CHAPTER ONE

E-LEARNING

This chapter reviews the literature pertaining to e-learning and e-learning competencies at the university level and is divided into five sections. The first section describes a variety of definitions of e-learning and presents a definition of e-learning for use in the study. The second section explores the use of Learning Management Systems in the delivery of e-learning in the university sector. The third section situates e-learning within the broader learning framework and identifies an appropriate learning theory within which to frame the study. The fourth section provides a discussion of the competencies students require for effective performance in university e-learning environments. The fifth section provides a conclusion to the chapter.

1.1 E-LEARNING

The purpose of this section is to derive a definition of e-learning for the study. In this section, the context of e-learning is defined, a variety of definitions for e-learning are examined, and a definition of e-learning derived for use in the current study is presented.

1.1.1 Defining the e-learning context

Chadha and Kumail (2002) contended that any definition of e-learning is dependent upon the context in which it is being defined. However, difficulty in defining e-learning arises because new contexts are emerging so rapidly that “opinion of the definition and scope of e-learning is differing and the changes are occurring almost at the speed of thought” (Chadha & Kumail, 2002, pp. 31 – 32).

Sloman’s (2001, p. 3) description of e-learning as “the delivery of learning and training that takes advantage of connectivity”, situated e-learning within two broad contexts, learning and training. However, there is a fundamental difference in the purpose of learning and training. Learning focuses on the open acquisition of knowledge, while training focuses on the improvement of job performance (Bonk & Wisher, 2000). While viewing e-learning from a training context is valid and valuable, the training literature on e-learning comes from a different conceptual space and uses different terminology.
to the learning literature. As the current study was concerned with student learning at university level, it was important to explore e-learning from within a learning context. Thus, it was necessary to establish a definition of e-learning from within this learning context.

1.1.2 Definitions of e-learning from the literature

Consensus on a definition for e-learning remains elusive. According to Siemens (2004a):

One of the biggest challenges in discussing e-learning arises from different understandings of the field. Most often, we attach our experiences and career to our conversations, presenting an image of e-learning that reflects what we have encountered (para. 1).

Clarke (2004, pp. 1-2) provided a list of terms used interchangeably with e-learning. These were online learning, computer-based learning, blended learning, distributed learning, computer mediated learning, computer mediated communication and web-based learning. While all of these terms have arisen from different understandings and experiences (Siemens, 2004a), none of these terms provide a clear conception of what is e-learning.

As a means of clarifying a conceptualisation of e-learning, Jackson (2004, para. 2) presented a “definitional dichotomy”, defining e-learning as either:

- technology-enhanced learning; or
- technology-delivered learning (italics in original).

Figure 1.1 presents a number of e-learning definitions from the literature organised according to Jackson’s (2004) definitional dichotomy.

Apart from Jackson’s definitional dichotomy, other definitions in the literature have focused upon the transformative effects of e-learning. Such definitions consider e-learning as being more than a new way of delivering learning, viewing it as a new way of thinking about learning (Rosenberg, 2001). For example, Priest (2000) defined e-learning as “using the special capabilities of the Internet as a delivery method to reinvent the way that people learn” (para. 3).
Examples of Technology-enhanced learning definitions for e-learning

e-learning exploits interactive technologies and communication systems to improve the learning experience (UK Department of Education and Skills, 2003, p. 7).
Learning and teaching that is facilitated by or supported through the smart use of information and communication technologies (New Zealand Ministry of Education, 2006, p. 2).
e-learning involves improving teaching and learning using instructional strategies enhanced by technology, especially computer technology (Waterhouse, 2005, p. 3).

Examples of Technology-delivered learning definitions

e-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance (Rosenberg, 2001, p. 28).
e-learning can be defined as any use of the Web and Internet technologies to create learning experiences (Horton & Horton, 2003, p. 13).
In considering e-learning, we include a range of electronically networked Information and Communication Technology via which learning can take place (Andrews & Haythornthwaite, 2007, p. 6).
Education created and delivered by using technologies related to computers, the Internet and telephony, in combination or in isolation (Chadha & Kumail, 2002, p. 31).

Figure 1.1 – Definitions of e-learning using Jackson’s (2004) definitional dichotomy

In a similar vein, Andrews and Haythornthwaite (2007) considered e-learning to be a “leaky system” that:

Spreads to take advantage of any and all opportunities for communicating, learning, and seeking resources and, like an invasive species, turns up in many places not traditionally associated with formal instruction – the kitchen table, coffee shop, workplace (p. 19).

Andrews and Haythornthwaite (2007, p. 19) described e-learning as being “continuously emergent” meaning that with each application new uses and new definitions will arise. Similar to the behaviour of electrons according to Heisenberg’s Uncertainly Principle, as soon as you think you know where e-learning is, it has moved on.

Increasingly common in the literature, is the idea that e-learning is essentially the use of computers and networked technologies such as the Internet for learning (Andrews & Haythornthwaite, 2007; Chadha & Kumail, 2002; European Union, 2001; Gillani, 2003; Littlejohn & Pegler, 2007; McConnell, 2006; Thompson, 2007). However this too requires qualification. For example, according to Sims, Dobbs and Hand (2002), e-learning is more than simply converting paper-based documents into their digital equivalents for distribution over the Internet. Sims et al. argued it should be “conceptualised as an environment that integrates collaboration, communication and
engaging content with specific group and independent learning activities and tasks” (p. 138). Similar sentiments have been echoed by Lynch and Roecker (2007) who acknowledged the importance of shared learning experiences with other students as being central to what constitutes e-learning. These ideas take the notion of e-learning as simply being a collection of technologies used for the delivery of learning and expands it to include varieties of social practice. According to Andrews and Haythornthwaite (2007), e-learning is not simply a computer system that can be purchased off the shelf and simply plugged in. Rather, having an e-learning system means “having people talking, writing, teaching, and learning with each other online, via computer-based systems” (p. 19, italics in original). The multidimensional nature of e-learning was further acknowledged by Thompson (2007), who stated:

Let us accept that e-learning is the current ‘term of art’ for an activity whose name belies its true complexity: a form of education characterised by multi-faceted, interactive systems of structures, activities, responsibilities, and stakeholders that is networked to minimise physical and psychological distance (p. 166).

Catherall (2005, p. 1) concluded, “we may well be forgiven if we cannot readily provide a simple definition for e-learning, a term which has been used heavily in recent years within a wide range of educational contexts”. It appears that this remains the case with consensus on a definition of e-learning still difficult to establish.

1.1.3 Defining e-learning for the purposes of the study

With the no clear answer forthcoming for a suitable definition of e-learning, it was necessary to adopt an operational definition of e-learning for the study that represented the ‘full complexity’ of e-learning described in the previous section. However, this was problematic as e-learning is made up of both physical objects and abstract conceptions. Consequently, trying to express these components adequately was the major impediment to finding a workable definition for e-learning. As a means of overcoming this impasse, the decision was made to reify e-learning. According to Andrews and Haythornthwaite (2007), it is common to “find e-learning reified as a particular course management system” (p. 6). Course Management Systems, also known as Learning Management Systems (Bonk, 2004a), are important tools in the delivery of e-learning (Waterhouse, 2005). While Learning Management Systems will be considered in the next section, it is sufficient at this stage to know that Learning
Management Systems aid in the creation and management of e-learning environments (Bonk, 2004a). In the context of the current study, reifying e-learning as a Learning Management System was an attractive proposition because a Learning Management System was in operation at the study site at the time of the research. This definition could also serve the dual purpose of defining both the context and scope of the study.

Originally, consideration was given to defining e-learning as learning using a Learning Management System. However, this definition was dismissed as it was suggestive of learning simply delivered via technology; in other words, the ‘e’ of ‘e-learning’. It was felt that such a perspective lacked validity because it failed to take into account the transformative effects and social practices shown to be inherent in e-learning. What was required was a definition that would allow the rich, complex, interactive transformative, social and multifaceted nature inherent in e-learning to be brought into play. Based upon this criterion, e-learning was defined in the current study as learning mediated by a Learning Management System. According the Macquarie Dictionary, ‘mediated’ is defined as “to bring about between parties by acting as mediator” (Macquarie Library, 2005, p. 890). This definition was attractive because it reflected the idea that e-learning environments were not bound or defined by the Learning Management Systems involved in their delivery. Importantly, defining e-learning in this manner acknowledged the complex interplay of people, content, and activities both inside and outside of the Learning Management System.

1.1.4 Summary

As shown by the previous literature, consensus on a definition of e-learning remains elusive. As a way forward, the decision was made to reify e-learning as learning mediated by a Learning Management System. Although defining e-learning in this way was both a highly contextualised and convenient definition, it was not without precedent in the e-learning literature (see Chadha & Kumail, 2002). An examination of Learning Management Systems is provided next.

1.2 LEARNING MANAGEMENT SYSTEMS

Learning Management Systems (LMS) have been described as one of e-learning’s most important tools (Waterhouse, 2005). They have been widely adopted by universities

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1 At the time of writing a LMS is still in operation at the study site and will continue to be so for the foreseeable future. This helps ensure the longevity and utility of the competencies identified in this study.
e-learning (Coates, James, & Baldwin, 2005; Siemens, 2006) and their rapid uptake is expected to continue into the future (Bonk, 2004a). A Learning Management System is software that allows for the creation, delivery and administration of online courses (Bonk, 2004a; Horton & Horton, 2003; Waterhouse, 2005). Learning Management Systems also provide secure online environments with a consistent look and feel that is generally easy to navigate (Sessums, 2006). Examples of Learning Management Systems include: WebCT, Blackboard, Moodle and Sakai (Bonk, 2004a).

Learning Management Systems are generally integrated with a range of e-learning tools capable of supporting a variety of activities. Coates et al. (2005, p. 236) provided a description of the tools common to many Learning Management Systems (Figure 1.2).

| Asynchronous and synchronous communication |
| announcement areas, e-mail, chat, list servers, instant messaging and discussion forums; |
| Content development and delivery |
| learning resources, development of learning object repositories and links to Internet resources; |
| Formative and summative assessment |
| submission, multiple choice testing, collaborative work and feedback; |
| Class and user management |
| registering, enrolling, displaying timetables, managing student activities and electronic office hours. |

Figure 1.2 – Tools available through Learning Management Systems

Typically, all of the tools, learning activities, and materials required for a course are organised and managed by the Learning Management System (Siemens, 2006). The combination of these elements as implemented through a Learning Management System characterise a particular learning environment (Siemens, 2006). Learning environments are developed within the context of a particular pedagogical model (Hultin, n.d.) which is generally aligned with a particular learning theory. A review of two relevant learning theories – behaviourism and constructivism – is provided later in this chapter.

The widespread adoption of Learning Management Systems by universities has not been without criticism. There is concern that the ‘management’ side of Learning Management Systems takes precedence over the ‘learning’ they are meant to support (Bonk, 2004b; Siemens, 2006). According to Siemens (2006), “(p)edagogy is generally a secondary consideration to student management” (p. 3). Bonk (2004b) argued that in many cases instead of having a learning focus, often these systems are used to
“warehouse students” (p. 2). Coates et al. (2005) observed that despite the rapid proliferation of Learning Management Systems in universities, little research has been done on the pedagogical impact of these systems. For example, evidence of the value of Learning Management Systems and their impact on teaching and learning has often only been collected through such indirect means as student surveys (OECD, 2005). Research that has been undertaken has tended to focus upon the economic and technical issues surrounding Learning Management Systems (Coates et al., 2005). The lack of pedagogical and learner-centred research is cause for concern as “online learning solutions, which are developed without proper regard to appropriate pedagogies and the needs of students, are destined to failure” (Bell, Bush, Nicholson, O’Brien, & Tran, 2002, p.2).

1.2.1 Summary

Three key themes emerged from this section that were of interest to the study. Firstly, Learning Management Systems have gained wide acceptance in the university sector and their usage is expected to increase in the future. Secondly, attention seems to be directed more towards the management of learning by these systems rather than the types of learning they might support. Thirdly, there has been a lack of research on both learners and the learning associated with Learning Management Systems.

1.3 LEARNING FRAMEWORKS

Learning Management Systems do not create learning of themselves. For this reason it was necessary to situate the study within the broader theoretical framework of learning. This section provides commentary on the theoretical learning frameworks used to inform the study. Discussion begins with an overview of learning and learning theories which is then refined to focus upon two widely accepted learning theories, behaviourism and constructivism. Each is reviewed with the aim of identifying the most appropriate learning theory to frame the study.

1.3.1 Defining learning

The systematic study of human learning is only a relative newcomer to scientific inquiry (Ormrod, 1990). Despite its recency, it draws on the ideas that occupied the minds of thinkers such as Plato and Aristotle through their investigations into the human mind, the nature of knowledge and what it is to know (Merriam & Caffarella, 1991). Plato, for instance, believed that knowledge was actively constructed by the mind, while
Aristotle argued that all knowledge came through the senses (Driscoll, 2000; Merriam & Caffarella, 1991). However, despite being central to the human condition, learning still “defies easy definition and simple theorising” (Merriam & Caffarella, 1991 p. 248).

According to the *Oxford English Dictionary* learning can be defined as:

> The action of receiving instruction or acquiring knowledge; a process which leads to the modification of behaviour or the acquisition or new abilities or responses, and which is additional to natural development by growth or maturation (1989, pp. 768 – 769).

Additionally, the Macquarie Dictionary defined learning as:

> The modification of behaviour through interaction with the environment (Macquarie Library, 2005, p. 813).

These definitions of learning reflect two common themes which appeared consistently throughout the literature. Firstly, definitions of learning typically involved individuals undergoing some form of change or modification (Biggs & Moore, 1992; Merriam & Caffarella, 1991; Ormrod, 1990; Rogers, 2002; Slavin, 1991). Rogers (2002, p. 86) referred to these areas of change as “learning domains.” Two of the most common learning domains identified in the literature were knowledge and skills (Biggs & Moore, 1992; Ormrod, 1990). There were, however, arguments for the inclusion of other domains. According to Rogers (2002), “in the field of learning, knowledge, skills and attitudes (KSA) is a well worn path” (p. 86). Lewin (1935) argued that learning involves changes in skills, cognitive patterns, motivation and in ideology. Gagne, Walker Yekovich, & Yekovich (1993), identified five learning domains: motor skills, verbal information, intellectual skills, cognitive strategies and attitudes in which modification could occur as a result of the learning process. Rogers (2002) used the mnemonic KUSAB (Knowledge, Understanding, Skills, Attitudes and Behaviour) to categorise the different domains across which learning could take place. Such an approach acknowledged the multidimensional nature of learning for as Coombs, Prosser and Ahmed (1973) argued, “these different kinds of learning... vary greatly in their depth and complexity [and] in the time taken to attain them” (p. 10).

The second theme common to definitions of learning was that changes in the learner must come about through experience and interaction with the world (Merriam & Caffarella, 1991; Ormrod, 1990; Slavin, 1991). According to Coombs et. al. (1973) such
experiences and interactions can be classified as taking place in three possible environments:

- **formal** – hierarchically structured and taking place in educational institutions often leading to some form of recognition or qualification;
- **nonformal** – organised activities outside established formal systems;
- **informal** – experiences learnt through everyday living.

Changes that occur through the process of maturation (for instance fine motor skills) or by temporary body states (induced for instance by fatigue or drugs) were not considered as being attributable to experience and were therefore not considered as being learned (Driscoll, 2000; Ormrod, 1990; Rogers, 2002).

To summarise, despite differences in opinions amongst authors into the nature of learning, there was general agreement that learning involved a persistent change in the learner through experience and interaction with the world. There was also evidence that these changes take place across five broad domains: knowledge, understanding, skills, attitudes, and behaviour.

While there was a certain degree of consensus on a definition for learning, the processes involved in making it occur remain contested. What these processes are and how they influence learning, are understood through the creation and application of learning theories.

### 1.3.2 Learning theories

Learning is a complex matter. According to Driscoll (2000), “it is perhaps impossible to conceive a theory broad enough to encompass all aspects of learning and yet still be specific enough to be useful for instruction”. As a consequence, Driscoll believed, “we must evaluate each separate theory for what it illuminates about learning and for how it can guide the development of effective instruction” (p. 239).

Learning theories attempt to describe the mechanisms underlying the learning process (Ormrod, 1990). A learning theory typically begins with a particular view about the nature of learning and then develops a set of principles consistent with this view (Gredler, 1997). These principles identify specific elements that influence learning and describe the particular effects they have on learning (Ormrod, 1990). However, as Driscoll (2000) observed, it is highly unlikely that one learning theory can explain every aspect of learning. To complicate matters, the study of learning has been approached by researchers representing a variety of disciplinary perspectives such as
Psychology, Biology, Computer Science and Education. As a consequence, each discipline brings with it a particular view of learning. It is this multiplicity of views that has led to the emergence of a number of different learning theories (Driscoll, 2000).

Despite their disparate nature, learning theories do share a common purpose. Gredler (1997, p. 9) identified five common functions of a learning theory:

- to serve as a framework for conducting research;
- to provide and organising framework for what is currently known;
- to reveal the complexity of apparently simple events;
- to reorganise prior experience;
- to serve as a working model for complex events.

Gredler’s first function: to serve as a framework for conducting research, was of primary importance to this study, as the identification of an appropriate learning theory to underpin the research was necessary. Despite there being a number of learning theories from which to select, for the current study attention was directed towards the two divergent theories of behaviourism and constructivism. This was because these are the two most commonly used theories in the application of Information and Communication Technologies within learning contexts (Roblyer, 2002). Both learning theories are discussed below.

1.3.3 Behaviourism

The term ‘behaviourism’ was first introduced by Watson in 1913. Behaviourism provides a view of learning that focuses inquiry solely on observable behaviours (Merriam & Caffarella, 1991; Pritchard, 2004). In particular, the relationship between environmental variables (stimuli) and responses (Driscoll, 2000; Gredler, 1997; Ormrod, 1990; Slavin, 1991). Internal process such as thoughts, motives and emotions – what would typically be defined as ‘consciousness’ – cannot be directly observed or measured. Therefore behaviourists believe they should not be considered as part of any legitimate scientific inquiry (Ormrod, 1990; Watson, 1913).

Learning from the behaviourist perspective is the acquisition of new behaviour (Ormrod, 1990; Pritchard, 2004; Slavin, 1991). Learning is achieved through the selection of stimuli to provoke particular responses that can then be directed towards the achievement of desired behaviours via processes such as reinforcement and
extinction (Driscoll, 2000; Gredler, 1997; Ormrod, 1990; Rogers, 2002; Slavin, 1991; Vander Zanden, 1980). Behaviourists believe what is learned is determined largely by the environment rather than by the individual learner (Merriam & Caffarella, 1991; Ormrod, 1990). Teaching, therefore, becomes the process of finding and arranging conditions for learning within this environment (Pai, 1973). As learning is considered as transmitted knowledge, the teaching of this knowledge should be teacher-directed, systematic and structured (Roblyer, 2002).

The main criticism of behaviourism is that it provides little attention to mental activity, concept formation and understanding (Pritchard, 2004). Behavioural models are considered too simple to explain the complexity of human behaviour (Biggs & Moore, 1992). Despite these limitations, behaviourism has had a profound impact on educational systems in areas such as classroom management, student motivation, identification of behavioural objectives, programmed instruction, mastery learning and computer assisted instruction (Biggs & Moore, 1992; Driscoll, 2000; Merriam & Caffarella, 1991; Skinner, 1968; Slavin, 1991; Vander Zanden, 1980).

1.3.4 Constructivism

The fundamental assumption of constructivism is that knowledge is ‘constructed’ by the learner (Vrasidas, 2000). Proponents of constructivism have argued that individuals create their own versions of reality (Kelly, 1991; Merriam & Caffarella, 1991; Rogers, 2002; von Glaserfeld, 1987). Individuals create personal constructs based upon feelings, ideas, previous experiences, and cultural backgrounds (Rogers, 2002). According to Kelly (1991), individuals view the world through such constructs that they create “and then attempt to fit over the realities of which the world is composed. The fit is not always good... [however] even a poor fit is more helpful ... than nothing at all” (p. 5).

Rather than a single theory, constructivism encompasses a number of perspectives, all of which are based upon the premise that learning is the process of constructing meaning. (Gredler, 1997; Merriam & Caffarella, 1991; Phillips, 1995). Cobb (1994) identified two variations: cognitive constructivism and social constructivism. However, differences between these two ‘flavours’ of constructivism are believed to be more a matter of emphasis rather than epistemological divergence (Bonk & Cunningham, 1998).
Cognitive constructivism draws upon the work of Piaget and focuses on an individual’s construction of knowledge through interaction with the environment (Bonk & Cunningham, 1998). Teaching from a cognitive constructivist perspective involves making learning relevant by placing students in authentic learning situations, posing problems and contradictions and when necessary, addressing misconceptions (Bonk & Cunningham, 1998).

Social constructivism is based upon the ideas of Vygotsky (1978) and views learning as connection with, and appropriation from the sociocultural context within which we are all immersed (Bonk & Cunningham, 1998). It is through social and cultural interaction that learning originates and develops (Gillani, 2003). Concepts developed at the social level then become integrated at the individual level via a process referred to as ‘internalisation’ (Vygotsky, 1978). Teaching from a social constructivist perspective involves the establishment of a collaborative culture within knowledge building communities. Learning occurs through the interaction, discussion and the sharing of ideas which supports the construction of new knowledge (Yuen & Chow, 2000).

Criticism of constructivism centres upon the consequences of student constructing their own knowledge. Richardson (1997) argued that problems would arise if student understanding was valued at the expense of the ‘right’ answers. Student knowledge could become idiosyncratic, with multiple numbers of students arriving at multiple interpretations of a concept, none of which may be appropriate (Abdal-Haqq, 1998). Assessment can also be problematic. With multiple student perspectives it becomes difficult to know what to assess. Furthermore, assessment tends to measure student learning gain rather than whether students have mastered a predetermined set of skills or understandings (Dick, 1992).

1.3.5 Comparison of behaviourist and constructivist approaches

Teaching beliefs and practices are largely shaped by the learning theory subscribed to by the educator (Vrasidas, 2000). As learning theories posit particular views of how learning occurs, the roles of teachers and students and how learning is managed will be a reflection of the particular learning theory being applied in that particular context. The epistemological differences existing between behaviourism and constructivism have already been noted, to summarise, Figure 1.3 shows how these epistemological differences are reflected in the fundamental elements of the learning environment.
### Figure 1.3 – Comparison of behaviourism and constructivism (Roblyer, 2002, p. 54)

#### 1.3.6 Identification of a learning theory to inform e-learning practice

As demonstrated in Figure 1.3, the competencies students require for effective performance in a university e-learning environment will be dependent on the particular learning theory underpinning this environment. Consequently, a choice had to be made about which of the two learning theories – behaviourism or constructivism – was the most appropriate for informing e-learning practice.

Examination of the literature showed that with respect to e-learning environments, there has been a shift in emphasis with the behaviourist view of learning being replaced by the constructivist view of learning (Bonk & Cunningham, 1998; Mayes, 2001; McCombs & Vakili, 2005; McCormack & Jones, 1998). This shift in emphasis is believed to be due in part to the increased use of technologies such as the Internet which are able to offer the type of learning opportunities that are in resonance with the learning principles espoused by constructivism (Oliver & McLoughlin, 1999). The shift towards the constructivist view was characterised, firstly, by the idea that learning is primarily developed through activity rather than guided acquisition, and, secondly, by a movement away from the individual towards a greater emphasis on social contexts (Mayes, 2001).

Earlier, two ‘flavours’ of constructivism – cognitive and social – were noted. However, out of these two, social constructivism, with its increased potential for enhanced interaction with other learners afforded by technologies such as the Internet, has emerged as the most popular ‘flavour’ of constructivism for e-learning. Social constructivism and e-learning are believed to enhance and complement one other.
Social constructivism has been able to provide e-learning with a firm pedagogical basis while e-learning has provided a suitable medium for interaction and collaboration (Bauer, Chin, & Chang, 2000).

However, is social constructivism as a theory of learning sufficient and robust enough to inform e-learning practice? The question of whether e-learning requires a new theory of learning is common in the literature (see Elliot, 2008; Mayes, 2001; Siemens, 2004b). However, Mayes (2001) argued that new technologies such as the Internet do not require new theories of learning to explain them. What is required is the development of novel forms of process and organising structures that both maintain and enhance the pedagogical principles fundamental to most forms of learning (Mayes, 2001). Evidence, based upon the literature cited above, suggests that social constructivism is sufficient for informing e-learning practice.

1.3.7 Summary

Discussion in this section identified three issues of importance to the study.

1. Learning involves a persistent change in the learner through experience and interaction with the world. These changes take place across five domains: knowledge, understanding, skills, attitudes, and behaviour (Rogers, 2002). Learning therefore is multidimensional in nature. Consequently the study would need to develop e-learning competencies that reflected this multidimensional nature.

2. Learning theories inform teaching practice of the best conditions for learning to occur. Therefore, learning theory defines the fundamental elements of the learning environment. Thus the e-learning competencies would need to be developed within the context of a particular learning environment, underpinned by a particular theory of learning (Gredler, 1997; Ormrod, 1990).

3. Social constructivism is considered to be the most appropriate learning theory to inform e-learning practice (Bauer et al., 2000). Consequently, e-learning competencies need to be developed in accordance with the principles and practices espoused by social constructivism.

The following section provides a review of the e-learning competencies identified in the literature considered relevant to the three issues highlighted above.
1.4 E-LEARNING COMPETENCIES

According to Linder, Dooley, and Murphy (2001), students must possess certain knowledge, skills, and abilities in order to complete a course of study successfully. Collectively, knowledge, skills and abilities are known as “competencies” (Lindner, Dooley, & Wingenbach, 2003). The purpose of this section is to review the literature pertaining to the competencies students require for effective performance in university e-learning environments. To ensure comprehensive coverage, commentary was broadened to the five domains identified by Rogers (2002), namely knowledge, understanding, skills, attitudes, and behaviour. For convenience all of these items were referred to under the umbrella term ‘competencies’. Chapter Two examines the concept of competencies in greater detail.

This section of the literature review has three major purposes. Firstly, to provide an overview of those competencies identified in the literature considered to be critical for effective performance in university e-learning environments. Secondly, to determine whether the decision to situate the study within the social constructivist framework was supported by the literature. Thirdly, to allow the e-learning competencies developed in the study to be situated within the broader literature framework. Information from this section was also used to help establish the content validity of the identified e-learning competencies as described later in the thesis.

As discussed in Section 1.1.2, no uniform definition exists for e-learning and as such, it has replaced or has been used synonymously with such terms as online learning, computer mediated communication, and web based learning. For the purpose of this review, the literature surveyed includes those environments for which learning was delivered predominantly or exclusively online irrespective of the terminology used. To begin this section of the review, attention is directed towards the literature focusing on the general profiles of e-learners.

1.4.1 General profiles of the e-learner

General profiles are useful as they provide a richer and more holistic picture of the competencies e-learners require rather than simply considering e-learners as a composite of isolated skills. This is important because the factors that determine student effectiveness in e-learning environments are inter-related and do not function independently (Schrum & Hong, 2002). Profiles of effective e-learners have been compiled by a number of authors.
Clarke (2004, pp. 4 - 5) created a profile using a comparison of ‘traditional’ and e-learning skills. Clarke’s comparison is reproduced in Figure 1.4. According to Clarke (2004), the two major differences between traditional and e-learning skills are the context and relative importance of the skills. What was notable in Clarke’s analysis however, was that no new skills were identified; while all were important, all were analogues of existing learning skills.

<table>
<thead>
<tr>
<th>Traditional Skills</th>
<th>e-Learning Skills</th>
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<tbody>
<tr>
<td>Acceptance of responsibility</td>
<td>Acceptance of responsibility</td>
</tr>
<tr>
<td>Planning</td>
<td>Planning</td>
</tr>
<tr>
<td>Searching skills – libraries</td>
<td>Searching skills – World Wide Web</td>
</tr>
<tr>
<td>Assessing quality – written and other physical content</td>
<td>Assessing quality – World Wide Web</td>
</tr>
<tr>
<td>Listening – to peers and teachers during presentations and discussions</td>
<td>Listening is required only occasionally e.g. when the programme is based on audio or video conferencing</td>
</tr>
<tr>
<td>Reading – mostly printed material</td>
<td>Reading is a key skill in e-learning. Most information is presented as text displayed on screen</td>
</tr>
<tr>
<td>Writing – mostly in the form of note taking or completing exercises (e.g. essays)</td>
<td>Writing (keyboard skills) – for communications, note taking and exercises</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>Self-assessment</td>
</tr>
<tr>
<td>Collaborating with others face-to-face</td>
<td>Collaborating with others through communication software (e.g. email)</td>
</tr>
<tr>
<td>Problem solving – individually or small groups</td>
<td>Problem solving – individually or with a group at a distance</td>
</tr>
</tbody>
</table>

Figure 1.4 – Comparison of traditional and e-learning skills

Schrum and Hong (2002) identified seven dimensions believed critical for e-learner effectiveness. These dimensions were derived by examining the documentation used by target institutions to screen students in regard to their suitability for online learning. Once identified, these dimensions were verified by 14 experienced e-learning educators. A summary of Schrum and Hong’s (2002, pp. 60 - 64) findings is presented in Figure 1.5.
Identified Dimensions | Comments
--- | ---
Access to tools | Experts believed student without regular access to appropriate tools tended to have difficulty in succeeding online.
Technology experience | It was considered important that students should be comfortable in using the technology.
Learning preferences | The ability for students to recognise their preferred styles and make appropriate adjustments to their learning was considered important.
Study habits in skills | It was important that students took responsibility and were able to manage their learning.
Goals and purposes | High levels of motivation and the reasons for being enrolled in the class were considered to be influencing factors.
Lifestyle factors | Factors such as: the ability to schedule study time, flexibility in scheduling, and supportive family members were considered to have an impact.
Personal traits & characteristics | Included patterns of behaviours that experts believed went beyond education-related issues.

Figure 1.5 – Dimensions identified by Schrum and Hong (2002)

One of the limitations of this study, and acknowledged by the authors, was the inclusion of personal traits and characteristics which went beyond education-related issues and may in fact be more a case of biology rather than pedagogy. Importantly, this study was based upon empirical foundations.

Birch (2002, para. 4), defined three broad sets of factors believed to influence an e-learner’s success. These were:

- management of the learning environment;
- interaction with the learning content;
- interaction with virtual learning facilitators and classmates.

Under these categories Birch included: self advocacy, self reflection, time management, self reliance, learning styles, self assessment, writing skills, social presence, openness, and the solicitation of feedback (2002).

In summary, many of the general e-learner profiles examined in the literature appeared to be simply ‘wish-lists’ of what students might need in order to be effective e-learners. Other than the study by Schrum and Hong (2002), there was no real evidence that any of the profiles had any form of solid empirical foundation. So while general profiles have the potential to provide a more holistic view of e-learners, without empirical rigour their validity and hence utility must be open to question.
1.4.2 Competencies identified in the e-learning literature

Birch’s (2002) three broad categories of e-learning competencies (see above) was used as the organising framework for this section of the review. However, this classification was modified in two ways. Firstly, items were reworded to reflect current nomenclature; hence ‘virtual learning facilitators and classmates’ was altered to read e-learning community. Secondly, ‘management of the learning environment’ was broadened to management of learning and the e-learning environment to include elements both internal and external to the student. A summary of e-learning competencies identified in the literature organised according to Birch’s (2002) modified classification is provided in Figure 1.6. Discussion of each of these competencies is provided below.

Student autonomy

Student autonomy is a common theme in the e-learning literature (Kearsley, 2000; Mayes & de Freitas, 2007; Stephenson, 2001). Learners in e-learning environments need to take greater responsibility in the management of their own learning (Mayes & de Freitas, 2007; Stephenson, 2001). This responsibility includes decisions about when and where learning should take place, identifying learning outcomes (Stephenson, 2001), and determining how these learning outcomes will be achieved (Mayes & de Freitas, 2007). With increased emphasis on learner-created content a common in e-learning environments (Stephenson, 2001), students have to make decisions such as where to source content and how it should be distributed (TESEP, 2007). Students who lack these skills are likely to perform poorly in e-learning environments (Kearsley, 2000).

Time management skills

Time management has been identified as a critical skill for e-learners (Clarke, 2004) and has been demonstrated to be a strong predictor of student effectiveness (Loomis, 2000). In e-learning environments, there are two broad issues associated with time management. Firstly, setting aside sufficient time in order to complete the course satisfactorily (Palloff & Pratt, 1999) and secondly, being able to organise this time effectively in order to achieve course objectives (Palloff & Pratt, 2003). Effective e-learners are characterised by the ability to set and prioritise goals (Clarke, 2004; Palloff & Pratt, 1999, 2003); plan study schedules (Loomis, 2000); balance work and family with study commitments (Clarke, 2004; Schrum & Hong, 2002); and avoid overload through the planning of regular breaks into schedules (Palloff & Pratt, 2003).
## Management of learning and the e-learning environment

<table>
<thead>
<tr>
<th>Item</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student autonomy</td>
<td>Chou and Liu (2005), Kearsley (2000), Polk Community College (n.d.)</td>
</tr>
<tr>
<td>Computing skills</td>
<td>Dabbagh and Bannan-Ritland (2005), Dupin-Bryant and DuCharme-Hansen (2005), Kearsley (2000)</td>
</tr>
</tbody>
</table>

## Interaction with the learning content

<table>
<thead>
<tr>
<th>Item</th>
<th>Author</th>
</tr>
</thead>
</table>

## Interaction with the e-learning community

<table>
<thead>
<tr>
<th>Item</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing skills</td>
<td>Birch (2002), Kearsley (2000), Polk Community College (n.d.)</td>
</tr>
</tbody>
</table>

Figure 1.6 – e-Learning competencies identified in the literature
Reflection

Reflection can be defined as the ability of a learner to “plan and control one’s learning processes” (Chung, Chung, & Severance, 1999, p. 238). Clarke (2004) identified three purposes of reflection:

- considering new experiences in the context of what is already known;
- fitting new knowledge into existing understanding of the content;
- analysing current experiences by comparison with previous experiences.

In an e-learning environment, students have to be able to reflect and build a bridge between what they already know and what they have learned thereby engaging and making sense of the content (Alexander & Boud, 2001). Chung, et al., (1999) found that students who engaged in reflective activities were able to construct and integrate knowledge more effectively than students who did not undertake such activities. Chen and Looi (2007) highlighted the importance of including self reflection in discussion board postings as a means of enhancing understanding through the process of writing what one was thinking. In online discussions, effective e-learners understood the importance of taking time to reflect upon the material they were learning or the ideas of their peers before composing a response (Palloff & Pratt, 2003).

However, e-learners not only need to be able to reflect upon what they have learned but also upon the decisions made and the processes employed (Hedberg, 2001). This was particularly important for collaborative activities. Therefore, reflection was considered to be critical for successful online group activities (Dabbagh & Bannan-Ritland, 2005). McLoughlin (2002) reported that for a collaborative computer programming task, members in high achieving groups made more reflective and self-monitoring comments than members in low achieving groups. The importance of reflection for group activities was also acknowledged by McConnell (2006) who believed a critical perspective on learning was provided through “reflection from one’s own learning [and] the conversations one has concerning one’s own and other students’ learning” (p. 15).

Computing skills

The computing skills of students is also attributed as a factor determining effectiveness in e-learning environments (Dupin-Bryant & DuCharme-Hansen, 2005). According to Salmon (2002, p. 12), “there is a complex interplay between the participant’s technical access and skills and the motivation to be active online”. Student computing skills have
been shown to vary greatly. Norton (2003) believed that some students “are not aware that there is more to operating a computer and working online than point-and-click behaviour” (p. 309). To ensure that students are effective in online courses it has been recommended that computer skills development take place as early as possible (Dupin-Bryant & DuCharme-Hansen, 2005). Specific computing skills identified in the literature as being important for e-learning are presented in Figure 1.7.

<table>
<thead>
<tr>
<th>Item</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic computer operation</td>
<td>Clarke (2004); Dupin-Bryant and DuCharme-Hansen, (2005); Kearsley (2000); Pallof and Pratt (2003); Polk Community College (n.d.)</td>
</tr>
<tr>
<td>Proficiency in the use of web-browsers and search engines</td>
<td>Carlson, Downs, Clark, and Repman (1999); Dabbagh and Bannan-Ritland (2005), Kearsley (2000)</td>
</tr>
<tr>
<td>Ability to use communication tools such as email, chat rooms and discussion boards</td>
<td>Barbour and Collins (2005); Kang (1998); Krentler and Willis-Flurry, (2005), Yang (2002)</td>
</tr>
<tr>
<td>Multimedia skills</td>
<td>Dabbagh and Bannan-Ritland (2005)</td>
</tr>
<tr>
<td>Ability to troubleshoot and solve technical problems</td>
<td>Clarke (2004)</td>
</tr>
</tbody>
</table>

Figure 1.7 – Computing competencies identified in the literature

**Attitudes towards computers**

Having a positive attitude towards technology has been demonstrated to shape computer use (Hiltz, 1994). Students’ attitudes towards technology in educational settings are the combined result of their total learning experience (Fong, Senkevitch, & Wolfram, 2003). Depending upon their attitudes, students can decide whether to accept, embrace, ignore or reject the technology (Fong, et al. 2003). Comfort with the technology has also been shown to contribute to a student’s psychological well-being and increase the likelihood of participation in e-learning environments (Palloff & Pratt, 1999).

**Web-based skills**

As e-learning is situated within a web-based medium, not surprisingly skills in using the World Wide Web and associated applications have been identified as factors contributing to e-learner effectiveness. Dabbagh and Bannan-Ritland (2005, pp. 41 - 42) listed a range of important web-based applications and the associated skills required to use them effectively (see Figure 1.8).
<table>
<thead>
<tr>
<th>Application</th>
<th>Related Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web-based hypermedia technologies</td>
<td>Familiarity with the use of browsers and search engines, ability to understand URL configurations, locate Web sites, navigate through hyperlinks, and evaluate Web content.</td>
</tr>
<tr>
<td>Web-based multimedia technologies</td>
<td>Ability to download and install plug-ins to view multimedia files.</td>
</tr>
<tr>
<td>Asynchronous and synchronous communication tools</td>
<td>Ability to use tools that enable asynchronous and synchronous communication and collaborative and distributed learning activities.</td>
</tr>
<tr>
<td>Web-based publishing and authoring tools</td>
<td>Familiarity with HTML editors and other Web-based publishing tools and scripting languages; Ability to upload HTML files to a designated Web site and the link the files appropriately.</td>
</tr>
<tr>
<td>Presentation and visualisation tools</td>
<td>Familiarity with media-creation tools such as PowerPoint, Adobe Photoshop, and concept mapping software; Ability to convert files created to a Web-based format.</td>
</tr>
<tr>
<td>Learning Management Systems (LMS)</td>
<td>Ability to use browsers and download files and use asynchronous and synchronous communications tools, web-based publishing tools, presentation and visualisation tools.</td>
</tr>
</tbody>
</table>

Figure 1.8 – Web-based competencies identified in the literature

In addition to the skills required to use the web-based applications, Brown (2000) introduced the concept of *bricolage*. According to Brown (2000, p. 14) bricolage:

> Relates to the concrete. It has to do with the abilities to find something – an object, tool, document, a piece of code – and use it to build something you deem important.

To be effective, e-learners need to become “digital bricoleurs” (Brown, 2000, p. 14), being able to take the resources available on the Internet and using them to create new knowledge and products. As Brown (2000, p. 20) argued:

> Key understanding is that on the Web there seldom is such thing as just a producer or just a consumer; on the Web, each of us is part consumer and part producer.

Adopting Brown’s learner-centred perspective, students move from using web-based tools as ‘knowledge consumers’ to ‘knowledge producers’ creating both new knowledge and products they value.
**Self-direction**

Dabbagh and Bannan-Ritland (2005) defined self-direction (also referred to as self-regulation) as the “skill of learning how to learn” (p. 46). For constructivist learning environments, self-direction is perceived to be a critical skill as learners are afforded greater opportunity to take control of their own learning – more so than in behaviourist learning environments (Dabbagh & Bannan-Ritland, 2005). Self-direction is important in the university context and it is common for universities to develop courses based upon the assumption that students are highly self-directed learners (Smedley, 2007).

Although much of the literature in the area of student self direction is anecdotal (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, & Liu, 2006), existing evidence suggests that students who are willing to take control of their own learning perform more strongly in e-learning environments than students who do not (Alexander & Boud, 2001; Bauer et al., 2000; Hedberg, 2001; Kearsley, 2000). Effective self-directed learners are able to identify their learning goals, and the time, effort and resources required to achieve them (Joung, 2005). Self-awareness, self-monitoring, self-initiative, self-discipline and self-evaluation have all been identified as important strategies used by self-directed learners (Cheurprakobkit, Hale, & Olson, 2002; Joung, 2005).

Two empirical studies further emphasised the importance of student self direction in e-learning environments. Firstly, McManus (2000) compared the performance of two cohorts of students, one identified as highly self-regulated and the other as less self-regulated. The two groups were each placed in two environments, one in which students had little choice in the type of activities performed or their pacing, and the second, which allowed for a greater degree of student choice. Although the results of the study showed no significant main effects or interactions, there were two near significant interactions. The first interaction, McManus believed, provided evidence that highly self-regulated students performed better in environments in which they had the opportunity to exercise choice. These students subsequently performed poorly in environments in which they were given less choice. The second interaction was that less self-regulated students performed poorly in environments in which they were given greater choice. In concluding the study, McManus concluded that more complex learner profiles needed to be examined in order to build a more accurate picture of learners in e-learning environments.
Secondly, Smedley (2007) used a modified version of the Self-Directed Learner Readiness Scale (SDLRS) to assess the level of preparedness for self-directed learning for first year nurses. Smedley’s results indicated that neither the institution nor the number of students enrolled in the course had any influence on a student’s self-directed learning abilities. However, student self-directedness was influenced by age with younger students being less ready than older students. Smedley suggested that the level of self-direction skills could be related to life experience. Smedley warned that students who did not possess an adequate level of self-directed learning skills had an increased risk of failure. These students needed to be identified and support provided to develop their skills in this area.

Learning style preference

Learning style is a learner’s characteristic style of taking in and processing information (Felder, 1996). Learning style is not necessarily a measure of the strength of the preference, but rather an indication of which preference a learner would ordinarily use (Dewar & Whittington, 2000). A number of learning style models have been presented in the literature, three of the most popular being: Kolb’s Learning Style Inventory (Kolb, 1984), Gardner’s Multiple Intelligences (Gardner, 1983), and the Myers-Briggs Type Indicator (Briggs Myers, 1998). Learning styles are considered important as a student’s learning style profile can be an indicator of success or difficulty in an academic setting (Crutsinger, Knight, & Kinley, 2005). The literature in the area of learning styles is extensive and beyond the scope of this thesis, however, a number of studies were examined that typified e-learning research in this area.

In the e-learning context, the importance of students being able to identify their preferred learning styles was identified by Birch (2002). Birch also highlighted the importance of students taking this knowledge and using it to select the most effective strategies to suit their particular learning style. However, evidence as to whether any particular learning styles are more suited to e-learning environments than others remains inconclusive (Valkenburg, Schouten, & Peter, 2005). For example, Palloff and Pratt (1999) believed students with the learning style categorised as ‘introverts’ would be more suited to e-learning environments than those classified as ‘extroverts’. Palloff and Pratt argued this was because e-learning environments could provide introverts with a greater opportunity to process information internally, as this was their preferred style. Palloff and Pratt believed that students with an ‘extrovert’ learning style would
struggle in e-learning environments. This conclusion was supported by Dewar and Whittington (2000) who found that introverts had an advantage over extroverts in e-learning environments. However, Kraut, Kiesler, Bonka, Cummings, Helgeson and Crawford (2002) showed that students with the extrovert learning style gained a greater positive benefit from use of the Internet than did introverts. Aragon, Johnson and Shalik (2000) also examined the relationship between learning style and student success and found no significant relationships. The authors concluded that students could be equally effective in e-learning environments regardless of their preferred learning style.

One explanation for the disparity in results is that learning style instruments are generally built according to a particular learning style model. For example, the highly popular instrument created by Kolb (1999) assesses an individual’s cognitive approach to processing information (Mokhtar, Majid, & Foo, 2008) but does not take into account any of the social aspects of learning (Crutsinger et al., 2005). This could have important implications especially if Kolb’s instrument was applied to e-learning contexts for which the social aspect of learning was an important dimension.

While uncertainty remains as to the influence of learning styles on e-learning, Dewer and Whittington (2000) believed the power of learning styles comes from giving students the appropriate tools and knowledge that allows them to:

- explore and identify their favoured approaches to learning;
- recognise when a particular experience was not meeting their learning style;
- take steps to adapt a situation to meet their particular learning style;
- be able to develop competence in other learning styles (p. 432).

**Interaction and collaboration**

Interaction and collaboration are key elements of e-learning environments built upon social constructivist principles (Bauer et al., 2000). Interaction can be defined as communication or dialogue that takes place between learners and instructors, learners and other learners, and users and the technology (Dabbagh & Bannan-Ritland, 2005). Collaboration is the means by which learners interact and work with each other in ways which benefit them both individually and collectively (McConnell, 2006).

Interaction is an important determinant of effectiveness in e-learning environments (Hiltz, 1994; Mayes, 2001; Pirila & Yli-Luoma, 2007). Pirila and Yli-Luoma (2007) found that learner-learner interaction had a significant relationship with student learning
outcomes. They attributed this to discussions between fellow students which led to enhanced understanding of the subject matter. Jiang and Ting (2000) identified a relationship between student learning and the quality and quantity of postings made to discussion boards. Shea, Fredericksen, Pickett, Pelz and Swan (2001) found that students who reported the highest levels of learning also reported the highest levels and quality of interaction with both instructors and other students. Students who reported the lowest level of learning were shown to have had the lowest levels of interaction.

A number of specific skills have been identified as being important for effective interaction online. Graham (2002 cited by Gabriel, 2004), listed decision-making, consensus building, dealing with conflict, basic communication skills and trust, as important skills. Furthermore, given that many of the tools provided by Learning Management Systems such as email, discussion boards and chat rooms have been designed to support interaction (Bouhnik & Marcus, 2006), the ability to use these and other tools that promote interaction is considered an essential e-learning competency (Dabbagh & Bannan-Ritland, 2005). Finally, interaction has been demonstrated to influence other factors known to have a positive impact on e-learning outcomes such as social presence (Tu & McIsaac, 2002) and self-reflection (Jonassen & Kwan, 2001).

Collaboration is also acknowledged in the literature as a critical e-learning skill (Benbunan-Fich, Hiltz, & Harasim, 2005; Birch, 2002; Hiltz, 1994). Effective collaboration requires students to move away from the idea that learning is largely a cognitive process towards one in which learning is socially based and knowledge is constructed through dialogue and negotiation with others (McConnell, 2006). Dabbagh and Bannan-Ritland (2005) identified a range of collaborative learning skills considered important for e-learning (see Figure 1.9).

Other collaborative skills identified by McConnell (2006, p. 62) included:

- the ability to develop own questions and search for solutions;
- the willingness to share ideas and resources;
- the ability understand the educational benefits of group work;
- the ability to tolerate and support multiple perspectives.
### Social learning skills
Skills that support decision making, communication, trust building, and conflict management.

### Discursive or dialogic skills
Skills that include the ability to discuss issues (discursive), share and debate ideas, negotiate meaning, be open to multiple perspectives, and have good articulation and listening skills.

### Self – and group evaluation skills
Skills that include being active and engaged in group activities, doing a fair share of work, helping other group members to demonstrate competence and learning achievement (promote interaction).

### Reflection skills
Skills that include the ability to apply frequent and substantive consideration and assessment of not only an individual’s personal learning process and product but also the groups.

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**Figure 1.9 – Collaborative learning skills** (Dabbagh & Bannan-Ritland, 2005, p. 45)

To summarise, interaction and collaboration are significant skills in e-learning environments built upon social constructivist principles in which knowledge is considered to be situated in the practices of communities and group processes. Consequently, learning outcomes are contingent upon the ability of individuals to effectively participate in such practices and processes (Mayes & de Freitas, 2007).

**Identity and social presence**

According to Wenger (1998), issues of identity are “integral aspects of a social theory of learning” (p. 145). The formation of identity is believed to be as critical in e-learning environments as the construction of knowledge (Mayes, 2001). Identity is continually being transformed or “renegotiated” (Wenger, 1998, p. 154), and serves as the pivot between the social and the individual. Critically, identity has been shown to be a major determinant of an individual’s decision whether or not to interact with others (Wenger, 1998). Students need to be able to establish a sense of identity online in order to build supporting and trusting relationships with other learners (Hewson & Hughes, 2005).

Closely associated with identity is social presence. Social presence can be defined as the degree of feeling, perception and reaction to another in an e-learning environment (Tu & McIsaac, 2002). In other words, social presence is the degree to which a person seems ‘real’ online (Gunawardena, 1995). Social presence has been shown to have positive effects on the degree of interaction and collaboration online (Gunawardena, 1995; McConnell, 2006; Tu, 2002; Tu & McIsaac, 2002). Social presence is closely related to identity and studies show students who were better able at projecting their identities online generally had a stronger social presence (Freeman & Bamford, 2004; Tu, 2002).
In face-to-face environments, factors shown to contribute to social presence included facial expressions, dress, posture and non-verbal cues (Tu & McIsaac, 2002). However, in e-learning environments as visual cues are missing it can be difficult for students to perceive other students online as real people or their subsequent interactions as constituting real relationships (Kang, 2006). Effective e-learners have the ability to express non-verbal cues in written form (Gunawardena, 1995). Consequently, they are better able to relate to others in e-learning environments and conversely, have others relate to them (Gunawardena, 1995). Factors shown to influence an individual’s degree of social presence are timely responses to messages (Tu & McIsaac, 2002), friendly, open writing styles, and personal, and a willingness to reveal information about themselves (Hewson & Hughes, 2005).

Communication skills

One of the most critical communication skills for e-learners is having the willingness to make the effort to initiate and maintain communication with others despite the psychological barriers of distance (Edwards, 2003) and absence of physical and non-verbal expression inherent in e-learning environments (Kang, 2006). A number of important social communication skills have already been discussed in the sections on identity and social presence. Other communication skills identified in the literature as important are presented in Figure 1.10.

Active listening skills
Through the anticipation, clarification, reiterating and summarising the ideas of others (Birch, 2002).

Collaborative skills
Communication skills that promote collaborative learning by initiating dialogue and discussion, seeking information from others in the group, giving information to others in the group, seeking consensus, describing one’s own feelings, and observing others (McConnell, 2006, p. 100).

Social skills
Communication skills that develop an online personality including the ability to: create an internal sense of privacy, be able to deal with emotional issues in textual form, to personalise communications and to appreciate the limits and boundaries of communicating online (Pallof & Pratt, 2003, p. 10).

Paralanguage
Through the use of emoticons and articons (for example, 😊), acronyms (for example, LOL) and intentional misspellings (for example, I was sooooooo happy), to convey feelings and emotions or remove ambiguity from text-based communication (Tu & McIsaac, 2002).

Writing skills
Writing skills are considered to be important for e-learning particularly in the context of group interaction where much of the communication is in written form (Kearsley,
Due to the importance of the written word in e-learning environments, participants are likely to be judged by the quality of their writing. Therefore e-learners need to be comfortable in expressing themselves in writing (Polk Community College, n.d.). Student writing needs to be clear, concise and free from factual and grammatical errors (Birch, 2002).

Writing skills are also important in helping to develop social presence with effective e-learners being able to express non-verbal cues in written form (Gunawardena, 1995). Writing skills help build relationships with members of the learning community and is a means of developing a personality through the written word (Birch, 2002).

Use of feedback

Feedback is widely recognised as being a critical element of effective learning (Blayney, 2007). However, in the e-learning context, Birch (2002) noted that feedback might not always be readily available. This was due in part to two reasons: firstly, the lack of physical presence of the instructor and secondly, the lack of visual cues such as body language and other informal sources of feedback (Birch, 2002). Effective e-learners have to know how to solicit timely and consistent feedback from teaching staff and other students (Birch, 2002). Knowledge of the type of feedback required, its preferred form (Blayney, 2007; Mayer, Fennell, Farmer, & Campbell, 2004), and the ability to relate feedback to personal goals and learning outcomes (Birch, 2002) were also considered to be important.

1.4.3 Summary

Effective performance in e-learning environments requires proficiency in a range of areas. Broadly categorised these are thinking skills, learning strategies, social skills, organisational skills, technical ability, and communication skills. Less tangible, yet equally important, are factors such as identity and social presence. However despite the work that has been done in the area of e-learning competencies, research has yet to converge on a typical or standardised profile of the e-learner (Dabbagh & Bannan-Ritland, 2005). This conclusion is supported by this literature review which has demonstrated that empirically based research on e-learning competencies – particularly that of a holistic and integrated fashion – to be rare.

The literature review has also shown that little is known about how various e-learning competencies inter-relate. While there have been a number of comparative studies with regard to particular competencies (e.g., Aragon et al., 2000; Dewar & Whittington, 2000;
Kraut et al., 2002; McLoughlin, 2002), two questions relating to the e-learning competencies appear yet to be explored. Namely:

- Are all of the e-learning competencies of equal importance or are some more important than others?
- What are the relative difficulty levels of these e-learning competencies?

Furthermore, information that could be of practical significance such as student preparedness with respect to e-learning in general and e-learning competencies in particular, also appears not to have been previously reported upon in the literature.

1.5 CONCLUSION

The literature review presented in this chapter was undertaken to achieve three main objectives. Firstly, to derive a definition of e-learning for use in the study. The review found definitions of e-learning to be problematic and showed that it was common practice for e-learning to be defined in terms of the context within which it was being delivered. Thus, for the purpose of the study, e-learning was defined as learning mediated by a Learning Management System. This was considered an appropriate decision as Learning Management Systems are the primary means by which e-learning is delivered in the university sector (Coates et al., 2005; Siemens, 2006). However, despite the popularity of these systems, little research appears to have been done with regard to learners and the learning taking place within Learning Management Systems (Coates et al., 2005; OECD, 2005).

Secondly, as Learning Management Systems do not create learning of themselves, it was necessary to situate the study within the broader theoretical framework of learning. The two most commonly applied learning theories for the use of technology in educational contexts, behaviourism and constructivism, were reviewed to determine which would be the more suitable theory to underpin the study. Evidence from the literature indicated that social constructivism was the most appropriate learning theory to inform e-learning practice. Consequently, the e-learning competencies identified by the current study were done so in accordance with social constructivist principles and practices.

Thirdly, to review the literature relating to e-learning competencies to determine the current state of knowledge in this area. The review found empirically based research into e-learning competencies to be rare. Thus, the conclusion was made that an empirically based study identifying the competencies required for effective
performance in a university e-learning environment was justified and would add to the knowledge-base in this field of inquiry.

The next challenge was to find a method capable of identifying e-learning competencies in a valid and empirically robust way. The next chapter expands upon the concept of competencies and describes two processes, the Behaviourally Anchored Rating Scale (BARS) and Hybrid BARS, which have both been shown to be valid and reliable methods of identifying competencies in a given context.
Chapter One highlighted an under representation of empirically based studies identifying the competencies required for effective performance in university e-learning environments. The purpose of this chapter is to expand upon the concept of competencies and to discuss two methods used to identify competencies for effective performance in a given context.

The chapter is divided into six sections. The first section operationally defines competencies for use in the current study. The second section examines a method to identify competencies known as the Behavioural Anchored Rating Scale (BARS). The third section discusses the more recent BARS variant known as Hybrid BARS. The fourth section provides an overview of the first three sections of the chapter. The fifth section discusses the implications for the study of the issues raised in Chapter One and Chapter Two of the thesis. The sixth section presents the Research Questions developed for the study in response to these issues and implications.

2.1 THE NATURE OF COMPETENCIES

To ensure as comprehensive coverage as possible, the concept of competencies used in the study included the five domains identified by Rogers (2002): knowledge, understanding, skills, attitudes, and behaviour (see Section 1.4). The purpose of this section is to explore the concept of competencies in greater detail and to provide an appropriate definition of competencies for use in the study.

2.1.1 Defining competencies

The term ‘competency’ is a multifaceted concept that has been defined in the literature from a variety of points of view (Hoffmann, 1999). Having had application in a variety of areas including Education, Psychology, Management Theory, and Human Resource Management (Hoffmann, 1999), there is no precise or widely accepted definition for the term (de la Teja & Spannaus, 2008; Jubb & Robotham, 1997). According to Hoffmann (1999), those who have used the concept of ‘competency’ (or its plural ‘competencies’) have simply defined it in the manner that best suits the focus of their...
Competencies and their Identification

work. To further confound attempts at definition, the term competencies has often been used interchangeably, and incorrectly, with competences. The differences in defining these concepts are more than simply a matter of semantics. Competencies are considered to be behaviours an individual needs to demonstrate while competences are these behaviours expressed as minimum standards of performance (Strebler, Robinson, & Heron, 1997). The focus of the current study was on ‘competencies’.

Hoffmann (1999, p. 276) identified three main positions taken in the literature with respect to definitions of competencies:

- observable performance;
- the standard or quality of the outcome of the person’s performance;
- the underlying attributes of a person.

According to Hoffmann, the first two definitions deal with outputs. The first specifically deals with observable outputs of the learning process. In this instance, the focus is on determining whether a person’s performance could be considered competent in relation to some written standard. The second definition also deals with outputs, but considers competency as a standard or quality of outcome for example, defining a minimum level of performance or a higher level of performance as a means of attempting to raise outputs. The third definition deals with inputs, in particular the underlying attributes of a person such as “their knowledge, skills or abilities” (Hoffmann, 1999, p. 276). Hoffmann argued the value of focusing on the inputs (e.g., knowledge, skills and abilities) required to produce competent performances because such an approach, “seeks to discover not what a person can do, but what they need to know, or what skills or other attributes they need in order to perform at a competent level” (p. 279).

Parry (1998) acknowledged that when developing competencies, it was important to distinguish between competencies, traits and characteristics. According to Parry, traits and characteristics are personality descriptors typically formed early in life or inherited. Examples include “initiative”, “self-esteem” and “decisiveness” (Parry, 1998, p. 60). Traits and characteristics resist change and are difficult to develop and measure (Cocanougher & Ivancevich, 1978; Parry, 1998). Competencies, however, are clusters of related knowledge, skills and abilities that correlate with effective performance in the task or role at hand. Competencies are measurable and can be developed and improved (Parry, 1998). Clusters of related competencies are referred to as ‘dimensions’ (Grussing, Silzer, & Cyrs, 1979) or ‘performance dimensions’ (Dickson,
In operational terms, performance dimensions could be considered as broad classes of duties, responsibilities or activities required for a particular task or role (Schneier & Beatty, 1979).

### 2.1.2 Inclusion of values and attitudes

There is the view that considering competencies solely in terms of knowledge, skills and abilities, such as described by Hoffmann (1999), is insufficient. Hager and Beckett (1995) argued that it would be difficult to imagine any task or role where values and attitudes are not important. According to Hager and Beckett (1995, p. 2), “competency standards that omit to incorporate attributes such as knowledge, skills, attitudes, values, etc. are akin to a zoo without animals”.

Hager and Beckett (1995) argued for the adoption of an integrated approach to competencies. In such an approach, attributes such as values and attitudes are considered as essential as knowledge, skills and abilities. This integrated approach has been successful in capturing both key performances and the combinations of attributes underlying these key performances in roles as diverse as architects, lawyers and youth workers (Chappell & Hager, 1994).

Critics of this integrated approach believe that elements such as values and attitudes are difficult to measure. However, according to Hager and Beckett (1995), such notions are demonstrative of the mindset that competency standards must be inherently atomistic and reduced to behaviours to be observed and boxes to be checked. Such thinking has led to the view that competencies should be restricted to the assessment of knowledge and skills (Chappell & Hager, 1994; Hager & Beckett, 1995). However, Hager and Beckett (1995) contend that values and attitudes can be readily developed into performance criteria and are not difficult to assess in real, holistic work contexts. Problems only arise when attempts are made to measure such attributes as values and attitudes in the abstract (Chappell & Hager, 1994).

### 2.1.3 Summary

As the focus of the study was on inputs – in particular what students needed to know and what skills and other attributes they needed to have to be effective in a university e-learning environment – the study adopted a view of competency that focused upon the underlying attributes of students. As Hoffmann (1999) argued, using a definition of competency that best suits the needs of the research is not without precedent and is
typical of competency-based studies today. However, as indicated in Chapter One (see Section 1.4.1), learning is multidimensional in nature. Therefore, any e-learning competencies identified by a valid study would need to reflect this multidimensional nature. Thus, it was necessary to define the scope of the competencies to be developed in the study in as broad as terms as possible. Consequently, the integrated approach to competencies, as discussed by Hager and Beckett (1995), was used in the study. Rogers’ (2002) five domains of learning – knowledge, understanding, skills, attitudes and behaviour – were adopted as the underlying attributes for defining the scope of the e-learning competencies to be developed. Thus, for the purpose of the study, e-learning competencies were defined as:

*Observable or measurable clusters of related knowledge, understandings, skills, attitudes and behaviours considered necessary for effective performance in an e-learning environment.*

The next step was to find an appropriate method for the identification of the e-learning competencies. Two methods shown to have been successful in identifying competencies in previous studies are the Behaviourally Anchored Rating Scale (BARS) and a newer variant, Hybrid BARS. Both are discussed next.

### 2.2 THE BEHAVIOURALLY ANCHORED RATING SCALE

This section provides discussion of the Behaviourally Anchored Rating Scale (BARS) and is divided into six parts. The first part provides an overview of the BARS process. The second part describes the procedure for developing BARS. The third part examines a number of modifications made to BARS since it was first introduced. The fourth part discusses the advantages of BARS over other rating scales. The fifth part examines two issues associated with the use and application of BARS that were of relevance to the study. The final part provides a summary of the section.

#### 2.2.1 BARS overview

The Behaviourally Anchored Rating Scale (BARS) is a rating scale instrument (Dickson, 2000) used for the identification and measurement of the critical components that constitute effective performance in a role or occupation (Jessup & Webb, 1994; Moore, Webb, & Dickson, 1997). Originally introduced by Smith and Kendall (1963) to rate the performance of staff nurses, BARS has been used in the development of performance criteria in roles and occupations as diverse as: police officers (Bradley & Pursley, 1987;

BARS has also been used in educational contexts in the development of performance criteria for university teaching (Conway & Ellison, 1995; Harari & Zedeck, 1973; Hom, DeNisi, Kinicki, & Bannister, 1982), administrative duties of school principals (Duignan, 1982) and classroom management and discipline (Jessup & Webb, 1994). However, the application of BARS in the development of performance criteria for students in general appears to be rare. With regard to e-learning, no studies were identified which had made use of the BARS process.

BARS has the capacity to “capture performance in multidimensional, behaviour specific terms” (Anshel & Webb, 1991, p. 32). As a consequence, scale items are considered to be more interpretable than those found in traditional rating instruments (Hom et al., 1982). Of particular significance for the current study, is the ability of BARS to provide descriptions of what constitutes excellent quality work (Jacobs, Kafry, & Zedeck, 1980). An example of a Behaviourally Anchored Rating Scale is provided in Figure 2.1.

<table>
<thead>
<tr>
<th>Point on BARS</th>
<th>Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The field instructor could be expected never to provide any specific reasons for criticism, just stated student not making the grade.</td>
</tr>
<tr>
<td>2</td>
<td>The field instructor could be expected to reprimand the student on misspelling a word, never commenting on the content.</td>
</tr>
<tr>
<td>3</td>
<td>The field instructor could be expected to provide written feedback but never go over comments orally with the student.</td>
</tr>
<tr>
<td>4</td>
<td>The field instructor could be expected to agree with the student’s assessment of a case.</td>
</tr>
<tr>
<td>5</td>
<td>The field instructor could be expected to tell the student he or she was efficient and the field instructor was impressed with the student’s work.</td>
</tr>
<tr>
<td>6</td>
<td>The field instructor could be expected to affirm the student’s ability as a counsellor.</td>
</tr>
<tr>
<td>7</td>
<td>The field instructor could be expected to provide specific and corrective feedback.</td>
</tr>
</tbody>
</table>

Figure 2.1 – Example of a BARS to assess the effectiveness with which social work field instructors instruct their students (Conway & Ellison, 1995, p. 112)
BARS defines points along its scale in behavioural terms (Hom et al., 1982) which are stated clearly and unambiguously using real world examples based upon the task or role being examined (Grussing et al., 1979). These behavioural examples are developed by individuals knowledgeable of the field under review and written in the language of the role being evaluated (Conway & Ellison, 1995). Once identified, the behavioural examples are used as anchors, defining levels of performance for each of the dimensions being rated (Smith & Kendall, 1963). The use of behavioural anchors is in contrast to typical rating instruments which rate along multipoint rating scales. One of the prime motivations behind the development of BARS has been to develop a reliable and valid rating system. According to Smith and Kendall (1963), most rating errors are not deliberate and better ratings can be obtained by providing raters with questions they can answer which are free from misinterpretation and based upon behaviours they can observe. Following is a description of the procedure used to develop BARS as first described by Smith and Kendall (1963).

2.2.2 Development of BARS

The original procedure described by Smith and Kendall (1963) consisted of five stages.

1. Identification of performance dimensions. Performance dimensions represented major components of performance for the role or task under investigation (Campbell et al., 1973). These were identified and defined by participants knowledgeable of the role being examined and retained the terminology of the participants who defined these dimensions (Smith & Kendall, 1963).

2. Generation of behavioural statements. The same individuals who defined the performance dimensions were then asked to describe specific behaviours representing effective and ineffective performance for each performance dimension. Consensus is achieved through the clarification, expansion and modification of the perceptions of participants (Cyrs, 1979).

3. Retranslation. A second group of participants – also knowledgeable of the task or role under investigation – was provided with the performance dimensions and the randomly ordered behavioural statements. Participants were asked to reallocate each statement into the performance dimension that it best described. Statements would be retained for possible inclusion in the final instrument if a certain percentage (60%) of the second group placed a particular behavioural
statement into the same performance dimension to which it had been placed originally (Smith & Kendall, 1963).

4. **Development of numerical scales.** Behavioural statements that were retained from the retranslation stage were then rated on a seven point scale as to how effectively or ineffectively they represented performance on the appropriate dimension. (Smith & Kendall, 1963). The average rating each behavioural statement received represented the degree to which it represented effective or ineffective performance for that particular dimension. The standard deviation of the ratings for each statement represented the level of agreement between raters on the effectiveness level the statement represented (Schwab, Heneman, & DeCotiis, 1975). Statements that had large standard deviations meant there was less agreement among raters (Maiorca, 1997). Behavioural statements with standard deviations of > 1.50 were discarded (Smith & Kendall, 1963).

5. **Final Instrument.** The behavioural statements that remained after the retranslation and scaling stages were used as behavioural anchors defining a particular level of effectiveness for the relevant performance dimension. These anchors were placed on a vertical scale corresponding to the whole number value of their previously calculated average rating (Schneier & Beatty, 1979).

2.2.3 Modifications to the development of BARS

Since Smith and Kendall’s (1963) inception of BARS, a number of modifications have been made. By far the greatest change was the creation of a variant referred to as ‘Hybrid BARS’ which is discussed later in this chapter. Although Hybrid BARS was the method used in the current study, it is important to review changes to Smith and Kendall’s original BARS procedure as these have impacted on the development of the Hybrid BARS variant. Three major changes made to BARS are discussed below.

**Reversal of performance dimension and behavioural statement development stages**

In later applications of BARS the order of the first two steps, identification of performance dimensions and generation of behavioural statements, was reversed (see Campbell et al., 1973; Conway & Ellison, 1995; Maiorca, 1997; Pecora & Hunter, 1988). The motivation for this was evidence which suggested that this modification was a more effective means of keeping participants focused on specific behaviours rather than traits or global performance dimensions (Campbell et al., 1973; Schneier & Beatty, 1979). Since then, there has been discussion as to the extent this change has been
responsible for problems associated with the independence of performance dimensions developed in this manner (Dickson, 2000).

**Differing criterion values used to develop BARS**

Subsequent implementations of the BARS process have included a range of differing criterion values at various stages of the development process. For example, in the retranslation stage, although Smith and Kendall (1963) used a percentage-agreement value of 60% or greater for retention of behavioural statements, later studies used values ranging from 50% - 90% (e.g., Bradley & Pursley, 1987; Conway & Ellison, 1995; Harari & Zedeck, 1973; Hom et al., 1982). In the scaling phase, Smith and Kendall (1963) retained behavioural statements with standard deviations up to 1.5 on a seven point scale while Campbell et al., (1973) retained behavioural statements with standard deviations up to 1.75 on a nine point scale. With regard to the differences in percentage-agreement criterion for the retranslation phase Bernardin, LaShells, Smith, and Alvares (1976) found no significant difference between scales developed using 50–60% agreement or 80% and above agreement.

**Changes in the number of participants used to create the scales**

Smith and Kendall’s (1963) original intention was of BARS being an iterative process with each successive stage of the development process being performed by a different set of participants. However, subsequent implementations of BARS have reduced the number of participants involved in the development process. For example, Campbell et al. (1973) used the same participants in the retranslation and development of numerical stages. After examination of the impact of such a change, Bernardin et al. (1976) found that scales developed using different participants in each stage of the scale development although requiring more time and personnel, did result in more stable items within a scale.

**2.2.4 Advantages of Behaviourally Anchored Rating Scales**

The BARS process has been described as “an effective means of constructing highly reliable and relevant performance criteria” (Dickinson & Tice, 1977, p. 217). According to Schwab et al. (1975), the strength of BARS comes as a result of its rigorous developmental procedures and the high level of participation by individuals knowledgeable of the role under investigation. Such participation has been proposed to bring with it a number of advantages. These advantages are explored below.
As BARS items are based in behavioural terms and described in the language of the role or task under review, they are believed to reduce ambiguity in descriptions of job performance (Schneier & Beatty, 1979). BARS has also been demonstrated to be able to address aspects of performance not normally identified by more traditional means (Pounder, 2000). This is achieved by using appropriate organisational personnel to consider in detail the components of performance for the task in question thereby allowing them to tell their own story (Duignan, 1982). Once identified, behavioural anchors can become behavioural goals which can be used to improve performance by explicitly identifying and describing what constitutes effective performance (Schneier & Beatty, 1979). These goals can also be used as the basis for training and development programs (Blood, 1974).

Factors such as those described above have been used to argue the case that BARS has increased validity and reliability over other rating scales (Conway & Ellison, 1995; Fogli, Hulin, & Blood, 1971). Validity can be considered as the extent to which a scale or measure accurately represents the concept of interest (Hair, Anderson, Tatham, & Black, 1998), while reliability refers to the consistency of the measure of a concept (Bryman, 2008). While research has not proven conclusively that BARS are superior to other scale formats with regard to validity and reliability (Dickson, 2000), there is consensus that BARS is useful in developing scales especially relevant to the performance being studied (Pounder, 2000).

2.2.5 Critique of the Behaviourally Anchored Rating Scale

BARS has not been without its critics. Concerns have arisen over the use of BARS, including the independence of performance dimensions and the time required to develop the scales.

*Independence of performance dimensions*

As discussed previously, the BARS process is characterised by the generation of performance dimensions of effective job performance and behavioural examples illustrative of these dimensions (Smith & Kendall, 1963). Performance dimensions should be conceptually distinct as the behavioural examples used to define them are described clearly and should only specify the one dimension (Dickinson & Tice, 1977). In fact, one of the major goals of the BARS process was the creation of such relatively independent scales measuring performance (Smith & Kendall, 1963). Schwab et al. (1975) believed that failure to obtain independence suggests that scales might be
Competencies and their Identification

redundant and hence fail to provide performance information which is unique. However, although the performance dimensions and their behavioural examples are developed to be conceptually distinct (Harari & Zedeck, 1973), there is no guarantee that the dimensions are independent, or in other words, have discriminant validity (Dickinson & Tice, 1977). Items which display high discriminant validity have low inter-correlations between them (Cohen, Manion, & Morrison, 2000). Several studies using the BARS process have shown this to be the case with dimensions generated that exhibit only low to moderate levels of discriminate validity (Dickinson & Tice, 1973, 1977; Zedeck & Baker, 1972). One possible explanation for this lack of independence is that behaviours and outcomes can be difficult to separate. Conway and Ellison (1995) found when developing BARS for field instructors, described behaviours were being confused with the outcome of that particular behaviour. Consequently, “developing categories or dimensions to include both meant a struggle to maintain mutually exclusive categories” (Conway & Ellison, 1995, p. 117).

According to Landy (1985), the lack of independence of the performance dimensions occurs because it is unrealistic to expect there to be no intercorrelations between performance dimensions due to an effect referred to as ‘true halo’. As Landy argued:

Most definitions of a job assume that the task performed in that job are homogeneous or similar in some respect. As an example, police officers are charged with preserving public good and enforcing a body of law. All of their assigned duties are directed towards these ends... Since this homogeneity exists, it is likely that there is a natural correlation between dimensions of performance that can be used to describe the behaviour of people who hold that particular job. This is a case of what has become to be known as ‘true’ halo. (1985, pp. 199 - 200)

Attempts to demonstrate the conceptual independence of scales through empirical methods have proven to be largely unsuccessful. For example, Dickson (2000) used factor analysis and Rasch analysis to demonstrate that performance dimensions developed in this manner were not unique and that alternate groupings of the competences were possible.

Jacobs et al. (1980) came to the conclusion that although the development of BARS ensured the generation of conceptually distinct dimensions in theory, in practice, performance among dimensions could in fact be correlated. If such is the case then the expectation for there to be total independence between performance dimensions is
unrealistic (Schwab et al., 1975). Significantly, the issue of performance dimension independence appears to remain unresolved in the literature (Dickson, 2000).

**Time required to develop the scales**

Perhaps the greatest criticism of the BARS process is that scales can be costly and time consuming to produce (Green, Sauser, Fagg, & Champion, 1981). This is particularly the case for scales developed for use in large and diverse organisations (Landy et al., 1976). BARS can require large amounts of time to assemble the appropriate staff and have them work through the stages required to develop the scale (Cocanougher & Ivancevich, 1978). Conway and Ellison (1995) concluded that the BARS process was too time consuming and difficult to be considered practical for their use in the development of a scale for rating college field instructors. Several studies however, have shown that it is possible to reduce the time taken to produce scales with little sacrifice to psychometric properties such as validity and reliability. For example, in the generation of a BARS for the evaluation of teacher performance, Green et al. (1981) used the same set of participants in the generation of behavioural statements and the development of the numerical scales, thereby reducing the time required to develop the scale. In weighing up the advantages of BARS in general with the time needed to develop the scales, Schneier and Beatty (1979) concluded that “BARS seems to be worth the effort” (p. 67).

**2.2.6 Summary**

It has yet to be proven conclusively that scales created using the BARS process are superior to other scale formats (Pounder, 2000). However, the qualitative attributes of BARS, namely its ability to create scales of particular relevance of the task or role under review, have been well documented in the literature (Jacobs et al., 1980; Pounder, 2000). The ability of BARS to capture performance in multidimensional, behaviour specific terms (Anshel & Webb, 1991) made BARS an attractive methodology for the current study. However, two issues still remained unresolved. Firstly, the BARS process identified levels of behaviour from ineffective to effective performance, however the purpose of the study was to identify e-learning competencies essential only for effective performance. Secondly, the amount of time and personnel required for the construction of BARS would have made it difficult to attract participants for the study. Consequently, a newer variant of BARS known as ‘Hybrid BARS’, which addressed both these issues, was also considered. Hybrid BARS is discussed next.
2.3 HYBRID BARS

This section explores a newer variant of BARS ultimately referred to as ‘Hybrid BARS’ (Dickson, 2000). For the purpose of clarity the term ‘original BARS’ will refer to the BARS described by Smith and Kendall (1963) to distinguish it from ‘Hybrid BARS’. In this respect, the study follows the nomenclature used by Dickson (2000).

2.3.1 Hybrid BARS overview

The 1980s saw the emergence of a modified version of BARS referred to as ‘Hybrid BARS’ (Dickson, 2000). Whereas the original BARS approach provided descriptions ranging from effective to ineffective performance for the major elements of the task in question, Hybrid BARS only identified elements of effective performance. Consequently, all listed behaviours in a Hybrid BARS were considered to be of equal value (Anshel, 1995).

Hybrid BARS has been used in a variety of areas such as sports refereeing (Anshel, 1995; Anshel & Webb, 1991; Dickson, 2000), football coaching (Anshel et al., 1987), primary school teaching (Moore & Webb, 1995) and classroom management and discipline (Jessup & Webb, 1994). As with original BARS, no studies were found that had used the Hybrid BARS process to identify e-learning competencies. An example of a Hybrid BARS for effective basketball refereeing is presented below in Figure 2.2.

1. Demonstrates mastery of the rules
   1.1 Applies rules quickly after and infraction.
   1.2 Give consistent interpretations of violations.
   1.3 Give consistent interpretation for fouls.

2. Displays effective communication skills on the court
   2.1 Projects voice at a proper volume.
   2.2 Does not belittle or embarrass players, coaches or peers.
   2.3 Does not use profanity.
   2.4 Does not use sarcasm.
   2.5 Relates to players, coaches and colleagues in a clear, concise, and positive manner.
   2.6 Has a sense of humour at appropriate times.

3. Demonstrates effective nonverbal communication skills on the court
   3.1 Demonstrates proper signalling.
   3.2 Creates and maintains a pleasant atmosphere.
   3.3 Demonstrates proper body language.

Figure 2.2 – Extract of a Hybrid BARS for effective basketball refereeing (Anshel, 1995)
As shown by Figure 2.2, Hybrid BARS incorporates several features of original BARS. Most obvious is the inclusion of performance dimensions (in bold text) representing major components of performance for the role or task under investigation. Behavioural anchors are also included but in the Hybrid BARS literature these are typically referred to as ‘competencies’ (Dickson, 2000) although in some studies (e.g., Anshel, Housner, & Cyrs, 1987) they have been referred to as ‘descriptors’. What distinguishes Hybrid BARS from original BARS is that the competencies identified are all of equal weighting and considered necessary for effective performance. This is in contrast to original BARS which has a continuum of behaviours from ineffective to effective performance (Anshel, 1995).

Hybrid BARS was developed largely to address two limitations of the original BARS process. Firstly, Smith and Kendall’s (1963) intention of BARS being an iterative process with successive stages being performed by a different set of participants meant it was time consuming and costly to develop. Hybrid BARS is quicker and simpler to implement than its predecessor because it has fewer iterations and focuses only on elements of effective performance.

Secondly, changing notions of competence have led to the view that competencies are not simply observable behaviours but rather a complex interplay of factors including knowledge, skills, thoughts, strategies and abilities (Anshel, 1995; Hager & Beckett, 1995). The emphasis on observable behaviours by the original BARS approach meant these elements of performance could be overlooked or discarded in the process of scale development (Hager & Beckett, 1995). Hybrid BARS, while still having a behavioural foundation, is better able to incorporate integrated notions of competence than its predecessor (Dickson, 2000).

### 2.3.2 Development of Hybrid BARS

Similar to the original process as described by Smith and Kendall (1963), Hybrid BARS consists of five sequential and distinct stages. These stages have been designed to ensure the identification of competencies and performance dimensions in a rigorous and robust way (Anshel, 1995; Dickson, 2000). These five stages are implemented in two distinct phases (Anshel, 1995):

- Construction Phase – consisting of Stages 1 through to 4;
- External Validation Phase – consisting of Stage 5.

The five stages of the Hybrid BARS process are described next.
Stage 1: Selection and formation of expert panels

Central to the Hybrid BARS process is the use of panels of domain-related experts in the generation of the competencies for the role in question. These ‘experts’ are selected on the basis of their knowledge, familiarity, expertise and previous experience of the role being examined. Typically two expert panels reflecting both a diversity and continuity of expertise in membership are formed. The composition of the expert panels is a critical factor in ensuring the content validity of the competencies being developed (Jessup & Webb, 1994). It is important that panels formed represent a good cross section of participants in the field being studied.

Stage 2: Generation of profession specific competencies by these panels

The panel process brings together these domain-related experts for a one day workshop. Panel members follow a number of clearly defined steps to develop a list of performance dimensions and competencies considered essential for effective performance in the role being examined. Each panel begins by identifying a range of words or phrases believed to be indicative of effective performance for the role under review (Anshel et al., 1987). For example, for the role of basketball referees, one such phrase was “explain a call” (Anshel, 1995, p. 14). Next, panel members organise descriptive words and phrases into what they perceive to be homogeneous categories (Moore & Webb, 1995). These categories are analogous to the performance dimensions of the original BARS methodology of Smith and Kendall (1963). Once organised into performance dimensions, each descriptive word and phrase is rewritten as a specific competency. In other words, “an action, behaviour or trait that is observable or measurable” (Dickson, 2000, p. 52).

Stage 3: Amalgamation of lists by researcher

The list of performance dimensions and competencies generated by each panel are amalgamated into a single document (Jessup & Webb, 1994). During this review and editing stage duplicate phrases are combined, unclear statements are clarified and unnecessary statements are deleted (Cyrs, Dobbert, & Grussing, 1976). The purpose of this stage is not to change the intent of the statements but rather to provide consistency in both language and format.

Stage 4: Verification of amalgamated list by panel members

The amalgamated list is sent to individual panel members for verification where they are given the opportunity to accept, reject or modify each of the performance
dimensions and associated competencies (Anshel & Webb, 1991). The final product is a list of performance dimensions and competencies panel members perceive to be necessary for effective performance in the role under review. In his study of the competencies required for basketball refereeing, Anshel (1995), referred to this list as the “BARS-BR” with ‘BR’ referring to basketball referees. This terminology was not adopted by later studies using Hybrid BARS process (e.g., Dickson, 2000; Moore & Webb, 1995), however considering Anshel (1995) used BARS-BR as shorthand for “competencies and behavioural examples (anchors) of effective performance for basketball referees” (p. 12), this nomenclature did have an attractive economy. Completion of Stage 4 concluded the Construction Phase of the Hybrid BARS process.

Stage 5: External validation of performance dimensions

Stage 5 represents the beginning of the external validation phase. The list generated by the first four stages of the Hybrid BARS process is externally validated by surveying a broad cross section of stakeholders of the role being examined. This group is asked to rate the importance of each performance dimension on a five point Likert scale. Items which meet with a 90% or greater agreement with regard to importance are considered to be validated. (Anshel & Webb, 1991).

Using the external validation stage to address additional issues with the scale

A number of studies have used the external validation phase to collect additional data of relevance to the developed scale. Jessup and Webb (1994), in a study of teacher classroom management and discipline, asked stakeholders to assess the relative difficulty of each identified item on their scale; and Dickson (2000), in a study of soccer referees, asked stakeholders to report on preparedness and improvement priorities of items on the scale. In this study, Dickson also made use of Rasch analysis and detailed parametric techniques, both of which had not been used previously in Hybrid BARS studies.

2.3.3 Critique of Hybrid BARS

As discussed in Section 2.3.1, the Hybrid BARS methodology was developed in response to limitations of the original BARS process. These being:

- the time and number of personnel required to develop the scale;
- the ability to incorporate integrated notions of competence.
In addressing these limitations Hybrid BARS has been shown to be successful. For instance, with regard to the time and personnel required to develop a scale using the Hybrid BARS process typically two expert panels of between six to ten participants can complete the process in a one day workshop (see Anshel, 1995; Anshel & Webb, 1991; Dickson, 2000; Moore & Webb, 1995). The ability of Hybrid BARS to incorporate an integrated notion of competencies was acknowledged by Dickson (2000) who concluded that although Hybrid BARS was built upon the behavioural aspects of performance, “the procedure allows for the provision of the identification of other performance attributes including knowledge, understanding and attitudes” (p. 79).

There are, however, a number of issues associated with the Hybrid BARS process. Three major issues which have been addressed in the literature: the extent to which Hybrid BARS comprehensively identifies all the performance dimensions and competencies, independence of the performance dimensions, and the validity and reliability of the Hybrid BARS process, are discussed below.

**Comprehensive identification of performance dimensions and competencies**

The degree to which the Hybrid BARS process can successfully identify a comprehensive set of performance dimensions and competencies within the particular field under review has been examined (Dickson, 2000). Firstly, Hybrid BARS incorporates many of the assumptions and procedures of the original BARS process, in particular the development of competencies by individuals knowledgeable of the field under review (Conway & Ellison, 1995). As performance dimensions and competencies are created by expert panels familiar with the task or role there is the argument that these people are in the best position to identify comprehensive sets of performance dimensions and competencies. For original BARS this has shown to be the case with the process addressing aspects of performance not normally identified by other means (Pounder, 2000). As the use of expert panels in the identification of performance dimensions and competencies is retained in the Hybrid BARS process, it is reasonable to assume that the same would apply to performance dimension and competencies identified using the Hybrid BARS process.

Secondly, the external validation phase, during which a broad cross section of stakeholders are surveyed, ensures that the competencies identified using Hybrid BARS are essential for the task or role under review. In reference to the external validation process, Dickson (2000, p. 54) reported that Hybrid BARS has been “relatively successful” in identifying essential performance dimensions, citing four
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Studies: Anshel et al. (1987) in which only two of 22 performance dimensions identified by expert panels as being essential for high school football coaching were considered as ‘unimportant’ in the external validation phase, and three other studies of Anshel and Webb (1991) (touch football referees), Jessup and Webb (1994) (classroom management), and Anshel (1995) (basketball referees), in which all of the performance dimensions identified were considered essential by stakeholder groups.

Dickson (2000) noted that in these previous studies assessment was only made of the essential nature of the identified performance dimensions not the competencies. This was the case for three of the four studies reported on by Dickson (2000), but not for the study of Anshel (1995), who did collect data on the importance the competencies (although he used the term “behavioural examples”). However, Anshel did not report extensively on these findings saying simply “subjects expressed agreement on all of the 56 behavioural examples in the scale” (1995, p. 18).

The failure to accurately determine the essential nature of the identified competencies should be considered as grounds for concern, for as Dickson (2000) argued:

> The attention directed to analysis of performance dimensions implied all competencies, identified through the [Hybrid] BARS procedures, were also well supported. However, such a conclusion may be tenuous, particularly as the assumption has not been subjected previously to analysis (p. 123, italics in original).

In order to avoid making a similar assumption, Dickson (2000) assessed both the essential nature of soccer refereeing competencies and their associated performance dimensions. In Dickson’s study, four of the 37 competencies identified were considered ‘unimportant’. Dickson concluded that subjectively these results indicated broad acceptance of the identified soccer refereeing competencies by soccer stakeholders.

**Independence of performance dimensions**

The independence of performance dimensions in relation to original BARS was discussed in Section 2.2.5. However, as Hybrid BARS categorises competencies into performance dimensions in the same manner as original BARS, the independence of performance dimensions developed using Hybrid BARS must also be open to question.

To review, it has been argued that performance dimensions should be conceptually distinct as competencies should only specify the one particular performance dimension (Dickinson & Tice, 1977). As discussed in Section 2.2.5, in original BARS studies this
has been shown not to be the case (Dickinson & Tice, 1973, 1977; Zedeck & Baker, 1972). Critically, the independence of performance dimensions identified using the Hybrid BARS has not been widely explored. According to Dickson (2000), Anshel (1995) used the external validation phase as a “form of ‘de facto’ factor analysis to place competencies into dimensions” (p. 56). However Dickson (2000, p. 56) expressed concern that categorisation of this type was “questionable”. In his own study using Hybrid BARS, Dickson (2000) used Principal Factor Analysis to extract six factors (analogous to performance dimensions) as part of a factorial solution for the 37 competencies identified in his study. Although this factorial solution had the same number of factors (six) as the number of performance dimensions, they did not contain the same sets of competencies. Furthermore, five competencies loaded significantly onto more than one factor suggesting that the performance dimension structure was not distinct. Dickson (2000) concluded that the performance dimensions were not unique and consequently the performance dimension structure could not be supported by statistical analysis.

Dickson (2000) suggested the possible explanation for this finding was the sequence by which the performance dimensions had been developed. In the Hybrid BARS process, competencies are developed first and then subsequently grouped into performance dimensions. However, in Smith and Kendall’s (1963) original BARS approach, performance dimensions were identified first and then competencies were developed with respect to these performance dimensions. This sequence reversal was one of the modifications to Smith and Kendall’s original procedure (as described in Section 2.2.3). Dickson (2000) recommended that in future studies using the Hybrid BARS process, the following change would be worthy of further exploration:

Performance dimensions should be developed initially, followed by the generation of competencies that are representative of specific dimensions. This sequence generates competencies aligned to each performance dimension, and may improve the likelihood of sustainable factor structures being generated (p. 236).

According to Dickson (2000, p. 236), “such analysis may provide deeper insights into the relationships between performance dimensions and competencies”.

Competencies and their Identification 2.18
**Validity and reliability of the Hybrid BARS process**

As for performance dimension independence, the validity and reliability of the Hybrid BARS process have not been widely explored. For example, several studies using the Hybrid BARS process (e.g., Anshel et al., 1987; Jessup & Webb, 1994; Moore & Webb, 1995; Webb, Jessup, Moore, & Landy, 1994) have used as supporting evidence the results of original BARS studies when discussing the issues of validity and reliability.

However, two studies, one by Anshel (1995) and the other by Dickson (2000), explored the validity and reliability of Hybrid BARS with empirical rigour. Anshel (1995) investigated three forms of validity: content validity, construct validity, and predictive validity, in his study identifying the competencies required for effective basketball refereeing. A fourth type of validity, concurrent validity, measured through triangulation with other tests or instruments (Cohen et al., 2000), could not be assessed as no other rating scales for basketball referees existed in order for comparisons to be made. (Anshel, 1995).

In the same study, Anshel (1995) used two methods to demonstrate reliability. Cronbach’s Alpha was calculated to determine the degree of consistency between the behavioural examples within each of the performance dimensions. Alpha coefficients of between 0.79 to 0.93 were calculated indicating that the examples describing each dimension were consistent with each other (Anshel, 1995). For the second method, Pearson’s Product-Moment correlation was calculated to determine inter-rater reliability between two sets of observations of referee performance based upon the 13 performance dimensions. Values of between 0.79 and 0.88 were obtained for these observations with an overall rating for all observations of 0.88. Anshel concluded that this demonstrated a high level of consistency (and hence reliability) of the scale.

Dickson’s (2000) study identifying soccer refereeing competencies examined three forms of validity: face validity, content validity and construct validity. Two other common forms of validity: predictive validity and concurrent validity, were not used as their relevance to the study was considered to be negligible (Dickson, 2000).

Face validity is typically determined by asking if the scale or measure appears to reflect the concept under question (Bryman, 2008). Dickson (2000) defended the face validity of his study on two grounds. Firstly, all of the performance dimensions and competencies developed were related to soccer refereeing roles. Secondly, face validity could be assured through the use of the Hybrid BARS process which had been
designed specifically to ensure the identification of performance dimensions and competencies in a robust and systematic fashion (Dickson, 2000).

Dickson (2000) argued that content validity could be demonstrated through the use of expert panels to identify performance dimensions and competencies. Instructing these panels to develop performance dimensions and competencies related solely to soccer referees was the means by which Dickson believed could ensure that the content area under investigation was clearly defined and focused upon.

For construct validity, Dickson followed the practice of previous original BARS studies (e.g., Stoskohf, Glik, Baker, Ciesla, & Cover, 1992) and used factor analysis to demonstrate construct validity. Analysis of the competencies was undertaken to determine if interpretable factor solutions could be found. Such factor solutions were considered as evidence of construct validity (Dickson, 2000). Factor analysis was unable to identify any stable factor solutions of underlying constructs but subsequent Rasch analysis was able to identify the existence of a single construct (Dickson, 2000).

Dickson (2000) investigated reliability using two methods. To assess internal consistency, Dickson used Rasch item consistency indices (analogous to Cronbach’s Alpha) obtaining a coefficient value of 0.93 which was an indication of a high level of internal consistency. For his second measure, Dickson used Pearson’s Product-Moment Correlation to assess the consistency of ratings across perspectives. A correlation coefficient of 0.93 was calculated indicating high levels of consistency.

2.4 CONCLUSION

The term ‘competency’ is a multifaceted concept that has been defined from a number of different perspectives. As a consequence, there is no widely accepted definition for the term (Hoffmann, 1999). Originally considered to include knowledge, skills and abilities, the modern interpretation of competencies has been broadened to include values and attitudes (Hager & Beckett, 1995). This integrated approach to competencies has been shown to be successful in capturing key aspects of performance across a range of diverse roles (Chappell & Hager, 1994).

Equally successful in capturing the multidimensional aspects of performance is the Behaviourally Anchored Rating Scale (BARS) and its more recent variant Hybrid BARS. While it has yet to have been demonstrated conclusively that BARS and Hybrid BARS are superior to other scales with regard to validity and reliability, there are other factors which gives them advantages over other rating systems. These include:
Competencies and their Identification

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- their ability to capture key aspects of performance in multidimensional, behaviour specific terms (Anshel & Webb, 1991);
- their ability to identify performance dimensions and competencies essential to the task or role under review (Dickson, 2000);
- their ability to address aspects of performance not normally identifiable by other means (Pounder, 2000);
- the ability for the identified performed dimensions and competencies to be used as the basis for training and development programs (Blood, 1974).

Hybrid BARS, was developed to address a number of procedural issues associated with the original BARS, while maintaining many of the key principles underpinning its predecessor. However, Hybrid BARS also inherited the unresolved issue of performance dimension independence. The suggestion that the performance dimension independence issue may have been caused by a methodological change remains unexplored (Dickson, 2000).

2.5 IMPLICATIONS FOR THE STUDY

As highlighted in Chapter One, research has yet to develop a standardised or typical profile of the e-learner (Dabbagh & Bannan-Ritland, 2005). However, the development of such a profile is important as it “poses considerable implications for the design of online learning environments” (Dabbagh & Bannan-Ritland, 2005, p. 40). Thus, a study that provided a typical profile of the e-learner by identifying the competencies required for effective performance in a university e-learning environment was considered to be warranted.

The ability of Hybrid BARS to identify competencies considered essential for effective performance in a robust and systematic way made it both an attractive and appropriate methodology for a study of this type. Although Hybrid BARS had not been used previously in e-learning contexts, it had been successfully implemented in other educational contexts (e.g., Jessup & Webb, 1994; Moore & Webb, 1995; Moore et al., 1997). Furthermore, both Hybrid BARS, and the original BARS methodology on which Hybrid BARS is based, have both been shown to be adaptable across a wide range of tasks and roles including pharmacy practice (Grussing et al., 1979), police officers (Bradley & Pursley, 1987), school principals (Duignan, 1982) and soccer referees (Dickson, 2000). Based on this evidence, it was assumed that Hybrid BARS would be equally effective in the context of a university e-learning environment.
The use of Hybrid BARS had three additional benefits. Firstly, expressed in behavioural terms the e-learning competencies identified by the Hybrid BARS process would describe what e-learners needed to do for effective performance. One of the criticisms of the e-learning literature is that it has often focused on traits and characteristics. Secondly, Hybrid BARS has been shown to address aspects of performance not normally identifiable by other means. Thus, the use of Hybrid BARS offered the potential to identify e-learning competencies hitherto unacknowledged in the literature. Thirdly, the e-learning competencies developed could be used as the basis of training and development programs for both students and staff, helping ensure that all stakeholders could receive the full advantages offered by e-learning.

Three additional issues arose out of the literature review beyond the broad research question - What are the competencies required for e-learning? Firstly, although competencies identified using the Hybrid BARS process are assumed to be of equal value (Anshel, 1995), examining the validity of this assumption for the e-learning competencies was warranted. Thus, the question of whether e-learning competencies were all of equal importance or whether some were considered to be more important than others was believed to be worth examining.

Secondly, no studies were identified in the literature review that assessed the relative difficulty level of e-learning competencies. Consequently, it is not known whether e-learning competencies are of equal difficulty in their execution or whether some are more difficult than others. As the difficulty level of the e-learning competencies could potentially impact upon the quality of their execution by students, this question was also considered worthy of examination.

Thirdly, evidence from the literature review suggested that the question asked by Arif (2001, p. 37) - “is the student ready for a change in the old studying techniques to the new ones?” - remained unanswered. Student readiness for e-learning could be assessed if the level of student preparedness for the e-learning competencies were known.

Thus it was believed that a study that addressed these issues could be of significant practical benefit. For instance, if there were competencies considered to be more important than others then these might be the focus of future development programs. Determining the relative difficulty of the e-learning competencies would also help in such programs as easier competencies would require less time to develop than those considered to be more difficult. Finally, an assessment of the level of student preparedness would provide an indication of possible starting points for development.
For example, it would be of little use focusing on e-learning competencies for which students were already well prepared.

When these three issues were taken into account, a further dimension considered worthy of exploration was identified. This was the difference in perception that might exist between the two broad stakeholder groups, students and staff, in their assessment of the relative importance, difficulty and preparedness of the e-learning competencies. Such difference could potentially impact on student performance in e-learning environments. For example, students being asked to undertake tasks based upon an ability level assumed by staff but in excess of the actual ability level of students. This could lead to learning outcomes either being achieved poorly or not at all.

In previous studies (e.g., Dickson, 2000; Jessup & Webb, 1994), the external validation phase had been used to collect additional information about the competencies developed in the first four stages of the Hybrid BARS process. For the current study, further data were collected in the external validation phase to address the issues raised above. As the external validation phase would collect data regarding the relative importance of the competencies, difficulty and student preparedness data was also collected in this phase of the study.

Emerging from the literature review was the issue of performance dimension independence. Although developing competencies first and then grouping these competencies into performance dimensions was the standard procedure for Hybrid BARS studies (Anshel, 1995; Dickson, 2000), this practice had been unable to develop performance dimensions which were independent. Dickson (2000) believed that the adoption of the Smith and Kendall’s (1963) original procedure of identifying the performance dimensions first and then developing the competencies based upon these performance dimensions might be able to produce independent performance dimensions. Examination of Dickson’s claim would help shed light on one of the major unresolved issues of both Hybrid BARS and original BARS.
2.6 RESEARCH QUESTIONS

From the issues raised in the literature review and subsequent discussion, a series of questions emerged that were considered to be worthy of further empirical investigation. In their most general form these questions were:

1. What are the competencies considered essential for e-learning?
2. How is the relative importance of the e-learning competencies perceived by e-learning stakeholders such as university students and staff?
3. How is the relative difficulty of the e-learning competencies perceived by e-learning stakeholders such as university students and staff?
4. How is the relative preparedness of the e-learning competencies perceived by e-learning stakeholders such as university students and staff?
5. To what extent (if any) are the relative importance, difficulty and preparedness of the e-learning competencies related?
6. Do e-learning stakeholders hold differing perceptions with regard to the relative importance, difficulty and preparedness of the e-learning competencies?
7. Can the independence of performance dimensions developed in accordance with Smith and Kendall’s (1963) original procedure be empirically validated?

These general questions were refined to formulate a set of specific research questions and, where appropriate, a number of null hypotheses. These are presented below.

Question 1.1. What performance dimensions and competencies, as identified by the Hybrid BARS process, are considered essential for e-learning?

Question 1.2 Are these e-learning competencies consistent with the e-learning competencies as identified in the literature?

Question 2.1 Do the major e-learning stakeholders (university students and staff) support the importance of the e-learning competencies identified using the Hybrid BARS process?
Question 2.2 What are the relative importance ratings of the e-learning performance dimensions and competencies as perceived by the e-learning stakeholders?

Question 3.1 What are the relative difficulty ratings of the e-learning performance dimensions and competencies?

Question 4.1 What are the relative preparedness ratings of the e-learning performance dimensions and competencies?

Question 5.1 Is there any relationship between the perceived importance of the e-learning competencies and their perceived level of difficulty?

Hypothesis 1 There will be no significant difference between the relative importance of the e-learning competencies and the relative difficulty in performing them.

Question 5.2 Is there any relationship between the perceived importance of the e-learning competencies and the level of preparedness of students in performing them?

Hypothesis 2 There will be no significant difference between the relative importance of the e-learning competencies and the relative preparedness of students in performing them.

Question 5.3 Is there any relationship between the perceived difficulty of the e-learning competencies and the level of preparedness of students in performing them?

Hypothesis 3 There will be no significant difference between the relative difficulty of the e-learning competencies and the relative preparedness of students in performing them.

Question 6.1 Do e-learning stakeholders (university students and staff) perceive the same relative importance for the e-learning performance dimensions and competencies?

Hypothesis 4 There will be no significant difference in perceptions between university students and staff in the relative importance ratings of the performance dimensions and competencies.
Question 6.2  Do e-learning stakeholders (university students and staff) perceive the same relative difficulty for the e-learning performance dimensions and competencies?

_Hypothesis 5_ There will be no significant difference in perceptions between university students and staff in the relative difficulty ratings of the performance dimensions and competencies.

Question 6.3  Do e-learning stakeholders (university students and staff) perceive the same relative preparedness for the e-learning performance dimensions and competencies?

_Hypothesis 6_ There will be no significant difference in perceptions between university students and staff in the relative preparedness ratings of the performance dimensions and competencies.

Question 7.1  Can the independence of performance dimensions developed in accordance with Smith and Kendall’s (1963) original procedure be empirically validated?

To conclude, having identified an appropriate methodology, research questions and associated hypotheses, the specific aspects of the research design were ready to be considered. The following chapter examines these aspects in detail.
CHAPTER THREE

METHODOLOGY

The previous two chapters provided a review of the literature beginning with an examination of e-learning focusing upon the competencies required for effective performance in a university e-learning environment. Next, attention was directed towards the nature of competencies in general and exploration of a procedure known as Hybrid BARS which had been shown in previous studies to be a successful means of identifying competencies in an empirically robust fashion. In the light of the issues raised in these two chapters, the current study was designed to identify the competencies required for effective performance in a university e-learning environment.

This chapter describes the methodology used in this study and is divided into eight sections. The first section provides commentary on the study context and scope and provides background information of the university study site, information on the organisation of faculties, student and staff numbers, student enrolment, provision of e-learning, and concludes with the scope of the study. The second section provides an overview of the study design, while the third and fourth sections describe the procedures employed in the implementation of Phase One and Phase Two of the study respectively. The fifth section considers the methodological issues associated with the study and the sixth section presents the Data Analysis Plan. An evaluation of the research plan is given in the seventh section. The eighth section concludes the chapter.

3.1 CONTEXT AND SCOPE OF THE STUDY

This section provides a description of the contextual issues associated with the study, in particular, the university study site, the organisation of faculties, student and staff numbers, student enrolment and unit delivery, and the provision of e-learning.

3.1.1 The study site

The study focused on the competencies required for e-learning at the university-level. All participants in the study were drawn from a university in rural Australia. Aspects of the study site of pertinence to the study are presented below.
Methodology

3.2

Background to the university

The university where the study took place was the first university in Australia to be established outside of a capital city and became an autonomous, degree-granting institution in 1954 (Chick, 1992). The location of the university, away from large urban centres of population, means that much of the university’s teaching has to be delivered externally. Since its inception, the university has remained one of Australia’s largest providers of distance education.

Organisation of the university faculties

At the time of the research the university was organised into four faculties:

- Arts, Humanities and Social Sciences;
- Economics, Business and Law;
- Education, Health and Professional Studies;
- The Sciences.

These four faculties were further divided into 17 Schools with students and staff typically, but not exclusively, attached to one particular School.

Student and staff numbers

Student and staff numbers at the time of the study are provided in Table 3.1.

Table 3.1 – Student and staff numbers

<table>
<thead>
<tr>
<th></th>
<th>Student</th>
<th></th>
<th>Staff</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>16466</td>
<td>Academic</td>
<td>492</td>
<td></td>
</tr>
<tr>
<td>International</td>
<td>1388</td>
<td>Administrative &amp; Support</td>
<td>799</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17854</td>
<td>Total</td>
<td>1291</td>
<td></td>
</tr>
</tbody>
</table>

(Planning and Institutional Research, 2006)

Student enrolment and unit delivery

University enrolment was divided across four different awards: Higher Degree Research, Postgraduate Coursework, Undergraduate and Non Award. Typically, each award, apart from Higher Degree Research, was made up of combinations of units of study with each unit being the equivalent of approximately 150 hours of study. Four units a semester was generally considered a fulltime load.
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The university catered for students enrolled in both external (i.e., off-campus) and internal (i.e., on-campus) modes of study. The university also had several other centres located away from the main campus. Table 3.2 provides student enrolment by award type and study mode at the time of the study.

Table 3.2 – Student enrolment by award type and study mode

<table>
<thead>
<tr>
<th>Course Type</th>
<th>External</th>
<th>Internal</th>
<th>Other Centres</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Degree Research</td>
<td>446</td>
<td>320</td>
<td>19</td>
<td>785</td>
</tr>
<tr>
<td>Postgraduate Coursework</td>
<td>3792</td>
<td>131</td>
<td>393</td>
<td>4316</td>
</tr>
<tr>
<td>Undergraduate</td>
<td>8867</td>
<td>3099</td>
<td>575</td>
<td>12541</td>
</tr>
<tr>
<td>Non award</td>
<td>204</td>
<td>8</td>
<td>0</td>
<td>212</td>
</tr>
<tr>
<td>Total (n)</td>
<td>13309</td>
<td>3558</td>
<td>987</td>
<td>17854</td>
</tr>
<tr>
<td>Total (%)</td>
<td>74.5</td>
<td>20.0</td>
<td>5.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Planning and Institutional Research (2006)

The high proportion of external students (74.5% of total enrolments) is evidence of the university’s heavy involvement in the delivery of distance education. It is common for units to be delivered in both internal and external study modes. Characteristic of internal delivery were weekly face-to-face lectures with students breaking up into smaller groups for tutorials. For the external delivery, the traditional correspondence model of distance education delivery was still dominant at the time of the study. However, the university was beginning to develop a greater web presence; particularly for the delivery of units in the external study mode.

Provision of e-learning at the university

The university has had a web presence since 1984. This early informal presence was typically in the form of unofficial web servers set up by various members of the teaching staff. Operating outside of the formal teaching structure of the university, these servers were largely used for the purpose of information and resource provision. This material was considered to complement, rather than replace, the instructional materials provided by the university (Brown, 2006, pers. comm.).

WebCT was the university’s first formal Learning Management System (LMS) coming online in 1995. Through WebCT students had access to a variety of information resources and tools such as those as described by Stevens and Jamieson (2002, p. 236):
Methodology

- course materials repository mechanism allowing students to access and download documents, such as lecture slides and readings;
- communication mechanisms for sending messages to individuals or groups;
- administration functions, such as mechanisms for placing students in groups;
- student mark recording mechanisms;
- assignment submission facility permitting students to upload files to WebCT;
- mechanisms for setting and marking tests.

Students and staff accessed this system through password protected accounts via the Internet using a conventional web browser.

At the time of the study, external units were delivered either with or without an online component. The decision whether a unit would have an online component was generally made by the staff member responsible for the unit (henceforth known as the Unit Coordinator). Units without an online component were typically delivered in the traditional distance education mode characterised by instructional materials being sent through the post to students. Units with an online component were offered through WebCT at one of three optional levels of online delivery. These options were developed to categorise the different degrees of online presence offered at the university. Descriptions of these three options are provided in Figure 3.1.

Option One – Online Support (OL1)

The online environment is used to provide additional support for units and students, providing essential information to students about the unit and links to key resources. This option makes use of simple features of the web environment for information provision and some communication.

Option Two – Enhanced Online (OL2)

The online environment is used to enhance the unit through the inclusion and use of communications tools such as bulletin boards and chat and links to resources. Two categories of enhancement may be used: the first would see interaction used informally to assist student learning, the second would involve more formal, structured interaction and learning tasks.

Option Three – Fully Online (OL3)

In this option all aspects of the unit or course would be delivered online. All interactions would occur online. There would be learning tasks designed specifically for the online environment and significant use of online resources and tools. Online is the only medium in which teaching occurs. While this may take a range of forms, all content and learning activities are delivered via the web. Online access is essential for learning in these units or courses.

Figure 3.1 – Options for online delivery (Teaching & Learning Centre, 2001, pp 1 – 2).
3.1.2 Scope of the study

The aim of the study was to identify the competencies considered essential for effective performance in a university e-learning environment. As discussed in Chapter One (see Section 1.3) the e-learning competencies had to be developed within the context of a particular learning environment and in accordance with a particular theory of learning. Based upon the arguments presented in Chapter One (see Section 1.1.3, and Section 1.3.7), the learning environment selected was a Learning Management System and the theory of learning selected was social constructivism.

The Learning Management System at the time of the study was WebCT. However, as there were three options of online delivery available (see Figure 3.1), a decision had to be made as to which option(s) would be the most appropriate to situate the study. To ensure that the competencies identified were specific to e-learning, it was important that the competencies were developed within the context of a fully online unit. Consequently, data collection was restricted to students in units delivered via WebCT at Online Level Three – Fully Online (OL3) as this was the only online option in which all aspects of the unit were delivered online.

To suit second semester (July – December) data collection, the study sample was restricted to Semester Two or Year Long units delivered at OL3. Table 3.3 presents the number of units in the four faculties delivered at OL3 as a percentage of the total number of units offered by the university.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Total units</th>
<th>OL3 units</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts, Humanities &amp; Social Sciences</td>
<td>320</td>
<td>7</td>
<td>2.2</td>
</tr>
<tr>
<td>Economics, Business &amp; Law</td>
<td>148</td>
<td>20</td>
<td>13.5</td>
</tr>
<tr>
<td>Education, Health &amp; Professional Studies</td>
<td>349</td>
<td>8</td>
<td>2.3</td>
</tr>
<tr>
<td>The Sciences</td>
<td>253</td>
<td>42</td>
<td>16.6</td>
</tr>
<tr>
<td>Four Faculties Combined</td>
<td>1070</td>
<td>77</td>
<td>7.2</td>
</tr>
</tbody>
</table>

(Planning and Institutional Research, 2006)

As shown in Table 3.3, units delivered at OL3 represented a small sample (7.2%) of the overall pool of units on offer during the data collection phase of the study. This figure was comparable with other universities in which fully online provision was “typically well under 5% of total enrolments” (OECD, 2005, p. 12). All of the units identified at
OL3 on offer during the data collection phase were at the postgraduate level. Specific student numbers for actual units were unavailable due to ethics approval restrictions.

3.2 OVERVIEW OF THE STUDY DESIGN

The Hybrid BARS process used to identify the e-learning performance dimensions and competencies was implemented in two phases. An overview of the two phases is given below. Firstly, a number of key terms associated with the study require clarification.

3.2.1 Defining key terms

Three key terms used in the study: e-learning, e-learning competency, and performance dimension, require clarification because the literature in this area does not present consistent terminology (Dickson, 2000). Definitions for two of these terms: e-learning and e-learning competency have been presented previously (see Sections 1.1.3 and Sections 2.1.3 respectively), however, they are reproduced below for convenience.

- **e-learning** – learning mediated by a Learning Management System;
- **e-learning competency** – observable or measurable clusters of related knowledge, understandings, skills, attitudes and behaviours considered necessary for effective performance in an e-learning environment;
- **performance dimension** – cluster of competencies, which together defined general qualities or characteristics of the role in question (Anshel, 1995; Dickson, 2000).

These definitions, while not definitive, were developed in relation to the e-learning and BARS literature, for use within the particular context of the study. Their purpose is to provide a set of working definitions for framing the study.

3.2.2 Overview of the Hybrid BARS process

In Chapter Two, the Hybrid BARS process was demonstrated to be a rigorous and robust means of identifying competencies. To review, the Hybrid BARS process used to develop the Behaviourally Anchored Rating Scale for e-learning (henceforth referred to as the BARS-EL) was made up of five stages:

- **Stage 1:** Selection and formation of two expert panels;
- **Stage 2:** Generation of e-learning competencies by these panels;
- **Stage 3:** Amalgamation of lists by researcher;
- **Stage 4:** Verification of amalgamated list by panel members;
- **Stage 5:** External validation of performance dimensions and competencies.
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3.7

The five stages of the Hybrid BARS process were implemented as two distinct phases, referred to as Phase One and Phase Two. This was because each phase had a different objective and made use of different sets of participants. An overview of the study design is presented in Figure 3.2.

<table>
<thead>
<tr>
<th>Phase One – Construction of the BARS-EL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hybrid BARS Stage 1:</strong> Selection and formation of two expert panels</td>
</tr>
<tr>
<td><strong>Hybrid BARS Stage 2:</strong> Generation of e-learning competencies</td>
</tr>
<tr>
<td><strong>Hybrid BARS Stage 3:</strong> Amalgamation of lists by researcher</td>
</tr>
<tr>
<td><strong>Hybrid BARS Stage 4:</strong> Verification of amalgamated list by panel members</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase Two – External Validation of the BARS-EL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hybrid BARS Stage 5:</strong> External validation of performance dimensions &amp; competencies</td>
</tr>
<tr>
<td>Survey of Stakeholder Perceptions of Difficulty and Preparedness</td>
</tr>
</tbody>
</table>

Figure 3.2 – Study design

3.2.3 Overview of Phase One

Phase One of the study involved the implementation of Stages 1 to 4 of the Hybrid BARS process. Central to this first phase was the meeting of two panels of domain-related experts to identify the performance dimensions and competencies considered essential for e-learning. The outcome of Phase One was the construction of the BARS-EL. The BARS-EL then formed the basis of the survey instrument implemented in Phase Two of the study.

3.2.4 Overview of Phase Two

Phase Two of the study involved the implementation of Stage 5 of the Hybrid BARS process. Using a survey instrument based upon the BARS-EL developed in Phase One, the performance dimensions and competencies for e-learning were externally validated by members of the university e-learning community (henceforth referred to as ‘stakeholders’). During this ‘external validation survey’, respondents were asked to rate, using a Likert scale, each of the performance dimensions and e-learning competencies of the BARS-EL in terms of their relative importance. The importance data
were used to determine whether the inclusion of a performance dimension or competency in the BARS-EL had the support of stakeholders. The outcome of this process was an externally validated BARS-EL.

As with previous studies (e.g., Dickson, 2000; Jessup & Webb, 1994), the current study used the external validation survey to collect additional data to assess other perspectives associated with the BARS-EL. Firstly, stakeholders were asked to rate the relative difficulty of each performance dimension and competency. Secondly, stakeholders were asked to rate the level of preparedness of students for each performance dimension and competency. As for the importance data, the difficulty and preparedness data were rated using Likert scales. The importance, difficulty and preparedness data sets were used to determine whether significant differences in opinion existed amongst stakeholders. Specific details of the analysis undertaken on these data sets are provided in the Data Analysis Plan presented later in this chapter.

3.2.5 Overview of study population

According to Cohen et al. (2000, p. 92):

> The quality of a piece of research not only stands and falls by the appropriateness of methodology and instrumentation but also the suitability of the sampling strategy that has been adopted.

As the study was situated within a university WebCT e-learning environment, participants either had to be students or staff at the university to be considered eligible for inclusion. Furthermore, it was important that the study sample be comprised of participants knowledgeable in the field of e-learning. Consequently, a purposive sampling technique was employed. Purposive sampling is non-random sampling in which participants are selected in a strategic way to ensure those sampled are relevant to the research questions being answered (Cohen et al., 2000). Each phase of the study used a different set of participants selected according to specific, clearly defined criteria. Specific discussion of the procedures used to select participants in Phase One and Phase Two of the study are described in the relevant sections in this chapter.

3.3 PHASE ONE – CONSTRUCTION OF THE BARS-EL

This section presents the procedures used in Phase One of the study. It begins with a description of the preliminary activities that were undertaken, and then the four stages of the Hybrid BARS process implemented in Phase One are described in turn.
3.3.1 Hybrid BARS preliminaries

Using procedures outlined in previous Hybrid BARS studies (e.g., Anshel, 1995; Anshel et al., 1987; Dickson, 2000), three preliminary tasks were undertaken prior to the implementation of the first stage of the Hybrid BARS process. These were:

1. identifying the target population;
2. determining the expert panel composition;
3. defining the roles of workshop support personnel.

The purpose of these tasks was to ensure the smooth running of the expert panel workshops which were the focal activity of Phase One. Each task is described below.

Identifying the target population

A clearly defined target population is central to the success of the BARS process (Anshel et al., 1987). This is because the competencies identified using this process are specific to the occupation or role being studied (Dickson, 2000). Therefore, the more clearly a target population can be defined, the greater the likelihood that the competencies identified will be an accurate reflection of the task or role being examined. For the purposes of the study, the identified target population were e-learners. An ‘e-learner’ was defined as a student at the university enrolled in one or more units delivered fully online (i.e., OL3, see Figure 3.1). For OL3 units, all content, learning activities, and assessment were web-based and delivered via WebCT.

Determining the expert panel composition

The purpose of the expert panel was to develop competencies for the role or task under review (Cyrs et al., 1976). For the current study an ‘expert’ was defined as someone who had “extensive knowledge, familiarity, expertise, or previous experience with the criterion job or task” (Anshel, 1995, p. 14).

In previous implementations of the Hybrid BARS process, expert panel membership reflected a diversity of expertise of the target role or occupation. This was to ensure that the role or occupation being examined was done so from a variety of perspectives (Anshel, 1995; Dickson, 2000). For example, Jessup and Webb’s (1994) study of classroom discipline and management used two expert panels composed not only of classroom teachers, but also special education teachers, school principals and educational consultants.
To achieve panel diversity, it was necessary to identify the various groups within the university who might be considered ‘expert’ in the area of e-learning. Using Anshel’s (1995) criteria for being considered an expert, three groups were identified within the university population from which members of the expert panel might be drawn. These three groups were: students, lecturers and academic developers.

To be eligible for expert panel membership student participants had to be enrolled at university in one or more fully online units (OL3). Furthermore, as the purpose of the study was to identify the competencies required for effective performance in an e-learning environment, potential student panel members were required to have successfully completed a fully online unit. This was considered as a necessary prerequisite to be considered an ‘expert’ according to Anshel’s (1995) criteria.

Initially, all lecturers with e-learning experience were considered eligible. However it was recognised that within this group there existed a diversity of e-learning expertise and experience that with careful selection could be drawn upon. Therefore refinement of the lecturer group was undertaken to plan for the inclusion of:

- lecturers with experience in Adult Education or Higher Education, as the target population was university students;
- Information and Communication Technology (ICT) Education lecturers, as learning was being delivered via web-based technology;
- lecturers with e-learning experience from across the four faculties of the university, as e-learning at the university was being delivered in the context of particular disciplines.

The third group, Academic Developers, were strong candidates for consideration because of their knowledge of both instructional design and the WebCT environment. Their inclusion provided an added dimension to the expert panels further increasing the diversity of panel membership.

To summarise, the following groups were identified for consideration for inclusion on the expert panels:

- Students with successful completion of a unit at OL3;
- Adult Education or Higher Education lecturers;
- ICT Education lecturers;
- Lecturers with experience in e-learning;
- Academic Developers.
Having established the eligible groups from which expert panel members might be drawn, the exact composition of the expert panels had to be determined.

As per previous implementations of the Hybrid BARS process (e.g., Anshel 1995; Anshel & Webb, 1991; Dickson 2000), two expert panels were convened. In order to achieve consistency of expertise across the two panels, two members from each of the identified eligible groups, one for each of the two panels, were required. The only exception was for the ‘Lecturers with e-learning experience’ group where four members (two for each panel) were required, ideally with one member being drawn from each of the four faculties of the university.

This gave a total of six participants for each panel (see Table 3.4) which was consistent with the range of six to ten participants used in previous implementations of the Hybrid BARS process (e.g., Anshel et al., 1987; Anshel & Webb, 1991; Moore, Webb, & Dickson, 1997). This panel composition represented a wide cross section of the e-learning community at the university. The composition for each of the two expert panels is provided in Table 3.4.

Table 3.4 – Expert panel composition

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Number per panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student with e-learning experience</td>
<td>1</td>
</tr>
<tr>
<td>Adult Education or Higher Education lecturer</td>
<td>1</td>
</tr>
<tr>
<td>ICT Education lecturer</td>
<td>1</td>
</tr>
<tr>
<td>Lecturers with e-learning experience</td>
<td>2</td>
</tr>
<tr>
<td>Academic Developer</td>
<td>1</td>
</tr>
</tbody>
</table>

Total members per panel 6

The expert panel workshops were held at two different times rather than simultaneously to meet the expected challenges of satisfying the availability of panel members. This was in contrast to previous Hybrid BARS studies (e.g., Anshel, 1995; Anshel & Webb, 1991; Dickson, 2000; Jessup & Webb, 1994) in which the two panel workshops were held simultaneously. Panels had met simultaneously in previous studies to reduce potential bias of panel deliberations (Anshel, 1995). As the necessity to hold the expert panel workshops at different times impacted on the roles of the personnel responsible running the expert panel workshops and could potentially bias workshop proceedings, a number of modifications were made to reduce the likelihood
of this occurring. Both the roles of the expert panel workshop personnel and the subsequent modifications as a result of the expert panel workshops being held at different times are described next.

**Defining the roles of the expert panel workshop personnel**

Following approaches adopted by previous Hybrid BARS studies (e.g., Anshel, 1995; Dickson, 2000), three support staff roles were required: Panel Leader, Process Observer and Recorder. The purpose of these support personnel was to provide assistance during the expert panel workshop and to help ensure the optimal utility of the expert panel members (Anshel, 1995).

The Panel Leader role was to lead each expert panel to a point of consensus on determining and documenting those competencies considered essential for e-learning. To achieve this the Panel Leader was required to:

- solicit the views of each panel member;
- ensure all panel members had an equal say;
- expedite all dialogue and avoid deep philosophical debate;
- paraphrase, clarify and summarise group statements;
- ensure time parameters were met;
- maintain the mutual respect of panel participants;
- bring each panel to a point of consensus.

(Anshel, 1995; Cyrs, 1979)

As the two expert panel workshops were held at separate times, the one Panel Leader was able to lead each of the two workshops.

The Process Observer role was to ensure a common approach to the expert panel workshops, in particular, ensuring that the expert panel deliberations remained free of influence from the Panel Leader (Cyrs et al., 1976). In previous implementations of the Hybrid BARS process (e.g., Anshel, 1995; Cyrs et al., 1976; Dickson, 2000), the one Process Observer had to move between the two panel workshops making observations at regular intervals throughout the day. However, with the decision to hold the two expert panel workshops on separate days, the Process Observer was able to be in attendance for the full duration of both panel workshops. This allowed greater scrutiny by the Process Observer than in previous Hybrid BARS studies. This was particularly important because having the same Panel Leader for both workshops created the potential for bias as participants in the second workshop could be influenced by the
Panel Leader on the basis of what might have occurred in the earlier workshop. In this case, the continuous presence of the Process Observer was instrumental in helping ensure the independence of the workshops.

The Recorder role involved the documentation of events and the information generated during the expert panel workshops (Anshel, 1995). Typically the Recorder did not contribute to panel deliberations except for clarification in recording the output (Anshel, 1995).

Anshel (1995) recommended that the Process Observers and Recorder be different individuals because recording required a continual presence at each of the panel workshops. However, with the Process Observer present for the duration of each panel workshop for the current study, the decision was made to merge the Process Observer and Recorder roles.

Summary

Three preliminary tasks had to be completed before the formal stages of the Hybrid BARS process could begin. These tasks were necessary to ensure both the integrity and smooth implementation of the Hybrid BARS process. Firstly, an appropriate target population was clearly defined and identified. Secondly, the expert panel composition decided upon meant that the role of e-learning would be considered from a variety of perspectives. Finally, clearly defined roles for the support personnel would maintain a suitable level of consistency and accountability in the overall process. With these tasks completed, the study moved into Stage 1 of the Hybrid BARS process.

3.3.2 Stage 1 – Selection and formation of two expert panels

Stage 1 involved the identification of specific individuals for inclusion on the two expert panels. The selection procedures employed in this stage were developed to take into account university research ethics approval conditions that stipulated that any sources of information consulted during this identification process had to be within the public domain. The ethics approval documentation for Phase One of the study is provided in Appendix 1.

Identification of student participants

The identification of potential student participants for inclusion on the expert panels proved to be difficult due to a lack of information about the level of student e-learning expertise. As this information was not freely available, the advice of academic staff was
sought. An ICT Education lecturer responsible for a number of fully online (OL3) units was asked to nominate five students who had displayed high levels of academic and technical proficiency within the WebCT environment. Once identified, students were sent an email inviting them to take part in an expert panel workshop. Students who expressed an interest in being involved in the panel workshops were emailed a copy of the *Explanatory Letter* and *Information Sheet for Participants* (see Appendix 2).

**Identification of staff participants**

Representatives from the university staff (i.e., lecturers and academic developers) were identified from the following five sources:

- university staff directory;
- university web media database;
- university staff research expertise database;
- staff profiles;
- staff homepages.

Potential panel members from the university staff were sent an e-mail inviting them to take part in an expert panel workshop. Those staff members who expressed an interest in participating were sent an email a copy of the *Explanatory Letter* and *Information Sheet for Participants* (See Appendix 2) making an offer for voluntary participation in the study.

The relationships between panel members were also taken into consideration. This was to promote uninhibited communication and to help reduce bias (Anshel, 1995). This meant that participants with close working relationships with each other or those who had direct supervisory responsibility over another panel member were assigned to different panels. With panel members identified and assigned to one of the two panels, Stage 2 was ready to begin.

**3.3.3 Stage 2 – Generation of e-learning competencies**

Stage 2 involved the convening of two expert panel workshops during which the e-learning competencies were generated. The suggested format for the workshops was based upon a number of previous studies identifying competencies (e.g., Anshel & Webb, 1991; Cyrs, 1979; Cyrs, Dobbert, & Grussing, 1976; Dickson, 2000). In accordance with recommendations made by Dickson (2000), performance dimensions were
identified first and competencies were then developed based upon these performance dimensions (see Section 2.3.3).

Each workshop comprised three distinct activities: developing performance dimensions, developing competencies, and reviewing the final output. These activities were broken up into six sessions spread over five hours (Figure 3.3).

<table>
<thead>
<tr>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 am</td>
<td><strong>Welcome Session:</strong></td>
</tr>
<tr>
<td></td>
<td>Introduction and definition of key terms</td>
</tr>
<tr>
<td>9:30 am</td>
<td><strong>Session One:</strong></td>
</tr>
<tr>
<td></td>
<td>Development of performance dimensions for e-learning</td>
</tr>
<tr>
<td>10:15 am</td>
<td><strong>Session Two:</strong></td>
</tr>
<tr>
<td></td>
<td>Identification of action words/phrases describing an effective e-learner</td>
</tr>
<tr>
<td>10:45 am</td>
<td>Morning Tea break</td>
</tr>
<tr>
<td>11:15 am</td>
<td><strong>Session Three:</strong></td>
</tr>
<tr>
<td></td>
<td>Combination of action words and phrases</td>
</tr>
<tr>
<td>11:45 am</td>
<td><strong>Session Four:</strong></td>
</tr>
<tr>
<td></td>
<td>Development of competencies from action words and phrases</td>
</tr>
<tr>
<td>12:30 pm</td>
<td>Lunch break</td>
</tr>
<tr>
<td>1:00 pm</td>
<td><strong>Session Five:</strong></td>
</tr>
<tr>
<td></td>
<td>Continued development of competencies from action words and phrases</td>
</tr>
<tr>
<td>1:45 pm</td>
<td><strong>Session Six:</strong></td>
</tr>
<tr>
<td></td>
<td>Final review and concluding comments</td>
</tr>
<tr>
<td>2:00 pm</td>
<td>Workshop ends</td>
</tr>
</tbody>
</table>

*Figure 3.3 – Expert panel workshop schedule*

Following is a description of the key activities undertaken during each of these sessions. Modifications to these activities are described in Chapter Four.

**Welcome Session**

The purpose of the welcome session was to prepare panel members for the workshop activities. Panel members were provided with a *Workshop Information Sheet* giving the agenda for the day, key definitions, examples of performance dimensions and competencies. Two further handouts were also provided: a list of Learning Management System tools and a description of social constructivist learning principles (See Appendix 3). Time was set aside at the end of this introductory session for questions or clarification.
Session One

The purpose of this session was the development of performance dimensions for e-learning. Working together, panel members were asked to identify what they perceived to be the general qualities, characteristics and activities of e-learning. These were to form the basis of the performance dimensions. This discussion was led by the Panel Leader and involved the free association of ideas through which panel members’ perceptions underwent clarification, expansion and modification until consensus could be achieved between panel members (Cyrs, 1979). Following the recommendations of Cyrs (1979), care was taken to ensure that the performance dimensions developed by the panel were “not too global or all encompassing... [and] manageable yet not too specific” (p.1). The outcome of Session One was a list of the performance dimensions for e-learning.

Session Two

The objective of the Session Two was the generation of sets of competencies for each of the performance dimensions developed in Session One. Competencies were described to panel members as statements representing a desirable manifestation or an indicator of its associated performance dimension (Anshel, 1995), and as such, competencies were considered as observable or measurable clusters of related knowledge, understandings, skills, attitudes and behaviour considered necessary for effective performance. Adopting Schneier and Beatty’s (1979) criterion that competencies consisted of behavioural statements, panel members were asked to work separately to develop words and phrases containing action words they believed to be indicative of high quality performance within each of the identified performance dimensions.

Session Three

In Session Three, panel members were asked to work together to gain consensus of action words and phrases to produce a composite list of words and phrases. As with previous Hybrid BARS studies, no words or phrases were rejected during this activity. This was done to retain as many actions words and phrases as possible for later consideration (Dickson, 2000).

Sessions Four and Five

The purpose of these sessions was the development of specific competencies from the previously generated action words and phrases. Working individually, panel members were asked to transform the relevant action words and phrases into statements that
were either observable or measurable (Dickson, 2000). To conclude Session Five, panel members were brought together and, through consensus and negotiation, generated a composite list of competencies.

**Session Six**

In this session, the final list of performance dimensions and their associated competencies were reviewed item-by-item by panel members ensuring that:

1. the performance dimensions identified were an adequate reflection of all aspects of e-learning;
2. the constituent set of competencies derived for each performance dimension fully represented the entire breadth of that dimension.

Once all of the panel members agreed that these two conditions had been met the expert workshop session ended.

**3.3.4 Stage 3 – Amalgamation of lists by researcher**

At the conclusion of the expert panel workshops two distinctive lists (one from each panel) of performance dimensions and competencies for e-learning had been developed. Stage 3 involved the amalgamation of the two panel lists by the Panel Leader into a single list of draft performance dimensions and competencies. This review and editing stage followed procedures outlined by Cyrs et al. (1976). Accordingly, lists were examined and when necessary the following changes were made:

- duplicate phrases combined;
- unclear statements clarified;
- unnecessary statements deleted;
- items added to complete deficient statements.

Care was taken not to change the meaning or intent of the statements, but rather to provide a consistency of both language and format. The purpose of Stage 3 was to integrate similar performance dimensions and competencies. As recommended by Dickson (2000), to preserve the intent of the statements, those performance dimensions or competencies unique to each panel were retained in order to ensure comprehensive coverage of all aspects of performance. The outcome of Stage 3 was a draft list of the amalgamated e-learning performance dimensions and competencies.
3.3.5 Stage 4 – Verification of amalgamated lists by panel members

The purpose of Stage 4 was to ensure the integrity of the performance dimensions and competencies by sending the draft list of amalgamated performance dimensions and competencies to all panel members for review and approval. Panel members were asked to comment on this draft list with regard to the following questions (Dickson, 2000):

- Are there any performance dimensions you feel need to be added, combined or deleted?
- Do the competencies reflect accurately the performance dimension with which they are associated?
- Are there any competencies you feel are superfluous?
- Are there any competencies you feel are ambiguous?
- Are there any competencies you feel would need to be reworded for clarification purposes?

Changes were made to the draft list if two conditions were met. Firstly, the change had to be supported by more than 50% of the other panel members (Anshel, 1995). Secondly, the change could not alter the original intent and meaning of the item. In situations where the status was unclear with regard to the changing of an item, the decision was made to leave the performance dimension or competency unchanged and allow external validation (in Phase Two of the study) to determine its level of appropriateness (Anshel, 1995).

Following procedures recommended by Cyrs et al. (1976), the revised list of e-learning performance dimension and competencies underwent a final review in order to ensure that the original intent or content of the competencies had not been changed. In previous studies this was achieved either by submitting the revised list to the Process Observer and Panel Leaders for review (Dickson 2000), or sending it to members of the expert panels (Cyrs et al., 1976). In the current study, the list was sent to members of the expert panels for review as it was considered that members of the actual panels would be in the best position to review the proposed changes. Two members, one from each panel, were selected based upon willingness and availability to review the revised list. The outcome of Stage 4 was a list of performance dimensions and competencies for e-learning or BARS-EL.
3.3.6 Summary

Phase One of the study resulted in the identification of a set of performance dimensions and competencies considered essential for effective performance in a university e-learning environment. Importantly, the implementation Hybrid BARS process ensured that the competencies were identified by persons knowledgeable of e-learning, using language common to the field, and captured in multidimensional behaviour specific terms. With construction of the BARS-EL completed, attention was then directed towards the external validation of the BARS-EL by members of the university’s e-learning community. This was undertaken in Phase Two of the study.

3.4 PHASE TWO - EXTERNAL VALIDATION OF THE BARS-EL

External validation of the BARS-EL took the form of a web-based survey, henceforth referred to as the ‘external validation survey’, in which stakeholders were asked to rate, using a Likert scale, the importance of each of the performance dimensions and competencies making up the BARS-EL. Previous studies (e.g., Anshel et al., 1987; Anshel & Webb, 1991; Jessup & Webb, 1994) collected importance ratings for performance dimensions. However, this procedure implied that all competencies were supported as well (Dickson, 2000). The current study followed Dickson’s (2000) practice by having stakeholders provide importance ratings for all of the competencies of the BARS-EL to ensure that support for the competencies was endorsed and not simply implied. The importance data were used to determine whether stakeholders supported the inclusion of an item in the BARS-EL.

During the external validation survey, stakeholders were also asked to rate, also using Likert scales, the relative difficulty and level of student preparedness of the performance dimensions and competencies. Data collected on the importance, difficulty and preparedness perspectives were subsequently used in three ways: firstly, to assess the relative levels of importance, difficulty and preparedness perspectives were subsequently used in three ways: firstly, to assess the relative levels of importance, difficulty and preparedness perspectives were subsequently used in three ways: firstly, to assess the relative levels of importance, difficulty and preparedness of the performance dimensions and competencies; secondly, to determine whether significance differences existed between the importance, difficulty and preparedness perspectives; and thirdly, to determine whether significant differences in perceptions existed amongst stakeholders with regard to these three perspectives. The identification of participants involved in the external validation survey is discussed next.
3.4.1 Identification of participants

The first step in Phase Two was the identification of a diverse range of participants knowledgeable in the field of e-learning to complete the external validation survey. In previous studies (e.g., Anshel, 1995; Anshel & Webb, 1991), participation in the external validation survey was generally sought by a representative sample of individuals upon whom the competencies were based. However, Dickson (2000) argued that such an approach had the potential to limit the diversity of opinion and thus constrain the validity of the findings. Dickson chose to adopt a broader approach and included the opinions of those in roles associated with the target role. Following this approach, the study population for Phase Two were participants drawn from the three groups described in Phase One (i.e., students, lecturers, and academic developers) plus a fourth group (‘other personnel’) comprised of personnel with both knowledge and experience of the university’s e-learning environment. Members of this group included: leaders of the Academic Unit and Learning Resources Unit, Learning Management System (LMS) Helpline Officers, and Academic Skills Advisors. This fourth group, along with lecturers and academic developers, were collectively referred to as staff. Participants involved in Phase One of the study were not eligible to take part in Phase Two.

To be considered eligible for inclusion in Phase Two, students had to be enrolled at the time of the survey in one or more units classified as Option Three: Fully Online Delivery. As the external validation survey took place in second semester, potential students participants were drawn from a pool of Semester Two or Year Long units. Units meeting these criteria were identified using the university unit database. To satisfy ethic approval conditions, each Unit Coordinator’s permission had to be sought before students could be approached. Unit Coordinators of eligible units were sent an email asking if they would be prepared to allow students in their units to participate in the external validation survey. The ethics approval documentation for Phase Two of the study is provided in Appendix 4.

Unit Coordinators who were willing to allow their students to participate were sent a second email with the request that an invitation to participate in the study be posted on the unit’s WebCT bulletin board or equivalent. Students who expressed an interest in participating in the external validation survey were sent an email that included a Student Participant Information Sheet (See Appendix 5) and URL link with a unique
password for accessing the external validation survey. This email was sent the same day as the external validation survey ‘went live’ on the Internet.

Potential university staff participants were identified using the same sources to identify expert panel members (see Section 3.3.2). Once identified, potential staff participants were sent an email asking if they would be prepared to participate in the external validation survey. Staff members willing to participate were sent a second email which included a Staff Participant Information Sheet (see Appendix 6) and URL link with a unique password for accessing the external validation survey. As with student emails, staff emails were sent on the same day as the survey went live on the Internet.

3.4.2 Survey instrument development

The external validation survey used to validate the BARS-EL was delivered as a web-based survey (see the section Methodological Issues for a justification of this decision) and had two major components: a questionnaire structured as a web-based form, and a database to store each participant’s responses to the questionnaire items. The survey instrument was designed specifically for the study and was done in accordance with specific design principles in order to improve the efficiency and accuracy of data collection.

Questionnaire design

The creation of the questionnaire followed both principles of questionnaire design – to ensure that the questionnaire was a usable document that respondents could answer accurately and efficiently, and principles of programming design – using Hypertext Markup Language (HTML) to create the questionnaire’s appearance, organisation and functionality.

The questionnaire was divided into two sections. The first section was designed to collect demographic information about each respondent, with items relating to each respondent’s sex, age, computing experience, e-learning experience, School of the university in which the majority of their studies were taking place, and level of study. This section was included to help make the questionnaire as non-threatening as possible while allowing nominal data to be collected about the participants (Cohen, et al., 2000).
The second section of the questionnaire was designed to collect ratings data on the relative importance, difficulty and preparedness of the performance dimensions and competencies of the BARS-EL. A definition for each perspective is given in Figure 3.4.

<table>
<thead>
<tr>
<th>Importance:</th>
<th>How important for effective e-learning the performance dimension or competency was perceived to be.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty:</td>
<td>How difficult the performance dimension or competency was perceived to do.</td>
</tr>
<tr>
<td>Preparedness:</td>
<td>How prepared students were perceived to be able to perform a performance dimension or competency</td>
</tr>
</tbody>
</table>

Figure 3.4 – Definitions of perspectives used in the external validation survey

To assess each of the perspectives, a five point Likert scale was used. This was consistent with other Hybrid BARS studies (e.g., Anshel, 1995; Dickson, 2000; Jessup & Webb, 1994). Values ranged from 1 for the lowest level of response for an item to 5 for the highest level of response for an item. The *importance* Likert scale items were identical to those used by Anshel (1995), while a similar syntax was applied to create the Likert scale items for the *difficulty* and *preparedness* perspectives (see Figure 3.5).

<table>
<thead>
<tr>
<th>Importance:</th>
<th>irrelevant – not very essential – somewhat essential – essential – very essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty:</td>
<td>easy – not very difficult – somewhat difficult – difficult – very difficult</td>
</tr>
<tr>
<td>Preparedness:</td>
<td>unprepared – not very prepared – somewhat prepared – prepared – very prepared</td>
</tr>
</tbody>
</table>

Figure 3.5 – Likert scale items used in the external validation survey

Separate questionnaires were created for students and staff due to different wording required for the *preparedness* perspective. For this perspective, students were asked to rate their own level of preparedness while staff were asked to rate the preparedness for the student body as a whole.

As a means of reducing the halo effect – an artefact by which the rating of one item can influence the rating of another (Neuman, 2006) – participants were instructed to consider all perspectives independently of each other (Erffmeyer & Martray, 1990). Thus, a competency considered as ‘essential’ could be either ‘very difficult’ or ‘easy’ and so forth.
Four design features were employed to improve the efficiency and utility of the web-based questionnaire. Firstly, each performance dimension and its associated competencies were grouped together in the one table to distinguish them from other performance dimensions and competencies. Secondly, Likert scale options were presented as drop down menus to reduce horizontal space requirements. This eliminated the need to scroll across the screen. Thirdly, scales items for the importance, difficulty and preparedness perspectives were presented on the same row. This reduced the length of the questionnaire and reduced the amount of vertical scrolling required. Finally, respondents were given the opportunity to save their responses and return to the questionnaire at a later time, if necessary.

The questionnaire was created in HTML using Dreamweaver MX web editing software. Screen shots of the completed questionnaire are reproduced in Appendix 7. The completed HTML document was uploaded into an appropriate directory of the host computer in preparation for its delivery across the Internet.

After the external validation survey questionnaire was completed, the next step was the development of the database for the survey data.

Database design

The purpose of the database was to store responses collected via the web-based questionnaire for subsequent retrieval and analysis. The software used to construct the external validation survey database was FileMaker Pro 8.5. This software was used for three reasons. Firstly, FileMaker Pro was the most widely accepted standard database software for use on the Apple Macintosh platform (Weiss, 2001). As this was the standard platform available for this project it was the natural choice. Secondly, FileMaker Pro had the ability to run its own web server. This allowed a local machine on the university network to deliver the survey via the World Wide Web.

Finally, Filemaker Pro used server-side code that integrated easily with HTML. This had two important implications. Firstly, complex routines such as retrieving and displaying data could be executed using a few simple commands. Secondly, server-side code meant that much of the processing load was be done by the server prior to being sent across the Internet to respondents’ computers. This resulted in web pages loading more quickly with the aim of reducing user frustration and increasing the likelihood that the web-based survey would be completed.
With the design and construction of the web-based questionnaire and database completed, the external validation survey was ready to begin. However, before the external validation survey was implemented, a survey pilot was undertaken.

3.4.3 Survey pilot

A pilot was undertaken to evaluate the performance of the external validation survey when used with actual participants. It is an assumption of the piloting process that the participants used have similar knowledge and experience to those in the survey sample (Drew, Hardman, & Weaver Hart, 1996). Consequently, two participants were selected, one student and one member of the academic staff. Both met the Phase Two eligibility requirements and were considered to be suitably representative of the two broad stakeholder groups (i.e., students and staff) reflecting the population sample of the external validation survey.

Pilot participants were sent the same Participant Information Sheet (see Appendix 5 and Appendix 6) to be used by the actual survey respondents. This sheet provided the survey details, consent form, password and link to the web-based survey. As piloting involved checking all parts of the experiment (Christensen, 2004), pilot participants were asked to evaluate the Participant Information Sheet as well as the external validation survey. Based upon the suggestions of Mitchell & Jolley (1996), participants were asked to provide feedback on the following four areas:

- The clarity of the Participation Information Sheet and instructions contained within the survey. Were the instructions provided clear, concise and unambiguous?
- The clarity of the survey items. Were these clear, concise and unambiguous? Was it clear what the survey was measuring?
- The amount of time and effort it took to complete the survey.
- Anything else that was felt to be worthy of mentioning.

Both survey pilot participants stated that the survey and instructions were clear and concise. With regard to the clarity of the survey items, both participants reported it was clear to them what the survey was measuring. Participants reported that it took approximately 15 minutes to complete the survey. The student participant made the comment that “there was a lot of pre-reading involved” but then acknowledged, “but I guess that can’t be avoided”. The staff participant stated that the survey was “not too long or hard to do”. The amount of pre-reading was reviewed and although the
Participant Information Sheet was two pages, one page of this was information that had to be included as part of university research ethics conditions so further editing was not possible.

3.4.4 Implementation of the external validation survey

The commencement date of the external validation survey was timed for the completion of the end of year examinations to avoid any potential conflict with student and staff examination preparations. The survey remained open for a period of two months. Reminder emails were sent out after one month. The survey database was backed up at the end of every week and after two months the survey was taken offline and data analysis began.

3.4.5 Summary

Phase Two of the study involved the implementation of the external validation survey. This survey had two main objectives. The first objective was to validate the e-learning performance dimensions and competencies making up the BARS-EL. This was achieved by having stakeholders rate the importance of each of the performance dimensions and competencies. The importance data set was used to determine if stakeholders supported the inclusion of an item in the BARS-EL. Secondly, stakeholders were asked to rate the difficulty and preparedness of each of the performance dimensions and competencies. With the external validation survey completed, data analysis was ready to begin.

3.5 METHODOLOGICAL ISSUES

Discussion in this section addresses two methodological issues that were addressed in the study design. These issues were:

- mode of delivery for the Internet-based survey;
- use of Likert scales in parametric analysis.

3.5.1 Mode of delivery for the Internet-based survey

In previous Hybrid BARS studies, external validation surveys were implemented as paper-based questionnaires (e.g., Anshel, 1995; Dickson, 2000). As the current study was set within an e-learning context, the external validation survey was delivered using the Internet. The two most common forms of surveys conducted over the Internet are e-mail and web-based surveys (Christensen, 2004).
An e-mail survey involves sending a message with a request to either complete the survey within the message or as an attached file. The completed survey is then returned to the sender. Such an approach offers the advantage of being fast, relatively inexpensive and requiring little technical skill to develop (Christensen, 2004). Limitations of e-mail survey include issues with privacy and anonymity (Bryman, 2008). A further limitation is that data may have to be extracted from the respective e-mails before analysis can be undertaken.

As suggested by its name, a web-based survey is posted on the World Wide Web (Christensen, 2004). Once constructed and posted on the Internet, potential respondents are identified and invited by e-mail to participate. Once consent has been given respondents are given an Internet address with a link to the survey. Web-based surveys have the advantage of being flexible with regard to layout and data can be easily downloaded for statistical analysis (Bryman, 2008). The main limitation of web-based surveys is that they require a large degree of technological skill to develop and implement (Christensen, 2004).

The web-based survey was considered to be the more suitable option for the study due to the flexibility afforded to the layout and design of the questionnaire and the ease with which data could be extracted for analysis. The technological complexity of implementing a web-based survey was reviewed and considered to be technically feasible and within the capacity of available resources and expertise.

3.5.2 Use of Likert scales in parametric analysis

The external validation survey made use of three Likert scales for the assessment of the importance, difficulty and preparedness perspectives. Both parametric and non-parametric techniques were applied to the Likert scale data as described in the Data Analysis Plan (see Section 3.6). Data obtained from Likert scales are considered to be ordinal level as the data has rank order but the intervals between scale items cannot be presumed to be equal (Jamieson, 2004). The parametric techniques used in the study (e.g., ANOVA and MANOVA) assumed interval level data in which the intervals between measures are equal (Field, 2005). Erroneous or misleading results can occur when parametric techniques are applied to ordinal level data (Allen & Seaman, 2007; Clason & Dormody, 1994; Jamieson, 2004).

For ordinal level data, descriptive statistical techniques such as the median or mode should be used to measure central tendency, while frequencies or percentages of
responses for each category should be used to describe the data (Jamieson, 2004). Inferential statistical techniques using non-parametric tests such as, the Mann-Whitney test, chi-squared, and Spearman’s Rho, are appropriate to apply to ordinal level data (Jamieson, 2004). Parametric techniques should not be applied to ordinal level data (Field, 2005).

For the current study the issues associated with Likert scale data were managed in two ways. Firstly, as recommended by Jamieson (2004), frequency analysis using cumulative percentages was used to describe the Likert scale data obtained from the external validation survey. Secondly, when parametric techniques such as ANOVA and MANOVA had to be used, ordinal level Likert scale data were converted to interval level data using Rasch analysis thus ensuring the assumption of interval level data for such techniques was not violated.

3.6 DATA ANALYSIS PLAN

The following section describes the analysis of the data collected in the study. As Phase One of the research involved the construction of the BARS-EL, the emphasis was on the rewording and reorganisation of data rather than data analysis per sé. For this reason the focus of this section is on Phase Two of the study.

3.6.1 Significance levels

For all statistical techniques applied to the data, probability values (p) below .05 were considered as being statistically meaningful. Therefore, values below this cut-off were considered to be indicative of a ‘genuine effect’ and not one simply occurring by chance (Field, 2005). The acceptance of values $p < .05$ as being statistically significant is considered to be standard practice for a study of this type (Bryman & Cramer, 2005; Field, 2005).

3.6.2 Data analysis pathway

Following the collection of importance, difficulty and preparedness data from the external validation survey, a number of analytical operations were applied to the data to answer the research questions presented in Section 2.6. The data analysis pathway followed in the study is provided in Figure 3.6.
Confirmation of Performance Dimension Independence
- Principal Component Factor Analysis
  - Rasch Analysis

External Validation of Performance Dimensions and Competencies
- Frequency Analysis
  - Rasch Analysis

Assessment of the e-Learning Competencies
- Frequency Analysis
  - Rasch Analysis

Assessment of Perspective Differences
- Rasch Analysis
  - ANOVA
  - Cook’s Distance
  - Rank-order Comparisons

Assessment of Stakeholder Differences
- Rasch Analysis
  - MANOVA
  - Cook’s Distance
  - Rank-order Comparisons

Figure 3.6 – Data analysis pathway
The procedures used for each of the operations presented in Figure 3.6 are presented as separate sections below.

### 3.6.3 Confirmation of performance dimension independence

One of the assumptions of both original BARS and Hybrid BARS is the performance dimensions identified are conceptually distinct and independent. In practical terms, this means a particular cluster of competencies should be unique to single performance dimension. To determine whether this was the case for the BARS-EL, the independence of the performance dimension structure was assessed using factor analysis and then confirmed with Rasch analysis. Following procedures used by Dickson (2000), if the independence of the performance dimension structure could be confirmed then subsequent analysis of the e-learning competencies would be undertaken within the performance dimension framework. If the independence of the performance dimensions could not be confirmed then the e-learning competencies would be analysed outside of the performance dimension framework.

#### Factor analysis

The purpose of factor analysis is to identify underlying dimensions (or factors) present among sets of measurements or variables (Blaikie, 2003). Once these dimensions have been identified, then the extent to which each variable contributes to the dimension can be determined (Hair, Anderson, Tatham, & Black, 1998). As Hybrid BARS attempts to identify underlying factors within a scale by having associated competencies clustered into performance dimensions, factor analysis is a useful means of confirming performance dimension structure. For the current study, the e-learning competencies identified were considered as the variables while the underlying factors were analogous to the performance dimensions (see Dickson, 2000).

A critical concept associated with factor analysis is ‘unidimensionality’ (Blaikie, 2003). Items are considered to be unidimensional if they all measure the same thing (Blaikie, 2003). In the current context, e-learning competencies clustered within a particular performance dimension should be unidimensional; in other words they should be unique to that particular performance dimension. If competencies were not unique to a particular performance dimension, then the independence of the performance dimensions structure could not be verified.

The relationship of an item to its particular factor is known as its ‘factor loading’ (Hair et al., 1998). The higher the factor loading the more representative a variable is of a
factor. Factor analysis establishes unidimensionality by identifying those variables that have a high loading on only one factor (Blaikie, 2003). If a single common factor is unable to be found then multiple factors can be identified. However, it would have to be demonstrated that each factor identified was within itself unidimensional (Blaikie, 2003).

In order to establish the number of factors present in a set of measurements an ‘unrotated factor solution’ is generated (Hair et al., 1998). Unrotated solutions while fulfilling mathematical requirements generally do not provide a satisfactory explanation of the variables being investigated (Hair et al., 1998). Consequently a process known as ‘rotation’ is employed to provide a simpler and easier to interpret factor pattern (Blaikie, 2003). There are several methods of rotation. Discussion of these however, is beyond the scope of the thesis (for a good discussion, see Hair et al., 1998).

For the current study, ‘oblique rotation’ produced by the oblimin method was applied to the importance data set using SPSS 16 software. Oblique rotation was selected as it is the rotation recommended when factors are believed to be correlated (Bryman & Cramer, 2005). As with Dickson’s (2000) study of soccer refereeing, the assumption was made that the e-learning performance dimensions were inter-related and not mutually exclusive.

To determine the appropriateness of the sample for factor analysis two tests were applied: the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett’s Test of Sphericity (BTS). The KMO is an index value which ranges from 0 (indicating that factor analysis is inappropriate), to 1 (indicating that factor analysis should yield distinct and reliable factors) (Field, 2005). Values for the KMO less than 0.50 are generally considered unacceptable (Hair et al., 1998). The BTS provides the statistical probability that correlations exist between at least some of the variables under analysis (Hair et al., 1998). A significant value for BTS (i.e., $p < .05$) indicates that correlations exist between variables and hence the data is suitable for factor analysis.

To identify the factors and their associated variables, the four commonly used decision rules were used (Hair et al., 1998):

1. minimum eigenvalue of 1;
2. minimum factor loading of 0.4 for each item;
3. simplicity of the factor structure;
4. exclusion of single factor items.
The resulting factorial solutions were then compared with the performance dimensions and competencies of the BARS-EL. For the independence of the performance dimensions to be confirmed, the performance dimensions and the e-learning competencies clustered within them had to be comparable to the factor solution identified through factor analysis. If this was not the case then the independence of the performance dimension structure could not be supported.

**Rasch analysis**

Rasch analysis provides a mathematical framework which allows for the conversion of raw scores into linear and reproducible measurement (Brentari, Golia, & Manisera, 2006). The Rasch model adopts a rational-empirical approach which specifies that all measurement is inherently represented by a single parameter. Rasch analysis evaluates the extent to which a given data set fits this assumption (Yim, Abd-El-Fattah, & Lee, 2007). Hence the model is based upon the concept of unidimensionality (Bond & Fox, 2007) and if items can be shown to fit the Rasch model they are considered to be measuring a single underlying construct (Brentari, Golia, & Manisera, 2006). Data which do not fit the model are said to be multidimensional, which implies that latent traits are present in the data (Dickson, 2000).

The degree to which an item meaningfully contributes to the measurement of the single construct is referred to as the fit (Elliot, Fox, Beltyukova, Stone, Gunderson, & Zhang, 2006). Fit is the amount of agreement between the observed response and expected response as predicted by the Rasch model (Bond & Fox, 2007). Fit statistics are important as they are the means by which the assumption of unidimensionality – fundamental to the Rasch model – can be tested empirically (Bond & Fox, 2007).

In Rasch analysis there are two types of statistics used to assess fit: infit and outfit statistics. Infit and outfit statistics can be calculated for both item estimates and case estimates. For item estimates, fit statistics provide an assessment of the degree of agreement between respondents of the difficulty of items along the scale (Cavanagh, Romanoski, Giddings, Harris, & Dellar, 2003). For case estimates, fit statistics provides an indication of the degree to which items have been answered logically and consistently (Cavanagh et al., 2003). Generally infit values are considered more important than outfit values although neither should be discounted (Bond & Fox, 2007).
Rasch analysis uses two reliability indices: case separation reliability and item separation reliability, which are measures for estimating the replicability of case (i.e., person) ordering and item placements respectively if applied to a similar sample of persons or items (Elliot et al., 2006). High values for both case and item separation reliability suggests a good spread of values across the linear scale which could be expected to be replicated in other samples measuring the same construct (Bond & Fox, 2007). Values for both indices range from 0 to 1 (Bond & Fox, 2007) with values of above 0.7 generally considered as acceptable (Field, 2005). A summary of the Rasch statistics and acceptable values used for the current study are provided in Table 3.5.

<table>
<thead>
<tr>
<th>Item</th>
<th>Acceptable Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infit (mean squared)</td>
<td>0.6 to 1.4</td>
</tr>
<tr>
<td>Infit $t$</td>
<td>-2 to +2</td>
</tr>
<tr>
<td>Outfit (mean squared)</td>
<td>0.6 to 1.4</td>
</tr>
<tr>
<td>Outfit $t$</td>
<td>-2 to +2</td>
</tr>
<tr>
<td>Case reliability</td>
<td>$&gt; 0.7$</td>
</tr>
<tr>
<td>Item reliability</td>
<td>$&gt; 0.7$</td>
</tr>
</tbody>
</table>

As a means of confirming the findings of factor analysis, Rasch analysis was applied to the importance data set and fit statistics were used to determine whether the data fitted the Rasch model. If fit statistics showed the data had good fit to the Rasch model, this would suggest that a single underlying trait was being measured by the full set of e-learning competencies. As a consequence, the organisation of competencies within the identified performance dimensions structure would not be conceptually distinct. Hence, the independence of the performance dimension structure could not be supported.

### 3.6.4 Validation of performance dimensions and competencies

External validation of the BARS-EL was undertaken using the importance data set. Previous studies had only collected importance ratings for performance dimensions, assuming the competencies associated with the performance dimensions were also supported (Dickson, 2000). To avoid this assumption, the current study followed Dickson’s (2000) guidelines and collected importance ratings for performance dimensions and competencies. The importance data were used to determine whether stakeholders supported the inclusion of an item in the BARS-EL.
The e-learning performance dimensions and competencies were classified as ‘Essential (must have)’, ‘Important (should have)’, or ‘Unimportant’, using cumulative percentages calculated from the importance Likert scale data set. The terminology and criteria for classification into these categories were on previous Hybrid BARS studies (e.g., Anshel, 1995; Anshel et al., 1987; Anshel & Webb, 1991; Dickson, 2000; Moore, et al., 1997). These criteria are presented in Figure 3.7.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential (must have)</td>
<td>At least 90% of responses ranked at either ‘4 (essential)’ or ‘5 (very essential)’.</td>
</tr>
<tr>
<td>Important (should have)</td>
<td>At least 90% of responses ranked at ‘3 (somewhat essential)’, ‘4 (essential)’, or ‘5 (very essential)’.</td>
</tr>
<tr>
<td>Unimportant</td>
<td>Failure to meet the above criteria.</td>
</tr>
</tbody>
</table>

Figure 3.7 – Criteria for classification of Importance data

Competencies classified as either ‘Essential (must have)’ or ‘Important (should have)’ were considered to have the support of e-learning stakeholders and hence were considered to be ‘validated’ (Anshel, 1995; Dickson, 2000).

3.6.5 Assessment of the e-learning competencies

Assessment of the e-learning competencies was undertaken using frequency analysis and Rasch analysis of the external validation survey data. For the importance, difficulty, and preparedness data sets, three procedures were undertaken. Firstly, the e-learning competencies were classified according to their perceived level of importance, difficulty and preparedness using frequency analysis; secondly, the competencies were ranked using frequency analysis in the form of cumulative percentages as an initial means of identifying differences in responses; and thirdly, the competencies were ranked according to their Rasch analysis item estimates in order to quantify any of the differences identified by frequency analysis.

Classification of the e-learning competencies

Classification of the e-learning competencies with regard to importance had been previously undertaken to externally validate the e-learning competencies (see Section 3.6.4). The difficulty and preparedness data sets were analysed in a similar manner to the importance data set. With regard to difficulty, the e-learning competencies were classified as ‘Very Difficult’, ‘Difficult’, or ‘Easy’, using cumulative percentages calculated from the difficulty Likert scale data set. Classification was based upon the criteria presented in Figure 3.8.
Methodology

<table>
<thead>
<tr>
<th>Difficulty Level</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Difficult</td>
<td>At least 90% of responses must be ranked at either ‘4 (difficult)’ or ‘5 (very difficult)’.</td>
</tr>
<tr>
<td>Difficult</td>
<td>At least 90% of responses must be ranked at ‘3 (somewhat difficult)’, ‘4 (difficult)’ or ‘5 (very difficult)’.</td>
</tr>
<tr>
<td>Easy</td>
<td>Failure to meet the above criteria.</td>
</tr>
</tbody>
</table>

Figure 3.8 – Criteria for classification of Difficulty data

For preparedness, the e-learning competencies were classified as ‘Very Prepared’, ‘Prepared’, or ‘Poorly Prepared’, using cumulative percentages calculated from the preparedness Likert scale data set. Classification according to preparedness was based upon the criteria presented in Figure 3.9.

<table>
<thead>
<tr>
<th>Preparedness Level</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Prepared</td>
<td>At least 90% of responses must be ranked at either ‘4 (prepared) or ‘5 (very prepared)’.</td>
</tr>
<tr>
<td>Prepared</td>
<td>At least 90% of responses must be ranked at ‘3 (somewhat prepared)’, ‘4 (prepared)’ or ‘5 (very prepared)’.</td>
</tr>
<tr>
<td>Poorly Prepared</td>
<td>Failure to meet any of the above criteria.</td>
</tr>
</tbody>
</table>

Figure 3.9 – Criteria for classification of Preparedness data

Although the classification of difficulty and preparedness data sets did not directly address any specific research questions or hypotheses, together with the importance data set they were useful in identifying trends and themes that were explored in later data analysis.

Ranking of the competencies using frequency analysis

Frequency analysis in the form of cumulative percentages is the standard form of Hybrid BARS data analysis (Anshel, 1995; Anshel & Webb, 1991; Moore et al., 1997; Webb et al., 1994) and although the process is simplistic it has been demonstrated as being able to provide an indication of the level of agreement among respondents with regard to Hybrid BARS items (Dickson, 2000). As a means of preliminary investigation into the level of agreement amongst respondents for the e-learning competencies, cumulative percentages calculated using the importance, difficulty, and preparedness data sets were used to determine the relative rankings of the e-learning competencies. If a discernable hierarchy could be identified from the frequency analysis results then the more sophisticated Rasch analysis would proceed.

In a previous Hybrid BARS study (Dickson, 2000), competencies had been ranked according to the percentage of the sample who responded in the 3, 4 or 5 categories.
This corresponded to the ‘Important (should have)’, ‘Difficult’ and ‘Prepared’ categories in the current study (see Figures: 3.7, 3.8 and 3.9 respectively). However, Dickson (2000) found that the inclusion of the ‘3’ category ratings (e.g., ‘somewhat essential’, ‘somewhat difficult,’ and ‘somewhat prepared’) might confound the results leading to a false impression of a competency’s relative ranking. This was because respondents in this category were considered to have a relatively minor level of commitment with respect to the competencies being rated. To avoid this problem, the e-learning competencies were ranked according to the percentage of responses in the 4 or 5 categories thus ensuring that each competency’s rating had been fully endorsed by respondents. For the current study, responses in the 4 or 5 categories for each of the perspectives corresponded to the ‘Essential (must have)’, Very Difficult, and ‘Very Prepared’ categories described in Figure 3.7, Figure 3.8 and Figure 3.9, respectively.

**Ranking of the competencies using Rasch analysis**

As discussed in Section 3.5.2, ordinal level Likert scale data – such as that used by frequency analysis to rank the e-learning competencies as described above – should not be analysed using parametric techniques. Consequently, the ordinal level Likert scale data was converted into interval data using Rasch analysis. Once converted, the e-learning competencies could be ranked as a hierarchy and, from this, judgments could be made of both the rank order of the e-learning competencies and the relative size of the differences between the rankings.

Within the Hybrid BARS context, Rasch item estimates can be considered as being analogous to the perspectives under review (Dickson, 2000). Therefore the larger the Rasch item estimate, the easier it was for respondents to endorse that particular scale item. For the current study, depending upon the perspective being examined (i.e., importance, difficulty, or preparedness), those e-learning competencies with large item estimates could be considered as being more important, more difficult, or better prepared for, than those e-learning competencies with lower item estimates. The ability of Rasch analysis to position items along a scale in this fashion allowed the e-learning competencies to be ranked according to their Rasch item estimates for each of the three perspectives of importance, difficulty, and preparedness.

To generate the Rasch item estimates for the e-learning competencies, Likert scores for the importance, difficulty and preparedness data sets were submitted for Rasch analysis and a separate scale was created for each of the three data sets using Bond & Fox Steps Rasch analysis software. Fit statistics for each scale were inspected to ensure they were...
within acceptable limits (see Table 3.5 for acceptable values) confirming that the data were unidimensional and therefore suitable for Rasch analysis. Item estimates for each of the three perspectives were placed in rank order to provide a list of relative rankings of the e-learning competencies for further analysis using parametric techniques.

3.6.6 Assessment of perspective differences

Assessment of perspective differences was undertaken in order to determine whether any statistically significant relationships could be identified between the importance, difficulty and preparedness of the e-learning competencies. Three combinations of perspectives were assessed:

- importance – difficulty;
- importance – preparedness;
- difficulty – preparedness.

Comparison of perspective means

Following procedures outlined by Dickson (2000), all importance, difficulty, and preparedness data were aggregated and submitted to Rasch analysis for calibration on a single scale. The rescaled item estimates were then re-sorted into the three perspectives for analysis. Means were calculated and compared for each of the three perspectives to determine whether any initial differences could be identified. Contingent upon the identification of initial differences between perspectives, data would be analysed using ANOVA to determine whether differences identified were statistically significant.

Application of ANOVA

ANOVA is a technique used to determine whether significant differences exist between three or more means (Bryman & Cramer, 2005). For the current study, ANOVA was used to compare the combinations of the perspectives rather than multiple t-test to avoid familywise error (Field, 2005). Familywise error, also known as escalating Type I error (Dickson, 2000), occurs because multiple applications of the same test on the same data set increases the probability of finding a genuine effect when one does not exist – in other words, a Type I error (Field, 2005).

The rescaled Rasch item estimates were analysed using ANOVA to determine whether any significant differences existed between the means of perspective-pairs (i.e., importance – difficulty, importance – preparedness, and difficulty – preparedness). However, while ANOVA was able to indicate whether a significant difference existed between
the perspectives, it was unable to identify the actual perspectives where the difference would be found. Bonferroni test was used to identify what perspective-pairs might be the cause of any significant difference. This test was chosen as it had good control over Type I error rate (see above) and it was the most suitable test for comparing a small number of means (Field, 2005).

Contingent upon significant ANOVA and Bonferroni test results, item estimates would be submitted for analysis using Cook’s Distance in order to detect any specific competencies impacting significantly for any of the perspectives pairs. Cook’s Distance is a statistical technique used for the detection of outliers (Stevens, 2002). It measures the influence an item has on a data set by summarising the changes that would occur if that item were removed from the data set (Dickson, 2000). According to Stevens (2002), values for Cook’s Distance > 1 would be considered large and evidence of that particular item as having a significant effect. Consequently, competencies with a Cook’s Distance value of > 1 would be considered as having a significant effect and would likely to be the cause of any significant difference identified between various perspective-pairs.

A non-significant result for Cook’s Distance would suggest that any significant difference between perspectives detected using ANOVA were attributable to an accumulative effect by all of the competencies. If such were the case then rank-order comparisons would be used in order to identify those competencies most likely to be responsible in causing the significant difference between the perspectives (Dickson, 2000).

**Rank-order comparisons**

If parametric techniques were unable to identify the competencies responsible for any significant difference that might exist, then inspection of rank-order differentials between pairs of competencies across each of the perspective-pairs would be used. Although rank-order comparisons are not as powerful empirically as parametric techniques, they have been shown previously to be able to provide details not available by parametric techniques (Dickson, 2000).

Rank-order differentials for competencies for each of the three perspective-pairs (i.e., importance versus difficulty, importance versus preparedness, and difficulty versus preparedness) would be calculated using the aggregated Rasch item estimate rankings for each of the three perspectives. A rank-order differential would be determined by
taking the absolute value of the difference between each respective competency-pair; for example, between *importance* rank of Competency 1.1 and *difficulty* rank of competency 1.1, between *importance* rank of Competency 1.2 and *difficulty* rank of competency 1.2, and so on. The absolute value of the rank-order differential would be calculated, as it would be the actual size of the differential that would be important, not its direction. In a previous study, Dickson (2000) considered competency-pairs with a rank-order differential of 20 or more places to have a notable effect in causing any identified significant difference between the perspectives. Dickson’s study identified 37 competencies therefore an equivalent ratio would be applied to the current study. Consequently, a cut-off value would be determined based upon the number of competencies in the BARS-EL and those pairs of competency with a rank-order differential equal to or greater than this value would be considered as having a notable effect.

Identification of competency-pairs of practical significance to the study

Although Cook’s Distance and rank-order comparisons would identify those competency-pairs having a *statistically significant difference* on the various perspective-pairs, it was recognised that there would be competency-pairs of *practical significance* to the study that would be worthy of inspection. Therefore the rank-order differentials for each perspective-pair were reorganised as follows:

- *importance – difficulty*: rank-order differentials for the ten most important e-learning competencies to identify the e-learning competencies ranked high in importance and high in difficulty;
- *importance – preparedness*: rank-order differentials for the ten most important e-learning competencies to identify the e-learning competencies ranked high in importance and low in preparedness;
- *difficulty – preparedness*: rank-order differentials for the ten most difficult e-learning competencies to identify the e-learning competencies ranked high in difficulty and low in preparedness;
- *importance – difficulty – preparedness*: presentation of the difficulty rankings of the e-learning competencies ranked highest in importance and lowest in preparedness.

With assessment of the perspective differences complete, the assessment of stakeholder differences proceeded next.
3.6.7 Assessment of stakeholder differences

Assessment of stakeholder differences was undertaken in order to determine whether any statistically significant relationships could be identified between student and staff perceptions of the relative importance, difficulty, and preparedness of the e-learning competencies. Three techniques: MANOVA, Cook’s Distance, and rank-order comparisons, were used to determine whether any significant difference existed between student and staff stakeholder groups.

Comparison of group means

Group means for student and staff groups were calculated and compared for each of the perspectives using individual case estimates derived by Rasch analysis. Case estimates were analogous to the perceptions of each respondent and were used as an indication of stakeholders’ perception of the perspective under review (see Dickson, 2000). Contingent upon the identification of initial differences between stakeholders, data would be analysed using MANOVA to determine whether any differences identified were statistically significant.

Application of MANOVA

MANOVA is a technique that allows group differences between several dependent variables to be examined simultaneously (Field, 2005). For the current study, MANOVA was applied to the case estimate data with the student and staff stakeholder groups representing independent variables and each of the three perspectives representing dependent variables. MANOVA is a two stage test so if significant differences were identified among the variables, subsequent analysis using univariate ANOVA would be used to identify the particular perspectives for which the significant differences between the stakeholder groups were occurring.

There are three main assumptions associated with the use of MANOVA. Firstly, the data should be measured at the interval level, secondly data should be normally distributed, and thirdly, there needs to be homogeneity of covariance matrices which means the variances for each dependent variable and the covariance between variables should be the same across all groups (Field, 2005). The first two assumptions were met as the Rasch case estimates used for the MANOVA were interval level and normally distributed. To test the third assumption, a procedure known as Box’s test was applied. If there was a non-significant result for Box’s test (i.e., $p > .05$) then homogeneity of covariance matrices could be assumed.
Although MANOVA and subsequent ANOVA could identify whether any significance differences existed between student and staff groups, they were unable to identify either the source or strength of such differences. To determine such differences Cook’s Distance would be applied.

**Cook’s Distance**

Contingent upon the results of the MANOVA separate sets of item estimates for both student and staff stakeholder groups were generated for those perspectives for which a significant difference had been identified. Item estimates for each group would then be submitted for analysis using Cook’s Distance in order to detect any specific competencies impacting significantly between student and staff groups. A non-significant result for Cook’s Distance would suggest that any significant difference detected between student and staff groups was attributable to an accumulative effect by all of the competencies rather than specific competencies (Dickson, 2000). If such was the case then rank-order comparisons would be used.

**Rank-order comparisons**

As for the assessment of perspective differences, if parametric techniques were unable to identify the competencies responsible for any significant difference that might exist, then inspection of rank-order differentials between pairs of competencies across the student and staff stakeholder groups would be used. The cut-off value determined during the assessment of perspective differences (see Section 3.6.6) would be applied to identify those competencies most likely to be the cause of any significant difference identified between student and staff groups.

**Identification of e-learning competencies of practical significance to the study**

Similar to the assessment of perspectives differences, while Cook’s Distance and rank-order comparisons would identify those competencies having a statistically significant impact between student and staff groups, it was recognised that there would be e-learning competencies of practical significance to the study that would be worthy of inspection. Therefore the rank-order differentials were reorganised as follows:

- *importance perspective*: the ten highest ranked competencies for importance according to students and the corresponding rankings made by staff;
- *difficulty perspective*: the ten highest ranked competencies for difficulty according to students and the corresponding rankings made by staff;
• *preparedness perspective*: the ten highest ranked competencies for preparedness according to students and the corresponding rankings made by staff;

• *preparedness perspective*: the ten lowest ranked competencies for preparedness according to students and the corresponding rankings made by staff;

• *preparedness perspective*: the ten lowest ranked competencies for preparedness according to staff and the corresponding rankings made by students.

Three sets of results for the *preparedness* perspective were inspected to allow a more detailed assessment of student preparedness based upon the perceptions of both students and staff. This was in response to the way this perspective was originally rated with students being asked to rate their own level of preparedness while staff were asked to rate the preparedness for the student body as a whole.

With this, the assessment of the stakeholder differences was finalised and the data analysis for the study was complete.

3.6.8 Summary

The *importance*, *difficulty* and *preparedness* data sets collected in the study were analysed using a variety of procedures. In Phase One, activities centred on the construction of the BARS-EL and emphasis was on the rewording and reorganisation of data rather than data analysis. In Phase Two of the study, the performance dimensions and competencies for e-learning were externally validated by members of the university e-learning community using a survey instrument based upon the BARS-EL. Data collected in this survey were analysed using factor analysis, Rasch analysis and frequency analysis. Parametric techniques such as ANOVA and MANOVA, and non-parametric techniques such as rank-order comparisons, were used to extrapolate findings from the data from which conclusions were drawn and discussed in Chapter Six to answer the various research questions and hypotheses of the study.

3.7 EVALUATION OF THE RESEARCH PLAN

For research to be valuable it must be conducted in a manner that is valid and reliable (Gay, Mills, & Airasian, 2006). The section evaluates the validity and reliability of the research plan. While threats to validity and reliability can never be completely erased, the effects of these threats can be minimised through close attention to validity and reliability throughout the research process (Cohen et al., 2000).
3.7.1 Validity

Validity is the extent to which a scale or measure accurately represents the concept of interest (Hair et al., 1998). Validity is highly context dependent being specific to the interpretation being made or a particular group being tested (Gay et al., 2006) and should be considered in terms of degree rather than an absolute state (Cohen et al., 2000; Gay et al., 2006). Four types of validity: internal, external, content, and construct, were pertinent to the study. Each is described below accompanied by commentary on how it was accounted for in the study design.

Internal validity

Internal validity is the “degree to which the findings accurately described the phenomena being researched” (Cohen et al., 2000, p. 107). Le Compte, Priessle, and Tesch (1993) identified five threats to internal validity: history and maturation, observer effects, selection and regression, mortality, and spurious conclusions.

History and maturation deal with the consistency of observations, ensuring that events observed at the beginning of the research are the same as those observed as the research progresses (Le Compte et al., 1993). For the current study, the effects of history and maturation were reduced by ensuring that for the external validation survey, all stakeholders were surveyed within the same time period after the university examination period.

Observer effects deal with threats to internal validity due to judgements being imposed upon the research setting by the observer (Cohen et al., 2000). For the current study observer effects were minimised in five ways. Firstly, the use of the Process Observer during the expert panel workshop sessions ensured that the expert panel deliberations remained free from influence (see Section 3.3.1). Secondly, guidelines were followed so that any changes that arose from the amalgamation of the two lists of performance dimensions and competencies (see Section 3.3.4), did not affect the meaning or intent of the original statements developed by the expert panel members. Thirdly, two expert panel members reviewed the amalgamated list (see Section 3.3.5) further ensuring that the intent and meaning had not changed. Fourthly, the use of two expert panel members to review and endorse the final verified list, again to confirm that the original intent or content of the competencies had not been altered (see Section 3.3.5). Finally, the external validation survey, was used to determine if the e-learning performance
dimensions and competencies had the support of the university’s e-learning community.

Selection and regression are concerned with isolating effects between treatment and control groups (Le Compte et al., 1993). As there were no such groups in the current study, threats posed by selection and regression were not applicable to the research design. This was also the case for mortality which relates to problems of attrition which can occur in long term studies (Bryman, 2008). As the current study was not of this type, mortality effects were not considered in the study design.

Spurious conclusions can threaten internal validity by identifying relationships that may not exist (i.e., Type I error) or by failing to identify relationship which do in fact exist (i.e., Type II error) (Bryman, 2008). Type I and II errors are inversely related which means the more one type of error is reduced, the likelihood of making the other type of error is increased (Bryman & Cramer, 2005). For the current study, two procedures were adopted to help reduce threats to internal validity as a result of spurious conclusions being drawn from the data.

Firstly, a significance level of .05 was used which was standard for a study of this type (see Section 3.6.1). This was a compromise to reduce the risk of identifying relationships that were not real (i.e., Type I error), while limiting the possibility of excluding relationships that might be genuine (i.e., Type II error).

Secondly, care was taken to ensure that assumptions associated with the various statistical techniques used in the study were not violated. As Likert scale data was used, particular attention was directed towards only using non-parametric techniques such as frequency analysis on the raw Likert scale data. Rasch analysis was applied to this ordinal level Likert scale data to convert it to normally distributed, interval level data when parametric techniques such as ANOVA and MANOVA had to be used.

External validity

External validity is concerned with the degree to which the results of a study can be generalised beyond the context in which it was conducted (Bryman, 2008). For results to be useful, they must be generalisable beyond the confines of the research (Cohen et al., 2000). Three factors representing the threats to external validity are: lack of representativeness of the available target population, unreliability of the research instrument, and ecological validity (Cohen et al., 2000).
Lack of representativeness of the available target population can threaten external validity because while those participating in the research may be representative of the population that is available, they may not be representative of the broader population (Cohen et al., 2000). An appropriate level of representativeness in the current study was created in two ways. Firstly, the expert panel members selected to construct the BARS-EL represented a good cross section of participants in the field of e-learning and reflected both a diversity and continuity of expertise. Secondly, the participants selected for the external validation survey represented the two major e-learning stakeholders at the university, students and staff. Both sets of participants were selected to be an adequate representation of the broader e-learning community.

The number of participants completing the external validation survey could influence external validity. Previous Hybrid BARS studies have used differing numbers of participants in the external validation phase including, 16 participants to validate competencies for Sporting Development Officers (Webb et al., 1994), 30 participants to validate competencies for Physical Education teachers (Moore & Webb, 1995), 62 participants to validate competencies for touch football referees (Anshel & Webb, 1991), 141 participants to validate competencies, again for Physical Education teachers, and 212 participants to validate competencies for basketball refereeing (Anshel, 1995). However, none of these studies provided any indication of what might be considered a minimum number of participants in the external validation phase, nor was any assessment made of the impact participant numbers might have on external validity.

However, the critical feature highlighted in the Hybrid BARS literature is the representativeness of the external validation sample rather than actual numbers of participants. However, while low participant numbers for the external validation survey might not necessarily impact upon the external validity of the BARS-EL, they could potentially impact upon the results of the various data analysis techniques outlined in the Data Analysis Plan. These issues are addressed in the relevant sections in Chapter Five.

Unreliability of the research instrument threatens external validity as it can lead to the generation of data in which confidence cannot be placed (Cohen et al., 2000). The Hybrid BARS process used by this study has been shown to be a reliable and valid method of identifying competencies within a given context. The external validation survey used in the Phase Two of the study was developed in accordance with procedures used in previous Hybrid BARS studies that had yielded reliable research
instruments. Therefore, it should be reasonable to assume that the instrument developed in the current study would be reliable as well.

Ecological validity is concerned with the extent to which research findings are applicable to everyday natural settings (Bryman, 2008). Critical to ensuring ecological validity is the provision of an accurate portrayal of the reality of the situation being studied (Cohen et al., 2000). The critical question for the current study was to what degree the performance dimensions and competencies identified in the BARS-EL were an accurate and comprehensive reflection of e-learning in general?

In the current study, ‘natural settings’ were the e-learning context, and the theory of learning within which this context was situated. As shown, definitions of e-learning are highly context-dependent (see Section 1.1.2) and for this study e-learning was defined as ‘learning mediated by a Learning Management System’. As the e-learning competencies were developed within this context, they should be applicable to contexts of a similar nature (i.e., other Learning Management Systems). However, the performance dimensions and competencies in the BARS-EL may not be valid for e-learning environments with a different underlying learning theory. This is because an e-learning environment based upon a different learning theory might not place the same level of importance on the performance dimensions and competencies as was done so for the BARS-EL. Hence to reduce potential threats to ecological validity, it was important that the parameters of the study be clearly defined and articulated.

Content validity

Content validity is the degree to which an instrument represents the intended content area (Gay et al., 2006). To demonstrate content validity, it must be shown that the instrument fairly and comprehensively covers the area or items it purports to cover (Cohen et al., 2000). In previous studies (e.g., Dickson, 2000; Jessup & Webb, 1994), construct validity was shown to have been demonstrated through the use of expert panels developing competencies for a particular occupation or role. It was of critical importance that the occupation or role be clearly defined to ensure an appropriate focus upon the content area under investigation (Dickson, 2000). The current study followed this practice by having members of the two expert panels develop performance dimensions and competencies related solely to e-learning within the context of a clearly defined setting – Learning Management Systems. Consequently, it should be reasonable to assume that the content validity of the BARS-EL developed using this process should be high.
Associated with content validity is *face validity*, an intuitive process which can be determined by asking whether the scale or measure *appears* to reflect the concept under question (Bryman, 2008). Face validity however, is not a psychometrically sound method of estimating validity and it should always be accompanied by other measures of validity (Gay et al., 2006). To determine face validity the competencies in the BARS-EL were compared with those identified by the literature review in Chapter One. A good level of agreement between these two sets of competencies could be considered as an indication that the competencies identified in the study were an accurate reflection of e-learning competencies in general.

**Construct validity**

Construct validity considers the degree to which a given hypothetical construct agrees with similar generally accepted constructs (Cohen et al., 2000). Significantly, as the current study involved the development of sets of competencies clustered into performance dimensions, construct validity could be determined by demonstrating that any categories used by the researcher were meaningful to the participants as well (Cohen et al., 2000). Previous original BARS and Hybrid BARS studies (e.g., Dickson, 2000; Stoskohf, Glik, Baker, Ciesla, & Cover, 1992), made use of factor analysis to determine construct validity. Dickson (2000) used both factor analysis and Rasch analysis to confirm whether the performance dimension structure identified for elite soccer refereeing competencies could be verified. The current study followed the same procedure used by Dickson (2000) and factor analysis was applied to the *importance* data set to determine whether factorial solutions could be found which closely approximated the e-learning performance dimensions. If they did approximate, then construct validity could be verified as factors were considered as being comparable to the performance dimensions (see Section 3.6.3). If however, unique factorial solutions could not be found, and the data was shown the fit the Rasch model – which assumes unidimensionality – then the competencies could be considered as measuring a single underlying construct. If this was the case, construct validity could not be demonstrated for the performance dimensions, however, it could be demonstrated for the competencies as a whole.

3.7.2 Reliability

Reliability, the consistency of the measure of a concept (Bryman, 2008), is generally expressed as a reliability coefficient; the higher the coefficient the higher the reliability
3. A reliability coefficient of 1 denotes perfect reliability. Gay et al. (2006), identified four general types of reliability: stability, equivalence, scorer/rater reliability, and internal consistency. The first three types require two sets of scores to be correlated in order to determine reliability. As the external validation survey was only administered once, it was not possible to calculate these measures of reliability in the current study. The fourth type of reliability, internal consistency, was measured in the study.

*Internal consistency reliability* is the extent to which items making up a measure are consistent amongst themselves (Gay et al. 2006). One of the most common measures of internal consistency is Cronbach’s Alpha (Field, 2005). However for the current study, Rasch case and item reliability estimates, which are considered equivalent to Cronbach’s Alpha (Bond & Fox, 2007) were used. Both indices estimate the replicability of case ordering and item placements on the scale if applied to a similar sample of cases or items. Values for these indices of greater than 0.7 are generally accepted as reliable. Both estimates were calculated during Rasch analysis and were used to assess the internal consistency of the BARS-EL.

3.8 CONCLUSION

This chapter presented the methodology used to identify the competencies required for effective performance in a university e-learning environment. In the first section, a commentary on the context and scope of the study was provided. The second section presented an overview of the study design. The third and fourth sections described the procedures employed in the implementation of Phase One and Phase Two of the study. The fifth section described the methodological issues associated with the study and the sixth section presented the Data Analysis Plan. In the seventh section an evaluation of the research plan was provided.

In the next two chapters, results for the study are presented. As discussed in Section 3.2.2, the Hybrid BARS process used in the study was implemented as two distinct phases. As a reflection of the study design, Chapter Four presents the results and discussion for Phase One – Construction of the BARS-EL and Chapter Five presents the results for Phase Two – External Validation of the BARS-EL. Discussion of the results for Phase Two are provided in Chapter Six.