from the flexibility, accessibility, ease of transfer and immediacy of application of learning experiences embedded in work. The workers see worth in participating in a meaningful and relevant learning experience that is accredited and where the majority of the costs are met by the organisation. The organisation receives a return on its investment through enhanced performance and profit because of a more motivated and skilled workforce. Furthermore a professional and accredited workforce can help win contracts when it is often the practice to include resumes of key staff to support the claims of organisational performance made in contract tender documents. The educational institution has improved its chances of survival in a competitive marketplace by making money and being seen to be taking steps to dispel the "disenchantment with the ability of the vocational education system to meet rapidly changing needs in the workplace" (Hawke, 2000, p. 2).

The trend to learning throughout life and outside formal institutions recognises the value of learning at work but "fundamentally challenges the relationship of workplace learning to formal education, since institutions are expected to adapt themselves to the demands of the workplace and working life" (McIntyre *et al.*, 2000, p. 2). The body of literature raises many questions for educational institutions

including issues as fundamental as: deinstitutionalisation (McIntyre, 2000); increasing vocationalism (McIntyre *et al.*, 2000); and even the purpose of VET: "What is it [VET] ... meant to do?" (Hawke, 2000, p. 15). These and other issues are too large to consider here. They do provide a vehicle to demonstrate that, if there are fundamental issues about purpose, structure and the nature of educational institutions in the trend to workbased learning, there must be parallel and fundamental issues regarding the structure of the workplace and the nature of work.

Workbased learning and/or embedding learning in work are a fundamental shift in the way the workplace is structured and in how the nature of work is conceptualised. As well as the need to look at the implications of changes for educational institutions there is a need to look at the changes required to the structure of the workplace and the nature of work to facilitate a shift to workbased learning. The concept of situated learning provides a way to understand the social learning that occurs in the communities of practice that exist in the workplace. The concept of situated learning provides a framework for understanding how "ways of organising and managing work are linked to the shaping and negotiation of learning practices" (McIntyre *et al*, 2000, p. 6). The concepts of situated learning and communities of practice reveal that learning has a negotiated character and is "to be found in 'learning networks' as they are organised through relationships, including authority relationships with managers and supervisors" (McIntyre, 2000, p. 6).

What could have more immediacy of application and "what could be more flexible and accessible than learning in worktime, at work, as part of, and for work! *Yet one has to ask at what cost?"* (McIntyre *et al.*, 2000, p. 5; emphasis added). Quality in learning and savings in dollars or returns on investment may not be evident in a shift

28

to workplace and workbased learning. Outcomes not being immediately evident, the quality of workbased learning will become a measure of value for the 'bean counters'. Smith and Betts (2000, p. 596) when talking of quality issues in workbased learning in the UK offer five key criteria for assessment of quality:

- explicit learning outcomes,

- formal assessment procedures,

- identification and delivery of standards,

- quality assessment processes, and

- accreditation and recognition.

What these criteria actually mean for the way that the workplace needs to be restructured is complex and may vary from workplace to workplace. It remains the case that people will need to ensure these criteria are addressed and there will be an associated cost in money, time and other resources.

Formalising workplace learning would require attention to quality issues, formalising 'learning networks' and negotiations required to access learning in existing structures and hierarchies where measurement of performance is based on productivity and profit. The success of changes to accommodate a shift to workbased learning in the structure of the workplace and the nature of work will not be seen immediately in measurable outcomes based on profit or productivity. If workbased learning is to be embraced in Australia the costs of change associated with a shift to workbased learning must be seen by the organisation as an investment tied to performance and by the employee as an investment in her/his future. While organisations can see only the cost, complexity and risk in embracing workbased learning there will be a barrier to the significant change required in the workplace. The changes required in the

structure and nature of work are not consistent with the existing aims and goals of the organisation. All these factors bring into question the degree of penetration workbased learning might make in the Australian workplace and how much educational institutions might actually change.

Chapter summary

A social constructivist paradigm and the concepts of situated learning and communities of practice provide a theoretical framework for VET practitioners to use when designing, developing and identifying training and learning resources for workers. VET is a complex environment where the transfer of knowledge is essential for the success of the organisation and impacts on issues as fundamental as the safety of workers and the survival of the organisation. Training and learning for work requires a mix of formal, informal, structured, unstructured, accredited, non-accredited, institution based and workbased learning to meet the needs of workers, the organisation and the wider community. There is an overarching requirement for all aspects of this mix to transfer to practice and therefore for the VET practitioner to link theory and practice.

The workplace is a complex environment and allowing socio-economic goals to dictate and control change to VET that is not guided by strong theories of teaching and learning is fraught with danger. A social constructivist paradigm and the concepts of situated learning and communities of practice are not just another fad and are concerned with theories of teaching and learning "which potentially will have far reaching consequences for performance and productivity in the real world of work" (Cornford, 1999, p. 9).

Chapter Three: Research design

This chapter explains why a qualitative orientation and a case study method were used. It outlines the research techniques and the make up of the semi-structured interview schedule data gathering instrument used in the study. It details how analysis was conducted and how the practicum report was written. In addition trustworthiness, ethical and political considerations are investigated.

This study investigated the informal learning that happens in the workplace and the multiple constructions of meaning that happen through participation in workplace communities of practice. A social constructivist paradigm informed the study and allowed for the interpretation of a real life situation where human participants were involved in informal learning in the context of the workplace. A social constructivist paradigm and the concepts of situated learning and communities of practice provided a theoretical framework that allowed for an understanding of how electronic technicians constructed knowledge through participation in a community of practice and everyday workplace activity.

Qualitative orientation

This research studied the informal learning of a group of technicians that happened as a part of everyday activity. Only a qualitative researcher who participated as an integral member, *albeit* an observer, of the group could record the group's social interactions and the effect on the group members' constructions of meaning. "Qualitative methods are used in research that is designed to provide an in-depth description of a specific program, practice, or setting" (Mertens, 1998, p. 159). As the researcher I observed, because "instead of intervening in experience by

removing it from its natural setting ... qualitative research looks for social and cultural patterns of experience, or relationships among various occurrences, or the significance of such events as they affect specific human purposes" (Kinchloe, 1991, p. 145).

"Qualitative research assumes that there are multiple realities – that the world is not an objective thing out there but a function of personal interaction and perception" (Merriam, 1988, p. 17). A qualitative orientation to my research provides an in depth and holistic view that ties experiences together and identifies underlying themes and patterns. This view was achieved through what Lancy (1993, p. 2) describes as a characteristic of qualitative research: "the investigator uses a 'wide-angle lens' to record context surrounding the phenomena under study". A qualitative orientation is consistent with a social constructivist paradigm because it allows for a description that portrays the multiple perceptions of the participants.

Case study method

This research studied the informal learning of a group of electronic technicians working to maintain a significant operational defence asset in Australia. Subordinate questions were posed and addressed to facilitate an understanding of what informal learning happened in the workplace. A case study method was used to gather data that were analysed to address these questions.

The definition of what constitutes a case study varies as much as the variation on possible contexts of applications of case study. Yin (1994, p. 13) defines case study research method as an "empirical inquiry that ... investigates a real life contemporary phenomenon within its real life context ... especially when the

boundaries between phenomenon and context are not clearly evident". For the purposes of my research case study is taken to mean the real life study of a distinct group of electronic technicians and the investigation of how they learn informally in the workplace.

Soy (1998, p. 1) draws from the work of Stake, Simons and Yin and proposes six steps to case study research design that should be used:

- Determine and define the research questions,

- Select the cases and determine data gathering and analysis techniques,

- Prepare to collect data,

- Collect data in the field,

- Evaluate and analyse the data, and

- Prepare the report.

The steps may be better described as phases that are not separate, may merge and may be revisited as the research develops. The most important part of the research design is found in the first step: to determine and define the research questions. These questions establish what the research is about and decide whether case study is an appropriate research method. The questions "establish a firm research focus to which the researcher can refer over the course of the study of a complex phenomenon or object" (Soy, 1998, p. 1). The research questions are not only a starting point but they also direct the research, identify the best techniques of collecting evidence, determine approaches to analysis, and identify stakeholders and the possible audience. Yin (1994, p. 6) spends some time establishing how to decide when to use a case study research method and provides a summary as shown in Figure One.

Strategy	Form of research question	Requires control over behavioral events?	Focuses on contemporary events?
Experiment	how, why	yes	yes
Survey	who, what, where, how many, how much	no	yes/no
History	how, why	no	no
Case study	how, why	no	yes

Figure One: Relevant situations for different research strategies (Yin, 1994, p. 6).

The research question is a 'how' question: How do electronic technicians learn informally in the workplace? Figure One confirms the decision to use a case study method because the research asks 'how' questions and is about contemporary events where the researcher has little control over behavioural events. In this case study steps one and two merged because the cases selected were fundamental to forming the research questions. "The unit (or level) of analysis influences the research design, data collection, and data analysis decisions" (Frankfurt-Nachamias & Nachamias, 1996, p. 53).

Research techniques

Preparing to collect data is not as easy as simply deciding which data gathering techniques to use; there is a foundation to be built for gathering and organising data. When preparing to collect a large number of data generated by case study research it is important to maintain focus on the research questions. In addition, as Soy (1998, p. 3) says, "systematic organisation of the data is important to prevent the researcher from being overwhelmed by the amount of data". All involved in gathering data must understand protocols, procedures and what data are important. As Soy (1998, p. 3) says, "exemplary case studies prepare good training programs for investigators and establish clear protocols and procedures in advance of investigator fieldwork".

Yin (1994) talks of data gathering techniques, identifies six major sources of

evidence and provides an overview of those sources as shown in Figure Two below.

Source of Evidence	Strengths	Weaknesses
Documentation	stable – can be reviewed repeatedly unobtrusive – contains exact names, references and details of an event broad coverage – long span of time, many events, and many settings	retrievability – can be low biased selectivity, if collection is incomplete reporting bias – reflects (unknown) bias of author access – may be deliberately blocked
Archival Records	[same as above for documentation] precise and quantitative	[same as above for documentation] accessibility due to privacy reasons
Interviews	target – focuses directly on case study topic insightful – provides perceived causal inferences	bias due to poorly constructed questions response bias inaccuracies due to poor recall reflexivity – interviewee gives what interviewer wants to hear
Direct Observations	reality – covers events in real time contextual – covers context of events	time consuming selectivity – unless broad coverage reflexivity – event may proceed differently because it is being observed cost – hours needed by human observers
Participant Observations	[same as above for direct observations] insightful into interpersonal behaviour and motives	[same as above for direct observations] bias due to investigators' manipulation of events
Physical Artifacts	insightful into cultural features insightful into technical operations	selectivity availability

Figure Two: Six sources of evidence: Strengths and weaknesses (Yin, 1994, p. 80).

This study used participant observation and semi-structured interview as data

gathering techniques. Participation observation, while time consuming, gathered

data from real life occurrences in a real life context. Interview is a powerful tool to

gather data about people and provided important insights into a situation and into the

history of that situation (Yin, 1994, p. 85). A copy of the semi-structured interview instrument used as the main data gathering instrument in this research is included at Appendix One. Recording of interview and observation relied on detailed field notes and audio tape recordings. Review of recorded material was completed in a timely manner and remained an ongoing task with milestones set to ensure progress.

Pilot study

There were potential barriers to progress, whether they were the researcher's or participants' motivation, work pressures or difficulties in the research itself. Soy (1998, p. 3) establishes the need to conduct a pilot study "in order to remove obvious barriers and problems". I initially said I would not conduct a pilot study as part of my research. This was borne out of a concern that I would not have the time or resources to conduct such a study. However, on reflection, I recognised the importance of a pilot study and decided that a pilot study should be conducted to uncover problem areas and prepare better for all aspects of the main study.

The participants in the pilot study were a group of eight electronic technicians who appeared to work well together and work effectively to develop skills through informal learning at work. I chose this group because group demographics were similar to the prospective participants in the main study and were representative of that group. Furthermore I was intimately familiar with the group dynamics and the group was easy to access.

The outcome of the pilot study was very helpful and I confirmed the use of a qualitative orientation, trustworthiness was enhanced, ethical issues were better served, the proposed theoretical framework proved workable and I was better

prepared for the research. Furthermore the pilot study was a catalyst to extend the literature review used in the main study. The pilot study and extended literature review have confirmed the use of a social constructivist paradigm, and the concepts of situated learning and communities of practice to provide a theoretical framework for both the pilot and the main studies.

Analysis of data

Collection of data is required in research, but collecting data with an understanding of how the data are to be analysed makes for a more valuable outcome as analysis takes research from a proposition to a defensible and credible finding. This research was analysed according to a theoretical orientation based on the research question and the subordinate questions. The analysis was guided by the principles that Yin (1994, p. 123f) offers when talking of ensuring the quality of analysis: the analysis should rely on all relevant evidence, include all rival interpretations, maintain focus on the research question and depend on the analyst completing sufficient preparatory study. Analysis did not start at the completion of collecting data but was "an ongoing process" (Mertens, 1998, p. 348). Systematic organisation of data as they are gathered allows for "a somewhat mysterious process in which findings gradually emerge" (Mertens, 1998, p. 348). Findings do not emerge by chance, but come about through significant effort in design and literature review as well as considerable effort in analysis (Mertens, 1998, p. 348f). This type of analysis is known as inductive and means that the important dimensions and the patterns and themes within those dimensions are discerned from the data, rather than being imposed on the data by existing expectations (Patton, 1990, p. 44).

Yin (1994, p. 128) advises that "the smart investigator will begin to compose the case study report even before the data collection and analysis have been completed". This practicum report is intended to provide sufficient detail of context, emotion and relationships to allow the reader to make a "thick interpretation" (Patton, 1990, p. 430). The nature of qualitative research is one of interpretation and the quality of the research is enhanced when it will "allow the reader to understand the basis for an interpretation, and sufficient interpretation to allow the reader to understand the description" (Patton, 1990, p. 430).

This practicum report aims to overcome "the greatest concern ... [about] the lack of rigour of case study" (Yin, 1994, p. 9) and should help show that any perception that "the case study investigator has been sloppy" (Yin, 1994, p. 9) is incorrect. This provided a challenge in writing the practicum report that was met by writing in a way that portrayed the complex interactions and constructions of meaning by the technicians, providing a "vicarious experience" (Soy, 1998, p. 4) for the reader.

Trustworthiness in qualitative research
Trustworthiness in my research has been addressed by persuading my audience that it is worthwhile to pay attention to the research findings (Lincoln & Guba, 1985, p. 290). Lincoln and Guba (1985, p. 300) say that internal validity, external validity, reliability and objectivity are criteria used to measure quality in research based on positivist assumptions and offer credibility, transferability, dependability and objectivity as a basis to evaluate quality, or trustworthiness, in naturalistic enquiry.

Credibility "asks if there is a correspondence between the way the respondents actually perceive social constructs and the way the researcher portrays their viewpoints" (Mertens, 1998, p. 181). Patton (1990, p. 461) points out the credibility of qualitative enquiry rests with me, the researcher, and credibility is measured by the method and techniques I employed. Techniques included peer debriefing and triangulation that strengthened the link between perception and portrayal that Mertens (1998, p. 181) identifies as enhancing credibility.

"Case study is known as a triangulated research strategy" (Tellis, 1997, n.p.). Denzin (1997; as cited in Tellis, 1997, p. 2) identifies four types of triangulation: data source, theory, methodological and investigator triangulation. Triangulation is a process that addresses issues of credibility and dependability and was achieved in this research by using multiple sources of information and reviewing findings with a selection of people from among the participants in the study, supervisors and managers. Triangulation through the use of multiple sources of data has been achieved by considering historical electronic data, in the form of electronic logs and fault reports. These are available in a relational database where reports may be produced quickly and easily.

Transferability, or what Patton (1990, p. 486) calls extrapolation, is used instead of generalisation in qualitative research. It is argued by Lincoln and Guba (1985), Mertens (1998) and Patton (1990), among others, that it is not possible to generalise in qualitative research because generalisation is possible only when it is independent of context. Qualitative research with human participants informed by a social constructivist paradigm attempts to describe multiple realities and must be context dependent, and generalisation would therefore be seen as a chimera (Lincoln &

39

Guba, 1985, p. 68ff). Patton (1990, pp. 486-490) takes us from generalisation to extrapolation, defining extrapolation as "modest speculations on the likely applicability of findings to other situations under similar, but not identical conditions". Extrapolation or transferability relies on the researcher to allow the reader to make a judgement and transferability is enhanced by "extensive and careful description of time, place, context, and culture known as a 'thick description'" (Mertens, 1998, p. 183).

Dependability in qualitative research replaces reliability as "circumstances and the individuals can never be the same at some later time" (Jackson, 1995, p. 338). Dependability in my research was enhanced by ensuring credibility and providing sufficient information to allow for the conduct of an inquiry or dependability audit (Hoepfl, 1999; Lincoln & Guba, 1985; Patton, 1990). Time and resources did not allow for an actual audit but preparation for such an audit raised the issue of dependability in importance in my research and identified potential problems.

Objectivity in qualitative research is like catching smoke and attempting to achieve objectivity is problematic (Patton, 1990, p. 54ff). Subjectivity exists only as a perception; objectivity exists independent of perception and "the problem is that trying to objectify the subjective is to miss the point" (Mournier, 2001, p. 2). Considering my research relies on my interpretation, is based on my viewpoint and is informed by my understanding of how people construct knowledge, objectivity is not possible and hence not desirable.

The quality of my research was the responsibility of the researcher: me. As I was unable to offer a simple statistical test of quality I attempted to make "a plausible

connection between observations and conclusions" (Hoepfl, 1999, p. 13). I achieved this only through "a solid understanding of the research paradigm and ... the use of qualitative observation and analysis techniques" (Hoepfl, 1999, p. 13). The strength of the plausible link rests with my understanding of the concepts that underpinned and guided my research.

Ethical and political considerations

This case study is about people, their views and the interpersonal relationships within their workgroup. "Breach of ethics is seldom a simple matter ... [and it is the researchers' responsibility, not the participants', to] exercise great caution to minimise risks" (Stake, 2000, p. 448). People may be the prime considerations in the researchers' minds, but the organisation and the interests of stakeholders in the organisation also need to be protected. Conducting research into the organisation may have far reaching impact on people, the community or in my case, because the organisation is working with a defence asset, the national interest.

Frankfort-Nachmias and Nachmias (1996, p. 95) say that "two common ... [ethical] issues are informed consent and privacy". In this study informed consent was achieved by inviting people to be a part of the research and utilising a detailed formal agreement between participants in the research and the researcher. An example of the formal agreement form is included as Appendix Two. Privacy was achieved by anonymity, whereby "the researcher's promise to respect confidentiality ... is to be treated as a sacred trust" (Jackson, 1995, p. 300). The formal agreement between researcher and participant promised anonymity and advised the participant that he/she could withdraw from the research at any time, without detriment.

The research was conducted in a commercial organisation and any commercial in confidence information was and will be protected. The organisation provides maintenance services for a defence asset and no report or correspondence compromised defence security. A security grading list exists. This document provides, in simple terms, what information must be protected and therefore provides a simple and effective tool to identify any sensitive material. A great motivator is the penalty for contravening the Commonwealth Secrecy Act: imprisonment with hard labour for seven years.

The organisation has provided funding for my Master of Educational Studies tuition costs. Approval for the expenditure is based on the understanding that there will be an outcome that is valuable to the organisation. Outcomes from the research may be inconsistent with the organisation's policies and direction; publishing widely in the organisation may have a negative impact. Reduction of the risk of harm to the organisation has been achieved by providing a condensed version of the outcomes of the research to the contract manager for wider dissemination as he sees fit. I was careful not to consume other people's time and ensured I maintained a focus on organisational goals whilst at work.

Chapter summary

A qualitative orientation is consistent with research informed by a social constructivist paradigm that assumes the existence of multiple realities. A qualitative orientation is also necessary to describe the informal learning, context and construction of meaning in the socio-cultural community of the workplace.

I chose a case study method for my research as "case study as a research strategy comprises an all encompassing method" (Yin, 1994, p. 13), and is suited to a qualitative orientation to research. As the researcher I ensured the rigour of the research was sufficient to ensure trustworthiness, ethical and political considerations were acceptable. I expended considerable effort to prepare sufficiently for the research; also when conducting the research I recognised "good case studies are difficult to do" (Yin, 1994, p. 9). Case study method in my research allowed for a qualitative outcome that provides a holistic, in depth description of the way the electronic technicians construct meaning informally in the workplace.

Chapter Four: Data analysis

The research question is about informal learning and the research was aimed at revealing how electronic technicians learn informally at work. The research data were analysed according to a theoretical framework based on a social constructivist paradigm and the concepts of situated learning and communities of practice. I conducted an inductive analysis where the patterns and themes within those dimensions were discerned from the data, rather than being imposed on the data by existing expectations (Patton, 1990, p. 44). I conducted a pilot study in advance of the main study, selecting the participants in the pilot study because the group demographics were similar to those of the prospective participants in the main study and were representative of that group. Fortuitously the work of the two groups was organised and structured in different ways, thereby providing a rich source of comparative data. In this study I have used the term 'Group A' to identify the pilot study group and the term 'Group B' to identify the main study group. I have used the letters of the alphabet to identify the individuals in each group; that is, Group A uses Albert, Anthony, Alan, etcetera and Group B uses Barry, Basil, Brian, etcetera.

The question explored in this study was: How do electronic technicians learn informally in the workplace? The following subordinate questions were posed to refine the focus of the study:

- What resources do workers utilise to effect the informal learning that happens in the workplace?

- How can the organisation provide better learning resources to improve the effectiveness of informal learning for technicians?

Analysis showed that the way work is completed and organised has a fundamental impact on what informal learning may occur. Informal learning at work was perceived as valuable by all the participants and was considered to have a wide range of stakeholders that includes the worker, the organisation and the wider community. The participants consider the workplace trainer is a person who conducts formal and structured training. The participants perceive that the role of the workplace trainer in informal learning is not fulfilled by one person but to be distributed among the workers.

I was able to identify and confirm the pattern and themes to be found in the data by firstly systematically organising the data as they were gathered. Secondly through completion of an extensive literature review I was able to complete an inductive analysis (Mertens, 1998, p. 348f). I found peer debriefing to be an invaluable tool when confirming patterns and themes. I debriefed four different people separately; two were workers and two held supervisory positions. The four participants I debriefed confirmed a solid link between the participants' viewpoints and my portrayal of the participants' viewpoints. The four were unanimous and responses indicated I had "painted an accurate picture" of the groups under study and I had the line manager "to a 'T'".

In this chapter I will articulate the patterns and themes emerging from the analysis of the data by firstly looking at the similarities between the two groups and then at the differences between the two groups. I will then provide a picture of each group in turn and then describe how the participants perceive the role of the workplace trainer, before providing a summary of the chapter.

The similarities

A consistent theme found in responses from the participants in the research was the perception that learning at work was important and valuable. This was also consistent with the literature, where statements like "the importance of informal learning among adults cannot be overstated" (Sparks, 2000, n.p.) are commonplace. Whether the responses from the participants were positive or negative, they indicated that informal learning occurring at work was considered to be of fundamental importance to the worker and workplace performance. This was not simply a theme or a pattern: it was a view held and expressed by *all* participants. Comments that came out of the semi-structured interviews and observation include:

- Albert said: "I learned more from a … [crisis] than I did from any … [formal] course";

- Alan said: "We cannot get this information anywhere else";

- Alan said: "I get a lot out of working with Andrew and the other guys for that matter".

- Barry said: "We never get any time to play with the system"; and

- Basil said: "It is great that everything is reliable and … [the line manager's] procedures work, most of the time, but what happens when something goes wrong? We do not have enough experience to take the covers off some gear".

One pattern or theme that came out of these responses was about what was not said and it is illuminating to see the consistently unsaid being articulated. When one looks at each of the comments above, they can be reinterpreted to be:

- I learn more through work *activity*,

- I can learn this only through work *activity*,

- I learn through work *activity*,

- we cannot learn if we do not have a focused work *activity*, and

- the knowledge can be constructed only through *activity*.

I purposefully used the term 'activity' because that is what emerged from the analysis of the data gained from observation and was reinforced by the above responses from the semi-structured interviews.

Andrew and Anthony were discussing how a piece of equipment worked and Andrew said, "Let's go and try it … [and confirm our understanding of how it works]" and "I do not care what the manual says; try it. We did it yesterday and I am not going to look stupid two days in a row … [and] we pretty much have it worked out". After testing their knowledge Anthony said, "It has never happened before and I thought it was important to find out how it worked". Manuals and formal courses are used as reference sources but *nothing* is real and known until it is experienced, shared and tested as a part of work activity. Workplace activity leads to informal learning, informal learning that is relevant, timely and valuable. If the organisation is to take advantage of the value to be found in the informal learning then "clear consideration and recognition will need to be given to informal learning" (Harris, Simons & Bone, 2000, p. 6).

I established workplace informal learning to be valuable early in my research and it became the foundation for further investigation. Learning how to navigate around the workplace and learning how to fill out time sheets are important and valuable learning experiences but not considered to be 'rocket science' and low on the

learning at work value scale. Anthony said that the most important learning is "in there, the system, the stuff you cannot get in books". Observation of the workplace and discussion with participants at work teased these words out to an understanding of a hierarchy of the value of learning at work. It appears that there are three parts to the informal learning at work: one that is general and transferable, one that is largely procedural and one that is specific to the workplace. The first, general and transferable learning, has a long term view, is important for the future and is important to the individual, although participants placed it at the bottom of the informal learning value scale. Learning about procedures is more important because it is the learning that allows a worker to complete his/her day to day tasks. Specific workplace learning is perceived as being most important because it is drawn out of experience, it cannot be found in texts and it belongs to the individual or the workgroup.

Learning that is specific to the workplace provides many benefits. It is learning concerned with 'how we do things' or 'how things are viewed here'. This learning leads to the development of a common identity and provides a link between work and the organisational product, the processes and other workers. Specific workplace learning makes the workgroup feel good, leads to an improvement in performance and achieves the goals of the individual and the organisational hierarchy.

The potential for improvement in performance and innovation also rests on what is allowed to happen by the way that work is structured. The way work is structured can impose barriers to learning or encourage learning at work. "Factors within the *organisational structure* will decidedly influence learning which is work related" (Caley, 2000, n.p.; emphasis in the original). In this study I saw two workgroups that

value informal learning at work, but where work and workplace structures had very different impacts on informal learning at work.

The differences

Earlier I stated that it was fortuitous that the participants in the pilot study, Group A, and the participants in the main study, Group B, worked in a similar physical environment and their work was organised and structured in different ways. The groups were chosen because they appeared similar but the differences proved illuminating. The sameness came from easily identified demographics, while the underlying differences emerged from the study. A significant difference between the two groups was that participants from Group A were happy in their work while the participants from Group B were unhappy in their work. In the pilot study I found a workgroup, Group A, that was actively learning and performing well when measured against organisational key performance indicators. In the main study, Group B, physically separated from Group A, but working with the same system, were not learning, were not encouraged to learn and were generally performing poorly. The marked difference in performance, by what initially appeared to be very similar groups, was worthy of further investigation.

The group performing well, Group A, had formed a community of practice and the group that performed poorly, Group B, had no sense of common identity and followed rules put in place by the line manager. Group B's work structure was mandated by the line manager who employed a managerialist approach and made a seemingly active effort to squash the formation of a community of practice. There was a strong belief in the group that was performing well, Group A, that they were greater than the sum of their parts, that is, that as a cohesive group they would

49

perform better than any individual. The participants in the group performing poorly, Group B, did as they were told, followed procedures and relied on the line manager to solve all problems. Group A was performing well and the members of the group were happy and connected to the organisational processes and products. Group B was performing poorly and the members of the group followed procedure blindly, even if they perceived what they were doing as 'bad'. For example, Bill was packaging some equipment for despatch and commented that the technicians receiving the equipment at the other end will not know what to do with the equipment, or why it was sent; "that is what … [the line manager] wants us to do and I will do it just as the standard instruction says". The members of Group B were disconnected from the organisational process and product, unhappy and in some cases recalcitrant.

Group A: Communities of practice

The electronic technicians in Group A had developed an enviable 'learning culture', and actively worked towards gaining the most value from learning experiences that came from day to day workplace activity. Group A recognised that "their skills are 'wasting' assets and must be continually renewed, that learning must continually go on" (Sharp, 1997, n.p.). The action of the community of practice was not based on any recognised theory or models but on the knowledge and experience of the senior members of the community of practice. Group A had formed a community of practice that had a structure, obvious mentoring arrangements, guided practice and an assessment process.

A novice could gain the authority to enter the community of practice, but, at least initially, was allowed only superficial access. A novice could progress quickly, particularly if he/she had a higher level skill sets and/or had previous experience with similar environments. Anthony said, "Albert was good value from the start. He had worked with … [like] systems before".

The first actions that indicate acceptance were through the sharing of stories. Albert said that he was told that he should "never get here late because the boss will tear you a new one … [and] it leads to penalties under the contract". In reality being late did not lead to penalties and the boss was likely to be lenient if there was good reason, but the novice had been made aware of the importance of starting on time. Andrew said that he was told that he should "always get to the security office early on the first Monday of the month or you will get mixed up with all the cleaning contractors and you will be late." Initially stories were prolific, covered many areas and were the richest learning resource provided by those with experience in the community of practice.

The participants were aware of a structure to their learning experiences that provided a logical pathway for learning. The structure was for people to work from the simple to the complex and allowed for construction of knowledge through activity. The participants expressed surprise that the structure of their learning experiences seemed as simplistic as simple to complex but when they delved further into actual experiences it was obvious that their learning experiences were certainly not simplistic. There was a maze of paths novices might follow and a myriad of potential disasters they might experience. This is the single most controlled area in

the community of practice and many paths were travelled only after rigorous assessment.

A new member of the community of practice was not allowed to work unsupervised unless he/she had been assessed as capable of performing the task to the satisfaction of the community of practice. There was an ongoing muttering among the 'masters' and more experienced members of the group about the new member's progress. At some point a 'master' offered the opinion to the others that the new member was ready to work unsupervised, initiating a discussion that provided a consensus of opinion. Albert said that he started working alone after he was asked: "There is not much happening next week; would you like to open the building? … [and complete the startup procedure]. I will be here, so if the worst happens I can always help".

Self assessment grows out of mistakes or errors. Good natured 'ribbing' from the more senior members of the community of practice, following a mistake or error, informed the novice that it was okay to make a mistake, blame was not apportioned and it was expected that he/she learned from mistakes or errors. 'I bet you won't do that again' in a number of forms is a full stop in the merriment and a marker of an individual's responsibility to learn from his/her mistakes. The good natured 'ribbing' and markers of an individual's responsibility were not confronting or threatening and were possible only because of a "culture of learning from mistakes and sharing of lessons learned" (Ali, Agostino, Pascoe & Warne, 2001, p. 6).

Individuals in Group A perceived there was value in being a member of this community of practice because it supported informal learning at work, which they perceived as being directly linked to their skill levels, personal performance and self-

esteem. Participation in the community of practice allowed the members to "develop

knowledge and understandings that go beyond their 'book learning' and formal

certification in trade" (Sharp, 1997, n.p.). This community of practice worked; it

was not *ad hoc* or unstructured and was certainly not limited in value because it was

formed informally.

Group B: Managerialism

In Group B a managerial elite is the power that directed all operations of the group.

The participants in Group B expressed a belief that the line manager considered, in

the words of Rees (1995, p. 15), that "any problem can be resolved through efficient

management practices". The line manager is described well by Edwards (199-?, p.

1), who says that managers, in a managerialist environment, are not risk takers

because taking risks may lead to failure. Instead managers tend to maintain the

status quo, are reluctant to change and tend to control the activities of their workers

through strict procedures and guidelines. Edwards (199-?, p. 1) goes on to say that

"thus, traits associated with managerialism are much the same as those normally

associated with the negative stereotype of bureaucracy including such pathologies as

over-emphasis on hierarchical relationships and control mechanisms, resistance to

change, risk averseness, turf protection, lack of creativity, rule-mindedness, and so

on". This is what the individuals in Group B called 'micro-management'.

When I asked participants in Group B about barriers to informal learning at work, I

was told that the focus of the line manager was on key performance indicators and

learning was an overhead that was not tolerated. Brian complained that he was told

to stop reading a technical manual and get back to work. He found this upsetting

because, during earlier system fault rectification, he had been 'abused' by the line

manager for not being able to bring the system back to operational status in a much shorter time and his reading was an attempt to improve his understanding of how the system functioned. Basil complained that he and two of his workmates were completing a 'wash up'; that is, they were discussing the action taken when repairing the system in an effort to understand what happened and how to improve their performance next time. The line manager broke up their 'needle work session' and put Basil to work on a menial task. These incidents are not isolated and the impact of this and like incidents reaches deeply into the psyches of the people involved.

One of the most illuminating events I observed was the removal of the electronic technicians' 'smoko-chat' area. The workshop had a small corner that had four chairs, a coffee table and a few technical journals that the technicians used as a morning tea and discussion area. The line manager removed this area because it was an 'occupational health and safety problem' and food and drink should not be allowed in the workshop. The technicians perceived this as a thinly veiled way of saying: stop talking and get back to work. The power of occupational health and safety forces was such that the technicians found it hard to argue against the removal of the facilities and could only lament the loss of what they saw as an important facility for social interaction. My observation was that the effect on the technicians was for an immediate lowering of self-esteem and a feeling of helplessness and anger. I was disappointed to see a valuable learning resource removed and a permanent barrier erected to informal learning at work. Moreover innovation was squashed because although the transferable and procedural knowledge could still be developed the construction of new and specific workplace knowledge found in day to day activity was limited.

When these barriers to learning were combined with the apparent lack of basic respect accorded individuals and their skills and knowledge, the individuals experienced a lowering of self-worth, tended towards learned helplessness, were disconnected from the organisational product and became alienated from their labours. The line manager had created a gap between his vision and the technicians' vested interest, creating a feeling of powerlessness that led to a reduced learning potential (Ali, *et al.,* 2001, p. 5). If workers are not encouraged to think and are not empowered to solve problems, the need to acquire knowledge is managed out of those workers. Incidentally, lack of encouragement to learn and not empowering the individual are likely to lead to worker dissatisfaction, high staff turnover, lower wages, confrontation and conflict. Sadly, this is an accurate description of Group B where workers adhered to strict and comprehensive procedures, were not happy, felt demeaned and regularly resigned and moved on, seeking more satisfying employment. P. A. Danaher (May 2003) in a personal communication said, in response to my description of Group B, "It sounds like learned helplessness" and that was certainly so.

It is difficult to impart the helplessness felt by the technicians without making their work environment seem like a prison yard. I found depressing the level of 'whingeing and bitching', the number of derogatory names for the line manager, the level of petty politics, the overuse of union strategies and continual complaints. There was a positive side to be found in the level of creativity in the technicians expressing their helplessness. The cartoon of the line manager's office being lifted by helicopter and placed in a remote location was well done. The poetry, plays on words and comical antics were worthy of literary and artistic note. The day the

technicians took the hinges of the side off the line manager's door and placed them at the top was most amusing because it was a demonstration of defiance that the line manager did not understand and ironically he saw it as a mark of respect. Respect is a fundamental requirement for healthy relationships among people and lacking in this workplace.

Formal courses

In group B the line manager appeared not to understand that informal learning at work is important and that informal learning is a significant part of skill development. While the line manager did not promote informal learning at work, he actively supported formal training courses. In Group B the formal courses did not provide the starting point for informal learning at work and a basis for the construction of new and/or workplace specific knowledge. The focus was very much on "training rather than learning" (Caley, 2000, n.p.) and little was done to support the construction of new knowledge. In Group A the formal courses were a doorway to allow them to delve further into understanding the working of the system. A number of formal training courses were conducted in the period of the study. These formal courses were outside the informal learning that is the subject of this study but because they existed outside the study they added to a better understanding of the informal learning occurring at work. I concentrated on three separate courses that were completed by both groups.

The participants in the training further illuminated the differences between the two groups. Group A were applying the new knowledge to past experiences, during the course, and I heard comments from participants in Group A like:

56

- Albert said: "It would have been of more value if I had completed it six months earlier";

- Arron said: "So that is why"; and

- Anthony said: "So that is how".

Group B mostly lamented that they had finished a course and learned some 'good stuff' but would not get to use the new knowledge. The comments I heard were:

- Bevan said: "When will I get to use it?";

- Bob said: "We will never be allowed access ... [to try out new approaches]"; and

- Basil said: "At least it will look good on my resume ... [because I am actively seeking employment elsewhere]".

While the responses were different they reinforced the barriers to informal learning experienced by the participants in Group B. The participants in both groups, unanimously, said they valued the learning experience and felt it provided a boost in self-esteem.

Participants in the pilot and the main study responded to question five – What do you think the role of the workplace trainer should be in assisting people to learn? – by talking of the aforementioned formal courses, with a TAFE like instructor in a classroom environment. This was the perception held by the majority of the electronic technicians. When I talked about informal learning and workplace trainers in the same breath, the participants did not find the two to be connected. The responses to other questions revealed the theme that the workplace trainer was perceived as a subject matter expert who stood up in the front of a group in a classroom environment delivering a formal and structured course.

When participants were prompted to describe the functions the workplace trainer could complete in informal learning that happens at work the responses mirrored the five functions discerned by Harris and Simons (2000, p. 2ff). The five functions are:

- fostering an environment conducive to learning,

- working and learning with co-workers,

- structuring and shaping the work processes to accommodate learning,

- promoting independence and self-direction in workers, and

- linking external learning experiences with work and learning in the workplace.

The participating technicians perceived that they learned informally from one another through everyday activity and social interaction at and outside work. That is, everybody in the workgroup carried out the above five functions as they worked and learned through everyday activity.

Andrew said that "we sort of work it out as we go". Anthony expressed the opinion that "we are pretty much allowed to try things out". Whilst there appeared to be no real structure to this learning there is an environment of sharing in Group A and all members felt they were always building on a knowledge base. They use 'adaptive real time' management to determine priorities and to make decisions about what areas to investigate. Albert had significant knowledge of other like systems and is considered a subject matter expert and he expressed his priorities were "after any ... [dilemma or crisis] I get into the computer system and see what I can apply here". The role of the workplace trainer in informal learning at work, at least in the minds of the participants in this study, was almost non-existent and lies instead in formal and structured training.

Chapter summary

How do electronic technicians learn informally in the workplace? The electronic technicians construct knowledge through day to day work activity and social interaction at and surrounding work. The construction of knowledge is real only after it is experienced, shared and tested. Subject matter experts, hardcopy and electronic reference sources are utilised as a gateway to informal learning, almost a rite of passage to construct valuable and workplace specific knowledge. Transferable and general knowledge is essential to career development and is well supported by solid and accessible resources. Procedural knowledge required for day to day work may be found in company standard procedures and guidelines. These two areas of knowledge are known and documented, may be accessed in formal training courses or informally through work activity and may be gained from peers and supervisors. They are certainly valuable and allow the individual to work.

Informal learning at work has a workplace specific component and that workplace specific component is about how the workplace is structured, processes work or procedures are completed. Specific workplace knowledge is most valued and can be constructed only by participation in day to day work activity and the surrounding social interaction. There are no certificates for informal and specific workplace learning and there are no markers of achievement except for the respect of peers for the skills and knowledge constructed through work activity. The workplace specific learning is where the competitive edge can be found; it is what makes innovation possible. An organisation can employ the 'best' people but then most organisations attempt to employ the 'best' people. The competitive edge comes from how and what these people do at work. There is a direct link between informal learning and

performance; therefore the competitive edge comes from how and what these people learn at work.

Managers and supervisors appear to understand that informal learning at work is important and that informal learning is a major part of skill development. In my study I found a community of practice in the workplace that had managed to encourage knowledge and skill development outside organisational policy. I found a workgroup that was fragmented and performed poorly because of an inappropriate management approach that did not accord individuals basic respect and promoted learned helplessness. The data demonstrated that the "way people relate to one another, the way they cooperate and show respect for one another amplifies the usefulness of training and learning" (Figgis *et al.*, 2001, p.6).

The role of the workplace trainer in informal learning at work, at least in the minds of the participants in this study, was almost non-existent and lay instead in formal and structured training. The role of the workplace trainer in informal learning at work was embedded in work and the participating technicians perceived they learn informally from one another through everyday activity and social interaction at and outside work. The workplace trainer role in informal learning at work was distributed among the participants in the community of practice.

Chapter Five: Implication of the findings

This study was informed by a theoretical framework based on a social constructivist paradigm and the concepts of situated learning and communities of practice. The theoretical framework was further refined by recent literature about the contemporary Australian workplace. The question explored in this study was: How do electronic technicians learn informally in the workplace? This chapter is concerned with the implication of the findings rather than providing a definitive and generalisable conclusion. The research relied on my interpretation, was based on my viewpoint and was informed by my understanding of how people construct knowledge. The implications of the findings are: dependant on context, provisional, subjective and tentative (P. A. Danaher, personal communication via e-mail, 29 July, 2003). Returning to what Mertens (1998, p. 181) said, I make a credible link between the perceptions of the participants and my portrayal of those perceptions.

Findings that emerged from this study indicate that informal learning at work was highly valued by all participants and that they perceived informal learning at work to be directly linked to personal and organisational performance. Furthermore, current literature and personal experiences indicate that it is widely accepted that it is important to value the knowledge and skills constructed by workers through day to day work activity. "It is this capacity to learn from one another that leads to the advancement of the human race" (Ali *et al.*, 2001, p. 2). While it is important to value the knowledge and skills constructed by workers through day to day work activity it is also important to understand that the informal learning at work has a foundation of formal learning experiences.

I found that a community of practice was a powerful vehicle to promote informal learning and to meet the needs of the individual and the organisation. The informal learning that occurs in a community of practice as a part of day to day activity and social interaction allows for the construction of specific workplace knowledge that is relevant and timely. Moreover, this informal learning, when based on a foundation of transferable and procedural knowledge, allowed for innovation and provided for a feeling of common identity and raised self-esteem. Conversely, a workplace where work was organised using a managerialist approach and where there was a focus on adhering to strict procedures and guidelines informal learning and the construction of new and specific workplace knowledge was limited. Innovation was limited because technicians were required to adhere to strict procedures and guidelines. The technicians working in the workplace characterised by a managerialist approach, Group B, were unhappy and overall workplace performance was less than satisfactory.

The implications I will address in this chapter are firstly the need for a supportive organisational environment for both informal and formal learning at work. A supportive environment can be provided through organisational policy, the structure of the workplace and the actions of supervisors and managers. Secondly there is a need to encourage the formation of communities of practice in the workplace that require all stakeholders to accept responsibility, from individuals accepting responsibility for their own learning to state sponsored inducements and a wider, supportive environment for informal and formal learning at work. Finally before the chapter summary I will discuss the need for changes to the role of the workplace trainer that are required to encourage informal learning at work and to link islands of formal training.

In the workplace examined as a part of this study, and I suggest in the contemporary Australian workplace more broadly, there is a need for a holistic approach to training and learning that:

- provides a supportive organisational environment for training and learning,

- recognises the value and importance of both formal and informal learning,

- encourages individuals to accept responsibility for their own learning, and

- exists within a wider supportive environment for training and learning.

Organisational policy

What should organisations do to maximise the amount of informal learning occurring at work and to maximise the benefits gained from informal learning occurring at work? It has been demonstrated that, in a competitive environment characterised by a global economy and a high rate of change, not looking after the knowledge that is embedded in the workers and processes in the workplace may lead to failure of the organisation or at least limit organisational performance. Davenport and Prusak (1998, p. xff) cite a number of incidents where organisations have ignored knowledge management and have "made costly errors". Organisations have become interested in developing knowledge and skills because they are known to be linked to competitiveness and competitive advantage. My personal experience and the literature have shown that organisations acknowledge that they need a 'learning culture', to put 'knowledge management' strategies in place or to encourage communities of practice. "For many businesses and institutions the idea of establishing a learning organisation is no longer a choice but a necessity" (White, 2002, p.1).

The first step for the organisation in maximising the benefits gained from informal learning at work is to value highly informal learning at work and to allow workers to construct knowledge as a part of participating in day to day work activity. Improvements in performance are made by individuals who participate in day to day work activity and who endeavour to overcome problems and improve the way work is organised and conducted. The importance accorded informal learning at work by the participants in Group A can be seen in artefacts; for example the technicians in the group all have extensive 'good guts' folders and there is a well used white board and other informal learning 'debris' in the 'smoko' room.

The improvements in performance are found in the specific workplace knowledge constructed informally through day to day activity. As shown in Figure Three overleaf, innovation is possible because of a firm basis in general and transferable knowledge and an understanding of procedures. But the more specific to the workplace the knowledge constructed the greater the potential for innovation. The trajectory used in Figure Three is based on the data analysis in this study and suggests that while there is a direct link between informal workplace specific learning and innovation there is a point where return diminishes.
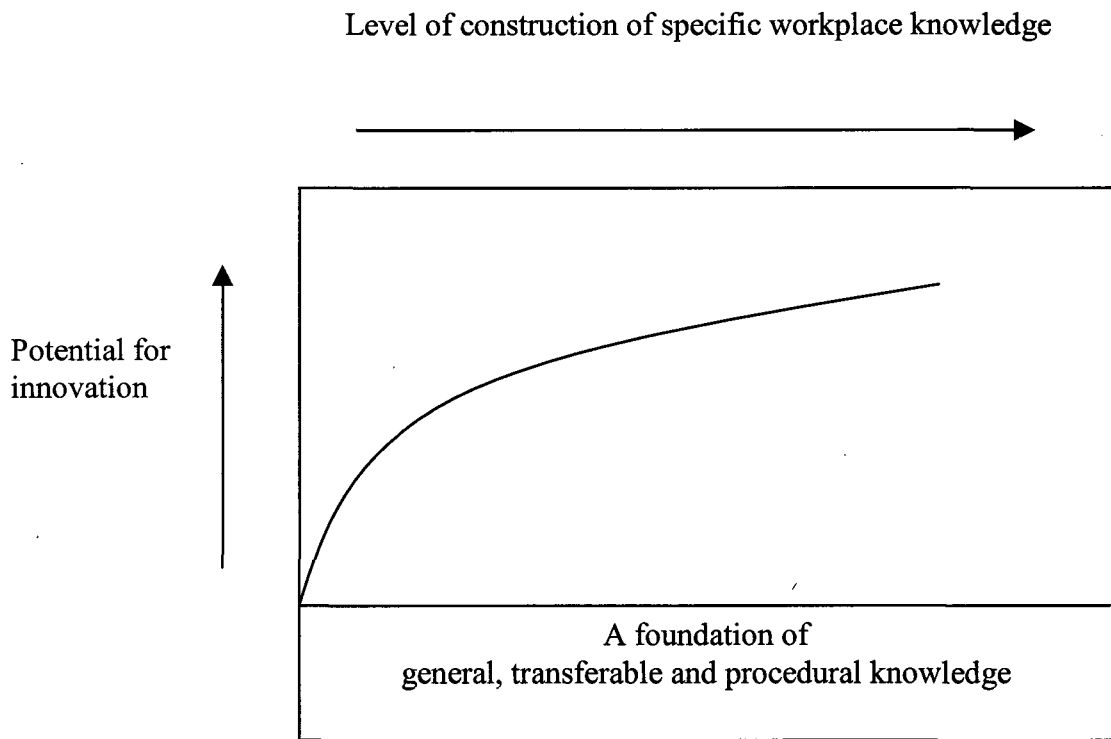
Level of construction of specific workplace knowledge

Figure Three: Potential for innovation

Workplace structure

The workplace structure and the organisation of work can reflect the value and importance accorded formal and informal learning. Furthermore the way the workplace is structured and the way work is organised can allow and encourage individuals to accept responsibility for their own learning. Davenport and Prusak (1998, p. x) say that "many firms are now struggling to gain a better understanding of what they know, what they need to know, and what to do about it". This study emphasised this struggle by demonstrating that the structure of the workplace and the organisation of work can provide substantial barriers to informal learning at work.

The participating technicians in Group B indicated that a managerialist approach provided a significant barrier to their informal learning at work. The barrier came from the way work was structured. The organisation employed a tall, hierarchical structure that negated a move to understanding that knowledge is embedded in the

worker and in the processes in the workplace because a few people high in the hierarchical structure made all decisions and dictated the way work was completed. The work of the participating technicians in Group B was structured and organised so that it was possible to attend formal training courses that concentrated on learning workplace procedures and denied resources for informal and specific workplace learning.

The tall, hierarchical organisational structure where decisions were made by a few did not recognise, utilise or demonstrate the value of knowledge held and distributed among the workforce. The depth and breadth of knowledge required for improvements in workplace performance and the ability to cope with change can be found in the knowledge distributed among workers. As Figgis *et al.* (2001, p. 11) say, "If enterprises are to be dynamic, innovative, and entrepreneurial much more responsibility and control needs to be delegated to workers". This will result in a flatter structure where people "need to organise themselves so that coordination bubbles up from below … [and requires] relationships of trust" Figgis *et al.* (2001, p. 11). While this was not apparent in Group B it could be seen in technicians who make up Group A. The technicians in Group A solved problems through group discussion and brainstorming and proffered and tested ideas among their peers and supervisor in an open and easy way. The final interpretation of the consensus of opinion among what is described best as a community of practice is left to the supervisor but nonetheless the decision belongs to the community of practice and comes from the distributed knowledge constructed and tested by the participants through day to day activity.

Managers and supervisors

The instances reported by the participants in Group B of the study where workers felt punished for expending effort on learning at work are difficult to understand when the same line manager, who was responsible for the 'punishment', often blamed the lack of knowledge and skills of workers for poor performance. This study raises the question: managers and supervisors might say they understand that informal learning at work is important – but do they walk the walk? This in turn evokes "the challenge of management clarity and consistency: the mismatch between behaviour and espoused values" (Senge, Kliener, Roberts, Ross, Roth & Smith, 1999, p. 27).

The managers and supervisors need to walk the walk. Barriers to informal learning should be dismantled and replaced with 'signs' that encourage informal learning at work. In Group B's workplace the 'coffee & chat' area that was removed could be reinstated, maybe including a whiteboard and whiteboard markers to allow for more animated discussion. A work theme could be indicated through inclusion of technical handbooks, industry publications and manuals. The line manager could promote communication by encouraging social interaction following, or during, a crisis or dilemma. The line manager could encourage 'wash up' sessions that focus on how to do things better rather than apportioning blame and limiting workers with restrictive procedures. The actual strategy employed is unimportant and may change from workplace to workplace but in all workplaces the barriers to informal learning should be dismantled and replaced with a workplace organised to encourage informal learning at work.

The performance of an organisation with a flatter organisational structure that comes with acknowledging the power of knowledge and skills distributed among workers will require an environment of mutual trust where workers have a sense of common identity and perceive a feeling of belonging. Furthermore, fundamental to any strategy to lower barriers to informal learning at work is an environment of open communication where managers and supervisors accord workers basic respect and provide encouragement for individuals to apply and develop their skills and knowledge. A way to facilitate open communication, a sense of common identity, a feeling of value and being valued by others is through widespread participation in communities of practice.

Communities of practice

A community of practice is a way to facilitate informal learning at work. The participants in a community of practice perceive that they are respected for their skills and knowledge and those skills and knowledge are valued. Communities of practice promote informal learning at work, they address the needs of the individual and when combined with a healthy relationship with the organisational hierarchy they are a powerful force to improve workplace performance. A community of practice is not a team; a team is as strong as its weakest link. The members of a community of practice understand the power of distributed knowledge and have a common purpose, and a community of practice may be more powerful than the sum of its members' strengths.

Group A formed a community of practice and provided an environment conducive to learning at work. Members of the group were able to test things and try new ways of doing things because they had the support of the members of the community of

practice. In Group A mistakes and errors were allowed and the good natured 'ribbing' that marked an individual's responsibility was not confronting or threatening and was possible because of the common sense of purpose and identity and the supportive environment of the community of practice.

It is simple to say that managers and supervisors should promote communities of practice and encourage workers to participate in one or a number of communities of practice. A problem arises if the organisational hierarchy makes a formal approach to the formation of a community of practice. If the organisation makes a formal approach to form a community of practice it can no longer be an informal group that came together because of a common purpose. The formal approach by the organisational hierarchy makes for a team – a team that may be immediately alienated and fractured by the imposition of organisational goals. Certainly making communities of practice form by fiat will not work (Sharp, 1997, n.p.). If managers and supervisors help an individual to; understand how s/he learns, appreciate the potential of communities of practice and appreciate the power of informal learning through activity and social interaction, then the seeds may have been sown for the formation of communities of practice. If the seeds are sown in a garden characterised by an organisation that supports formal and informal learning that operates in a wider supportive learning environment then the community of practice has the potential to be a rich and a mutually beneficial learning environment.

Responsibility for learning

Organisations can change the structure of work and accept responsibility, as an organisation, for the development of workers, but without workers accepting responsibility for their own learning returns from investment in training and learning

will be far from optimal. The investment in workplace learning will benefit the organisation as well as the individual and flow on to the community. If the stakeholders include the organisation, the individual worker and the wider community then there is a need for a holistic approach that includes all stakeholders and where all stakeholders can demonstrate that they value learning, whether it be formal or informal.

Both the organisation and the individual benefit from learning and the individual may accept some of the cost, particularly if the cost of learning is perceived as an investment in one's own future. The individual could accept some cost by allocating personal time and resources to complete formal training or by accepting responsibility for his/her own learning. If the skills and knowledge of the individual are a valuable asset for both the individual and the organisation then it is reasonable that the individual and the organisation apportion the cost of investment in the development of skills and knowledge. If the community also benefits it is reasonable that the state or other community bodies may also accept some responsibility for an individual's learning for work. To provide a wider supportive learning environment the stakeholders need to form a partnership, and however that partnership is formed the quality of the partnership will rest on the level of involvement of each of the stakeholders (Smith & Betts, 2000, p. 594).

A wider supportive environment comes from the wider community recognising the value to be found in formal and informal learning. The support can be demonstrated through state sponsored inducements like tax breaks, providing incentives for organisations to employ apprentices or encouraging educational institutions to provide flexible learning programs. Workbased learning, remote access to learning

resources, computer based learning resources, realistic approaches to recognition of prior learning and better access to learning resources are all approaches that could be developed to provide a wider supportive environment for learning and a holistic view of learning at, through and for work.

Workplace trainers

There is certainly a place for a TAFE like workplace trainer who is an expert who stands up in front of a class and delivers formal and structured training that leads to some nationally recognised award. However, as Harris and Simons (2000, p. 2) said, "there is a need to put 'work' back into notions of the 'workplace trainer'". The organisation needs to recognise, and through staff development programs let workers know, that training courses are a starting point for informal learning at work. A holistic approach needs to be employed where the workplace trainer not only delivers islands of formal training, but also encourages and provides less formal learning experiences that fit between the islands of training – that is, performs the five functions discerned by Harris and Simons (2000, p. 2ff):

- fostering a work environment conducive to learning,

- working and learning with co-workers,

- structuring and shaping the work processes to accommodate learning,

- promoting independence and self-direction in workers, and

- linking external learning experiences with work and learning in the workplace.

It is certainly a significant implication for me that newly qualified people coming into the workplace after a formal course need to be prepared for informal learning at work and that the formal learning process should promote informal learning at work.

A formal training course does not provide an individual with all he/she needs to know. A formal training course provides a way for him/her to participate in work and is therefore a starting point to construct new knowledge, test skills and confirm knowledge in real life. Formal learning experiences should add to the wider supportive environment for informal learning at work and not start providing barriers to informal learning before people arrive at work.

The structure of the workplace can construct barriers to informal learning at work before the formal training course starts. I reported that the participants in Group B lamented that they would not be able to use or test the new knowledge they had constructed as part of the training course while Group A were already applying new knowledge to past workplace experiences and planning to test and try new things. Therefore it is not only important that a formal training course should not start providing barriers to informal learning before people arrive back at work but also that the structure of work should not provide barriers to informal learning *before* people attend a formal training course.

Chapter summary

Organisations should value the knowledge distributed among workers and understand that "if enterprises are to be dynamic, innovative, and entrepreneurial much more responsibility and control needs to be delegated to workers" (Figgis *et al.*, 2001, p. 11). Managers and supervisors can do this by structuring work such that they demonstrate:

- an understanding of what a 'learning culture' might mean in the context of their organisation;

- an understanding of what 'knowledge management' strategies might work in their organisation; and

- the need for and encouragement of the establishment of communities of practice.

The managers and supervisors need to walk the walk. The managers' and supervisors' walk begins with according workers respect for their skills and knowledge and facilitating open communication across all levels of the organisation. Once a foundation of respect and open communication exists the managers and supervisors can work towards organising work and providing a work structure that supports and encourages the construction of new knowledge. A true view of workplace performance and a true view of the potential for improvement in workplace performance must be based on key performance indicators that consider construction of new knowledge as an investment.

Workplace trainers need to promote and encourage informal learning at work as well as conducting formal courses. Formal courses conducted by the workplace trainer should add to a wider supportive environment for informal learning at work and not start constructing barriers to informal learning before people arrive at work. Furthermore the role of the workplace trainer needs to bridge islands of formal learning experiences.

A community of practice is a powerful vehicle to promote informal learning and meet the needs of the individual and the organisation. How to promote communities of practice when they are something that forms through a perceived common purpose is another question. Any overt effort by the organisational hierarchy to promote the formation of a community of practice may be seen as an imposition of organisational

73

goals and therefore deny the formation of a community of practice based on a common purpose. The organisation must first provide a foundation of respect, facilitate open communication and encourage the construction of new knowledge. Removal of barriers to the construction of new knowledge and encouraging individuals to accept responsibility for their own learning may be enough to promote the formation of communities of practice.

The most important implication I found in this study is about the nature of knowledge. This study supports my argument that knowledge is not something that is abstract. Knowledge is something owned by individual people who through activity and social interaction constantly test, reconstruct and extend that knowledge. Some things seem to be indisputable truths but all people never view the same thing in the same way. It is important to understand that knowledge is idiosyncratic and unique to an individual as it has a fundamental impact on understanding how people learn informally in the workplace. The organisational capacity for innovation and improvement in performance rests on its 'people' and on the way the interpersonal relationships that are formed by those people are formed as a part of day to day work and social activity. If work is structured and organised such that the interpersonal relationships add value to training and learning experiences it is possible for the community of workers to perform above the sum of their individual capabilities.

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Appendix One

Semi-structured interview data gathering instrument

Step One	Make the interviewee feel at ease – personal instructions
Step Two	· Provide focus: Gain an understanding of the informal learning that happens in the workplace

What do you understand by the term informal learning?

10 MINS

Step three	Make the interviewee feel at ease; ask the following:

How long have you been with the organisation?
What is your experience?
What qualifications do you have?

<div align="center">ASK EVERY QUESTION</div>

Step four

Questions	*Cues/Joggers*	
Q 1	What informal learning do you think happens in the workplace?	Talking to others about work Listening to peoples' problems/difficulties Assist with problem solving Correct others' mistakes Identifying learning opportunities/resources	15 MINS
Q 2	What informal learning is encouraged (by peers/supervisors/organisation)? What informal learning is discouraged (by peers/supervisors/organisation)?		10 MINS
		Probes	
Q3	What part do you play in assisting others to learn in this informal fashion?	• Keep Quiet, wait • Encourage ok, mmm, yes	10 MINS
Q4	What situations/opportunities do you think are valuable as informal learning experiences?	• Can you elaborate? • Can you clarify? • Paraphrase	10 MINS
Q5	What do you think the role of the workplace trainer should be in assisting people to learn?		5 MINS
Q6	Any other comments about your learning or your efforts to help others learn?		5 MINS

Appendix Two

Sample informed consent agreement form

INFORMED CONSENT FORM

Title of Research: Electronic technicians' informal learning in the workplace

Explanation of the research:

The research is intended to identify what informal learning happens in the workplace.

The research is necessary for Mr R.D.Westlake to fulfil the requirements of a Master of Educational Studies program studied externally through Central Queensland University. The studies are largely funded by BAE Systems with a majority of effort completed outside normal paid employment.

If you agree to participate in this research you will be asked to take part in 2 semi-structured interviews that will take up to 1 hour each and 2 observation sessions included as part of normal day to day work. These sessions may require some follow up sessions to clarify or extend data gathering. In addition you may be asked to assist with review of findings.

All data gathered will be in a written or audio tape form and will be securely stored until destroyed.

The intention is to publish results to fulfil of the requirements of the requirements of a Master of Educational Studies program and on agreement with the Contract Manager a workplace focused report will be made available to participants.

Explanation of participants' rights:

The researcher will answer all questions about the research procedures and processes.

The researcher will safeguard the data generated during this study and maintain all participants' privacy. Publication of the research will not disclose personally identifying information, and will not compromise company specific sensitive data nor will it compromise defence security. On agreement of the JSC manager, a workplace focused report will be made available on request.

Participation is voluntary. Participants may refuse to answer any questions without penalty and the participant is free to stop participating at any time without penalty.

Risk is low and minimal impact is envisaged above that encountered in everyday life.

Page 1 of 2

AGREEMENT

Research on electronic technicians' informal learning in the workplace

Participant:

I agree to participate in the above-described research.

I understand the above explanations and have received satisfactory answers to all questions I have raised and agree to the conditions as described.

I understand I will receive no remuneration for participating in this research.

I envisage no reason why I should not participate in this research.

I understand that I may refuse to answer specific questions and withdraw from the research at any time without penalty.

I understand I will receive a signed copy of this form.

Signature..

Date...................................

Researcher:

I certify that the privacy of the participant will be maintained and that I have answered all questions fully.

Signature..

Date...................................

Please contact Central Queensland University's Research Services Office (Tel 07 4930 9828) should there be any concerns about the nature and/or conduct of this research project.

page 2 of 2