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Defining a framework for effective distance education for project management and the role of educational technology

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Abstract

Evaluation of effective project management education is a poorly researched area as is the role of educational technology in professional education. Technology is being embraced at an increasing rate into all administrative and educational aspects of university life, and particularly so in distance education, but much of the research in this area is focused on the efficiency of the processes rather than the effectiveness of the outcomes. Additionally, there is little research on how technology influences the effectiveness of learning outcomes and the development of professional competencies for students in higher education. This paper suggests a framework for the evaluation of effective project management education and the relationship between technology and the development of professional competencies, based on preliminary exploratory research comprising a review of literature, plus interviews with representatives of the major stakeholder groups in project management education and training.

Keywords: Project management, education, effectiveness, technology, distance education, competency

Introduction

This paper looks at the issues associated with an effective distance learning environment for project management in higher education, and the effects of educational technology on the development of professional competencies. Current research suggests that it is difficult to identify all of the variables in educational systems, the interaction between them, and the effects on the outcomes. Much of the research into educational technology has focused on the efficiency of the processes rather than the effectiveness of the outcomes, and it has often lacked a theoretical framework for evaluation. Project management education involves a wide range of stakeholders and their respective influences and expectations have led to the fragmented system that exists today, with a large gulf between the professional bodies and the tertiary institutions.

This paper represents the outcomes of preliminary exploratory research as part of doctoral studies to define guidelines for effective project management distance education, and to consider the effect of technology on the development of professional competencies. Although the research has been carried out in the specific context of project management education, the conclusions are generalisable for many other forms of professional education.

Research proposal

This paper suggests that there are measurable differences in the effectiveness of technological environments and media in the development of professional competencies in project management through higher education.

The nature of project management education

The first section of this paper looks at what constitutes effective project management education, based on a review of current literature. Turner et al. (2000) observe that most project personnel hold a qualification or first degree in an area other than project management (so further education is approached at postgraduate level), fewer than fifteen percent of project personnel hold any form of project management certification or registration, and that the majority of project personnel have gained their knowledge through experiential learning.

Formal project management education is relatively new to the higher education sector and although Master's level programs have been offered in the United Kingdom for about twenty years, they are still uncommon throughout most of the world. They are generally post-experience and aimed at professionals who are advanced in their chosen careers as part of the current emphasis on lifelong learning (Turner & Huemann 2000). Despite project management having its roots in the engineering and defence industries, Jaafari (1998, p. 514) suggests that it 'has tended to evolve into an independent discipline, even to the point of defining competency levels for project managers…', but there is still 'no coherent and systematic programmes for the preparation of project managers from an early age through to full professional status'.

Project management education and training is provided in many modes, and more than twenty distinct delivery methods have been identified in research in the United States of America (Wirth & Amos 1996). Table 1 provides an overview of the general characteristics of common project management training and educational programs in Australia, ranging from vocational training programs offered by private training organisations and Technical and Further Education (TAFE) institutions, predominantly using a competency-based approach, through to doctoral programs which are now being offered in some universities. At this stage, there is no evidence of any undergraduate Bachelor programs in project management in Australia, and this is consistent with the pattern internationally (Turner & Huemann 2000). From details of educational programs published in professional journals, the most common type of formal project management education is at Masters level in an on-campus part-time mode, and apart from the program at the University of Southern Queensland, most are offered through the faculties of engineering, architecture or construction, consistent with the origins of the discipline (Australian Institute of Project Management 2002).

The Project Management Institute (PMI) in the United States of America offers professional accreditation through their Project Management Professional (PMP) program, which is based on a consideration of academic qualifications and the results of a knowledge-based multiple-choice questionnaire. The Australian Institute of Project Management (AIPM) offers their Registered Project Manager (RegPM) professional accreditation program using competency-based assessment requiring submission of

evidence to independent assessors. There are three levels of the RegPM program reflecting increasing levels of responsibilities—Qualified Practising Practitioner (QPP), Registered Project Manager (RPM), and Master Project Director (MPD). The RegPM program does not take into account academic qualifications as part of the assessment process.

Table 1: General Characteristics of Project Management Training and Educational Programs in Australia

Item	Training	TAFE	HE Undergrad	HE Master's coursework	HE Masters research	HE Prof doctorate	HE Research doctorate
Provider of education	Private training organisation RTO	TAFE	University	University	University	University	University
Location of student learning	• Training org'n • Workplace	• On-campus • Workplace	• On-campus • Off-campus	• On-campus • Off-campus	• On-campus • Off-campus	• Off-campus	• On-campus • Off-campus
Method of educator / student interaction	• Face to face	• Face to face	• Face to face • Distance	• Face to face • Distance	• Face to face • Distance	• Distance	• Face to face • Distance
Purpose of program	Vocational competencies	Vocational competencies	Learning competencies	Learning competencies	Research competencies	Research competencies	Research competencies
Professional role relevant to educational program	• Team member	• Team member	• Team member • Project manager	• Team member • Project manager • Project director	• Project manager • Project director	• Project director	• Project director
Applicability to professional accreditation by PMI (USA)	Medium	Medium	Medium	Low	Low	Low	Low
Applicability to professional accreditation by AIPM (Australia)	High	High	Low	Nil	Nil	Nil	Nil
Academic level suggested as a prerequisite for AIPM RegPM accreditation levels	• QPP	• QPP	• QPP • RPM	• RPM • MPD	• RPM • MPD	• MPD	• MPD
Suitable for workplace based learning	Yes	Yes	No	No	No	No	No
Utilisation for • full time learning program	Unlikely	Yes	Yes	Yes	Yes	No	Yes
• part time learning program	Yes	Yes	Yes	Yes	Yes	Yes	Yes

From Table 1 and a review of the current literature, the following conclusions may be drawn about project management education in Australia:

- Private registered training organisations (RTOs) and TAFE colleges provide the bulk of project management education, and this is provided as vocational competency-based programs aimed at practitioners at team member level
- There are few, if any, undergraduate degree programs, and formal education is undertaken at postgraduate level
- Postgraduate programs are targeted at practitioners at a higher level of the professional community such as project managers and program directors
- Coursework Masters programs focus on a mix of knowledge, cognitive and functional competencies, whereas other postgraduate programs have an emphasis on personal, behavioural, values, ethical and research competencies (see the elements of professional competence in table 5).
- Higher education programs, which are not competency-based, provide little value for practitioners in achieving professional accreditation under current models.

In order to develop a suitable framework for evaluation of effective project management education, the following sections look at the issues associated with the effectiveness of professional and adult education.

The nature of professional education

Project management is often represented as a 'profession' although it is arguable whether it has reached that level of acceptance in the community (Turner 1999). Research indicates that professional practitioners should have a sound theoretical knowledge of the subject and that the provision of formal educational programs is an essential part of the development of a new profession (Turner & Huemann 2000). Based on the views of Schon (1987), Benson (2001, p. 92) suggests 'that the most important areas of professional practice lie beyond the instrumental boundaries based on technical expertise and go into the more indeterminate areas of practice that deal with uncertainty, uniqueness and value conflict' and that the 'outstanding professionals in all areas, including those with high levels of formal rationality, reflect wisdom, intuition and artistry beyond the instrumental'. Dinham and Stritter (1986) differentiate professional education from trades or craft by its 'reliance on theory' (p. 952), and differentiate higher educational curricula by the inclusion

of educational experiences, courses in the basic arts or sciences, typical problems of the profession, and professional initiation through an apprenticeship, clinical studies, and an internship. One of the distinctions of a profession is the requirement to 'set aside personal beliefs and preferences in favour of the client's best interests' (p. 953). They describe professional education in terms of 'transforming the student's gestalt from confusion to familiarity, so the student comes to inhabit the professional world'. Their conclusions include that there is no magical formula to predict a learner's academic nor professional performance, preparation must include more than merely cognitive knowledge, and that successful education requires both the 'art' of teaching and the 'science' of teaching'.

They raise valid questions about determining the effectiveness of professional education (p. 964) as indicated below, and these are readily applied to project management education:

- Are there student attributes that will result in better prepared professionals?
- What aspects of professional education must students master before entering the practical environment?
- Have the characteristics of effective practical instruction been fully identified?
- What are the most efficient and the most effective methods for evaluating a learner's practical performance?

Also of importance to project management is their suggestion that professional education suffers from two versions of insufficient theory:

- Many professions are themselves loosely defined, and that their practice is based on models such as habit, the 'artist as hero', or craftsmanship—there is no 'theory of action'; and
- Professional education, resting on an already tenuous theory base, suffers further because there is little education theory of action for instruction – particularly practical instruction.

Adult education

Malcolm Knowles (1973) carried out extensive research into adult education during the 1970s and 1980s and highlighted the problem of inappropriate learning for mature age students. He revived the use of the term 'andragogy' and defined it as the 'art and science of helping adults learn' (quoted in (Jarvis, Holford & Griffin 1998, p. 61)). The emphasis in andragogy is for learning to be student-centred rather than teacher-centred, for the educator to take the role of facilitator rather than teacher, and to allow each student to realise his or her own potential (Jarvis, Holford & Griffin 1998, p. 77). Jarvis suggests that self-directed learning is most appropriate for adult learners because 'self-directed learners are better learners, adults do not need teachers in the sense that they are perfectly capable of taking charge of their own learning, and open and independent learning systems are creating a need for students to develop appropriate skills (in self-directed inquiry)' (p. 81).

As a result of the research by Knowles (1973) and Stephen Brookfield (1995), adult learning is now 'strongly identified with personal growth and social change' (Jarvis, Holford & Griffin 1998, p. 85). This point is particularly relevant for mature age students who return to tertiary education at postgraduate level to prepare themselves for senior positions within their professional communities, and appears to be at odds with a narrowly defined competency-based evaluation along vocational guidelines for professional accreditation.

Objectives of learning and evaluation

Jones & Paolucci (Jones & Paolucci 1999, p. 9) suggest that 'assessment of learning outcomes provides the major feedback mechanism' and 'is critical in evaluating the instructional system and its effectiveness. The information that is collected as evidence of learning achievement will depend on the nature of competency being measured'. These consist of 'cognitive tests (measurement of intellectual skills), performance tests (measurement of capability) and attitudinal tests (measurement of disposition and perspective)'.

Bloom's (1956) taxonomy of learning in the cognitive domain provides part of an essential framework for understanding desirable educational objectives and skills and the processes necessary to achieve them. The hierarchy of learning outcomes for this domain is:

- lower order learning objectives of knowledge, comprehension and application; and
- higher order learning objectives of analysis, synthesis, and evaluation.

Jones & Paolucci (1999) suggest that 'learning is achieved when a permanent change in thinking, attitude, or behaviour is experienced' (p. 3) and that instructional objectives can and should be based on one or more of the following factors:

- learning domain—cognitive, affective or psychomotor
- learner profile—objectives should be appropriate for the learner's level of ability
- task characteristics—instructional objectives should be appropriate for the tasks associated with the subject matter that is to be learned, and
- grouping—instructional objectives should be appropriate for the grouping arrangement and learning situation.

Farivarsadri (2001) has researched the pedagogy of architectural education, for which there are many parallels with project management, and asserts that 'education's purpose goes much beyond the mere transformation of knowledge; it aims at implementing changes in the patterns of behaviour of a social group in the desired direction' (p. 2). He also indicates that apart from preparing students for a profession, a university architectural education 'is different from training that is only giving knowledge and skills necessary to serve a profession' and that:

'a holistic university education aims at addressing the whole person, developing the personalities of students in different dimensions, making them know how to acquire knowledge, to communicate, to be aware of his own values, and those of the other's as well. So does a holistic architectural education. This education in one end should prepare student for the profession with necessary abilities and skills and on the other end should educate them as people aware of social realities, being able to see the problems, to find solutions, have critical thinking, have their own values, etc' (p . 2).

There are considerable parallels here with project management education, and extend the range of issues to be considered beyond Bloom's cognitive domain into the affective

domain. This is consistent with the views of tertiary educators from interviews carried out by the author, but appears to be in conflict with the limited range of competencies considered for professional development and accreditation by professional bodies.

Project management comprises a wide range of roles and responsibilities, and this must be reflected in the educational programs. Conner et al (1996, p. 33) remind us that 'what might be effective when we're novice learners, meeting complex bodies of information for the first time, may not be effective, efficient, or stimulating for learners who are more familiar with the content'. Consideration of competencies in the affective domain becomes increasingly significant as higher levels of education are reached, such as those in postgraduate studies. The importance of competencies in the psychomotor domain varies from discipline to discipline. They may be of considerable importance to professional activities in medicine (surgery) and architecture (design and drawing), but may be of marginal importance to project management and many other business disciplines.

Learning effectiveness

Research into the effectiveness of educational programs recommends consideration of the learning outcomes over the entire program, rather than perceptions of the effectiveness of a single component of the program, or of the learning processes themselves, and research into distance education suggests a consistent lack of a theoretical or conceptual framework in such evaluation (Perraton 2000; Phipps & Merisotis 1999; Saba 2000). The conceptual framework of project management education must consider the significant components of learning outcomes mapped to an existing overall framework of professional competencies, and these are considered later.

Kretovics and McCambridge (2002) have indicated that the research focus 'has now shifted to value-added measures that assess what students have actually learned as a result of their participation' and that 'one systematic way to measure student learning would be to compare measures of student competencies at the beginning and end of their educational experience' but concede that 'few schools of business have conducted outcome studies that compare their graduates to their newly admitted students'. They conclude that 'there are no significant differences in the learning outcomes of students enrolled in distance courses as

compared to traditional face-to-face classroom settings'. Their framework involved measurement of twelve learning skills grouped into four major skill areas:

- Interpersonal skills—helping, leadership, and relationship skills
- Information gathering skills—sense-making, information gathering, information analysis
- Behavioural skills—goal setting, action, initiative
- Analytical skills—theory, quantitative, technology

(Kretovics & McCambridge 2002)

Jones & Paolucci's (1999) research into evaluation of the educational effectiveness of learning technology suggests a framework as indicated in figure 1.

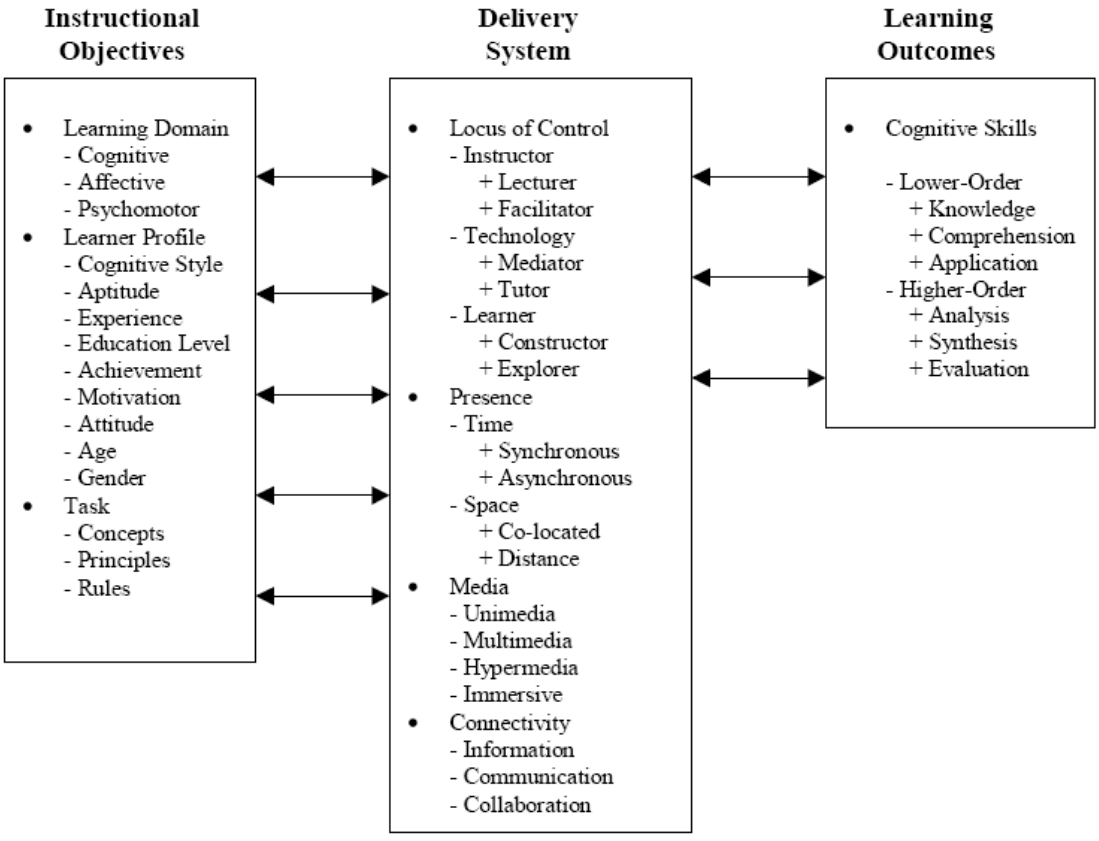

Figure 1: Research framework for evaluating the effectiveness of educational technology on learning outcomes.

Source: (Jones & Paolucci 1999, p. 10)

Mayes (2001) suggests that learning must be active, that the best way to get students to think deeply is to get them to perform some kind of problem solving, that meaningful learning is partly determined by the social and organisational context, and that a particularly effective form of learning is that which occurs in groups. These views are supported by Sommerlad who indicates that research has brought new theoretical perspectives and insights to the 'new learning', and that some of the core concepts include an emphasis on learning as a social or distributed activity rather than an individual cognitive activity, a focus on learning in communities rather than as isolated individuals, incorporation of the social world of the learner into the educator's identity, and the centrality of the learning setting or context to the learning process (Sommerlad 2003, p. 151).

Exploratory research into project management education

To confirm the conclusions drawn from the literature review discussed above, the author has carried out interviews with representatives of major stakeholders in project management education including academic staff from three universities offering Masters level programs in project management, a Government project manager responsible for providing project management services and training in the public service sector, a senior consulting project manager who is also an executive office holder of a major professional body in Australia, a senior project manager providing consulting and contractual services to the Department of Defence, and a postgraduate project management student.

Data reduction and analysis of the interview material has identified the following themes and categories relating to postgraduate education in project management:

- The incorporation of ***autonomous learning processes*** including:
  - reflective and self-referential learning skills
  - deep learning
  - the academic role to be one of facilitation
  - mapped to an overall competency framework
  - incorporating a range of assessment techniques including self-assessment and peer-assessment
  - high levels of communication among educators and students
- ***Personal transformation*** outcomes to include:

- change mindset and perspective
- generate new visions
- change platform of thinking
- development of personal competencies and soft competencies
- becoming a lifelong learner
- challenge and address prejudices
- qualifications, recognition and status

- ***Professional transformation*** outcomes to include:
  - development of professional competencies
  - become self reflective with regard to ongoing professional development
  - involvement in the definition and development of the profession
  - provide a positive influence on changing the professional culture
  - establishment of professional standards and best practice

These conclusions are consistent with the views of Jarvis {, 1998 #195, p. 77} who suggests a focus on such concepts as 'self-determination, self-actualisation or self-transformation as the underlying concepts of all education for adults'. Table 2 provides a comparison of the pedagogical issues associated with the project management programs identified in Table 1.

Table 2: Pedagogical Dimensions of Project Management Training and Educational Programs in Australia

Item	Training	TAFE	HE Undergrad	HE Masters Coursework	HE Masters Research	HE Prof Doctorate	HE Research Doctorate
Academic qualification outcomes	Ranges from • no qualification up to • Diploma in PM	Ranges from • Certificate to • Diploma in PM	• Diploma PM • Undergrad Degree eg BPM (Note: no courses in Australia)	• P/G Certificate • P/G Diploma • Master of PM • MBA (PM)	• Master of PM	• Prof doctorate (eg DPM, DBA)	• PhD
Assessment basis	Either • None or • by competency based	• by competency based	• Knowledge based	• Knowledge based	• Research based	• Knowledge and research based	• Research based
Assessment methods	• None or • competency assessor	• Competency assessor	• Institutional assessment	• Institutional assessment • Self assesst • Peer assess't • Group assess't	• Self assessment	• Self assessment	• Self assessment
Typical assessment medium	• None or • competency tasks	• Competency tasks	• Assignments • examination	• Assignments • examinations	• Dissertation	• Dissertation	• Dissertation
Level of prior learning required	• None required	• None required • secondary school	• Secondary school	• Undergrad degree	• Research undergrad degree	• Coursework Masters degree	• Research Masters degree
Duration of learning program	Short courses • 1 day upwards	From • a few weeks to • 1year full time • 2 years part time	• 3 years full time • 6 years part time	• 1.5 years part time • 3 years full time	• 1.5 years part time • 3 years part time	• 1.5 years part time • 3 years full time	• 3 years full time • 5 years part time
Educational objectives in cognitive domain (Bloom 1956)	Lower order only	Lower order only	Lower and middle order	Lower to higher order	Higher order	Higher order	Higher order
• Knowledge	High	High	High	Medium	Low	Low	Low
• Comprehension	Medium	Medium	High	High	High	High	High
• Application	Low	Low	Medium	High	High	High	High
• Analysis	Low	Low	Medium	High	High	High	High
• Synthesis	Low	Low	Medium	High	High	High	High
• Evaluation	Low	Low	Medium	High	High	High	High
Approach to learning	Highly directed learning	Highly directed learning	Directed learning and independent	Partly directed but mostly independent	Highly independent learning	Highly independent learning	Highly independent learning

• on the basis of:			learning	learning			
• Collaborative learning and group work	Negligible	Negligible	Low	Medium to high	Low	Medium	Low
• Level of independent learning	Low	Low	Medium	Medium to high	High	High	High
• Level of reflective learning	Negligible	Negligible	Low	Medium	High	High	Very high
• Level of content delivery	Very high	Very high	High	Medium	Low	Low	Low
Instructor/student communication	High	High	High	Medium	Low	Low	Low
Student/student communication	Low	Low	Low to medium	Medium to high	Low	Low	Low

From the comparison in table 2, the following conclusions can be drawn with regard to postgraduate programs:

- The *'approach to learning'* changes significantly for postgraduate programs from one of directed learning to one of independent learning
- Although the *assessment media* for postgraduate coursework programs are similar to those of undergraduate programs (assignments and examinations), the recommended *assessment methods* change significantly to incorporate self-assessment, peer-assessment and group-assessment.
- The emphasis for *learning objectives* changes from lower order to higher order
- The nature of *communication* changes from an emphasis of instructor/student to one of student/student, involving a high level of collaborative learning.

Educational technology in project management

Goodyear (1998) suggests that possibly, the main driver for the increasing use of educational technology in higher education is that ICT (information and communication technology) has become a ubiquitous technology in the world of work. Taylor {, 2001 #275, p. 2} suggests that 'universities with a significant commitment to distance and open education institutions have been at the forefront of adopting new technologies to increase access to education and training opportunities', and that we are approaching the fifth generation of distance education with increasing levels of technology:

- first generation—traditional distance education model using print media
- second generation—the multi-media model
- third generation—the tele-learning model
- fourth generation—flexible learning model
- fifth generation—the intelligent flexible learning model.

The guidelines indicated in table 2 above for effective project management education provide a framework for considering how technology can be used to create an effective learning environment. Fundamental principles for best practice in education that were developed in the 1980s (Chickering & Gamson 1987) have since been updated to consider the effects of educational technology. They maintain that cost effective best practice:

- encourages contact between students and faculty

- develops reciprocity and cooperation among students
- uses active learning techniques
- gives prompt feedback
- emphasises time on task
- communicates high expectations
- respects diverse talents and ways of learning

(Chickering & Ehrmann 1996)

In the broadest sense, flexible learning is about a learner-centred rather than a teacher-centred approach to learning, and in this view technology can be an enabler but the effective use of learning technologies can be held back by poor underlying pedagogy. Program effectiveness does not necessarily require maximum flexibility and the point is to maximize effectiveness, not flexibility (Radclife 2002). Jonassen (2003) has carried out extensive research into the effective use of educational technologies and suggests that they should be used to keep students' learning:

- *active* and engaged by the learning process
- *constructive* in order to integrate new ideas with prior knowledge
- *collaborative* in learning and knowledge building communities
- *intentional* and goal directed
- *complex*—engaged in ill-structured problem-solving
- *contextual* and situated in some meaningful real world task.
- *conversational* through a social, dialogical process
- *reflective* so they can articulate what they have learned and reflect on the processes.

Considering the points above, tables 3 and 4 illustrate how technology can be incorporated into project management education and the implications for the respective learning environments. The effectiveness of the respective learning environments using a theoretical framework is analysed in a later section of this paper (see table 5). For the purposes of comparison, the term 'computer-based learning' (CBL) has been used in this paper to indicate a non-portable system that can only be accessed by students in an on-campus computer laboratory, however, many other definitions of CBL are possible. Again for the purposes of this comparison, 'CD-ROM/DVD' indicates that learning materials are

made available to students in those media, and that students are required to undertake their learning in isolation in distance mode. In practice, these media are used in conjunction with the internet to establish communication among the various parties. 'Internet' implies that students are engaged in 'e-learning' using only the Internet for access to learning materials and communications.

Table 3: Utilisation of Educational Technology in Project Management Training and Educational Programs

Item	Training	TAFE	HE Undergrad	HE Masters Coursework	HE Masters Research	HE Prof Doctorate	HE Research Doctorate
Availability of learning materials by institution	Yes	Yes	Yes	Yes			
Access by student to additional prescribed content	Yes	Yes	Yes	Yes			
Access to research materials				Yes	Yes	Yes	Yes
Instructor/student communication	Yes	Yes	Yes	Yes			
Student/student communication			Yes	Yes			
Research supervisor/student communication					Yes	Yes	Yes
Formative self assessment of learning	Yes	Yes	Yes	Yes			
Institutional formative assessment of learning	Yes	Yes	Yes	Yes			
Institutional summative assessment of learning	Yes	Yes	Yes	Yes			
Need for • access to technology for • or use of:							
• Word processing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Spreadsheets			Yes	Yes	Yes	Yes	Yes
• Project management software programs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Databases				Yes	Yes	Yes	Yes
• Graphics packages			Yes	Yes	Yes	Yes	Yes
• PowerPoint	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Multimedia (Java, Flash etc)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Internet browser	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Internet WWW	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Video conferencing	Yes	Yes	Yes	Yes		Yes	
• Telephone conferencing	Yes	Yes	Yes	Yes		Yes	
• Email			Yes	Yes	Yes	Yes	Yes
• Synchronous communications—chat rooms			Yes	Yes	Yes	Yes	Yes
• Asynchronous communications—discussion boards			Yes	Yes	Yes	Yes	Yes
Educational technology media commonly utilised (CBL = computer based learning)	• CBL • CD / DVD • Internet	• CBL • CD / DVD • Internet	• CBL • CD / DVD • Internet	• CD / DVD • Internet	• Internet	• Internet	• Internet

From this understanding of technological applications in project management education, we can consider a comparison of the respective technological media suggested above.

Table 4: Comparison of technology-based learning environments with on-campus and paper-based distance education for project management

	Technology based learning environment			On-campus learning	Traditional distance education medium
Implications of educational technology	**On-campus computer-based learning (CBL)**	**Interactive CD / DVD**	**Internet / email**	**Face to face**	**Paper based education**
Suitability for off-campus use	Nil	High	High	Nil	High
Suitability for on-campus use	High	High	High	High	High
Suitability for range of learning styles • such as (Fleming 2001):	Medium	Medium	Medium	High	Low
• Visual learners	High	High	High	High	Low
• Aural learners	High	High	High	High	Low
• Read/write learners	Low	Low	Low	High	High
• Kinaesthetic learners	Medium	Medium	Medium	High	Low
Level of interactivity	High	Medium	Medium	High	Low
Portability of learning materials	Nil	Medium	Medium	Low to medium	High
Cost implications for institution of development of learning materials	High	High	High	High	Medium
Cost implications for institution of production of materials after development	Low (infrastructure costs applicable)	Very low	Very low	Medium	Medium to high
Cost implications for institution of providing access to / delivery of learning materials	Very low	Very low	Very low	High	High
Cost implications for student of accessing learning materials	Nil	Medium (printing costs)	Medium (printing costs)	Nil	Nil
Suitability for instructor-student communication	Nil	Nil	High	High	Nil
Suitability for student-student communication	Nil	Nil	High	High	Nil
Flexible study pathway	Medium	High	High	High	High

Framework for evaluation of project management education

In order to carry out a more quantitative analysis of the likely effects of technology on project management education, it is essential to derive a suitable framework for evaluation. In the mid 1990s, Cheetham & Chivers (1996) developed a framework for evaluation of professional competencies. They indicate that competence can be a difficult concept to pin down when it relates to professional occupations, where roles can be complex and the knowledge and skills involved are many and varied. They suggest that the components of professional competence are those indicated in figure 2, comprising functional competence, personal or behavioural competence, knowledge/cognitive competence and values/ethical competence (p. 24)

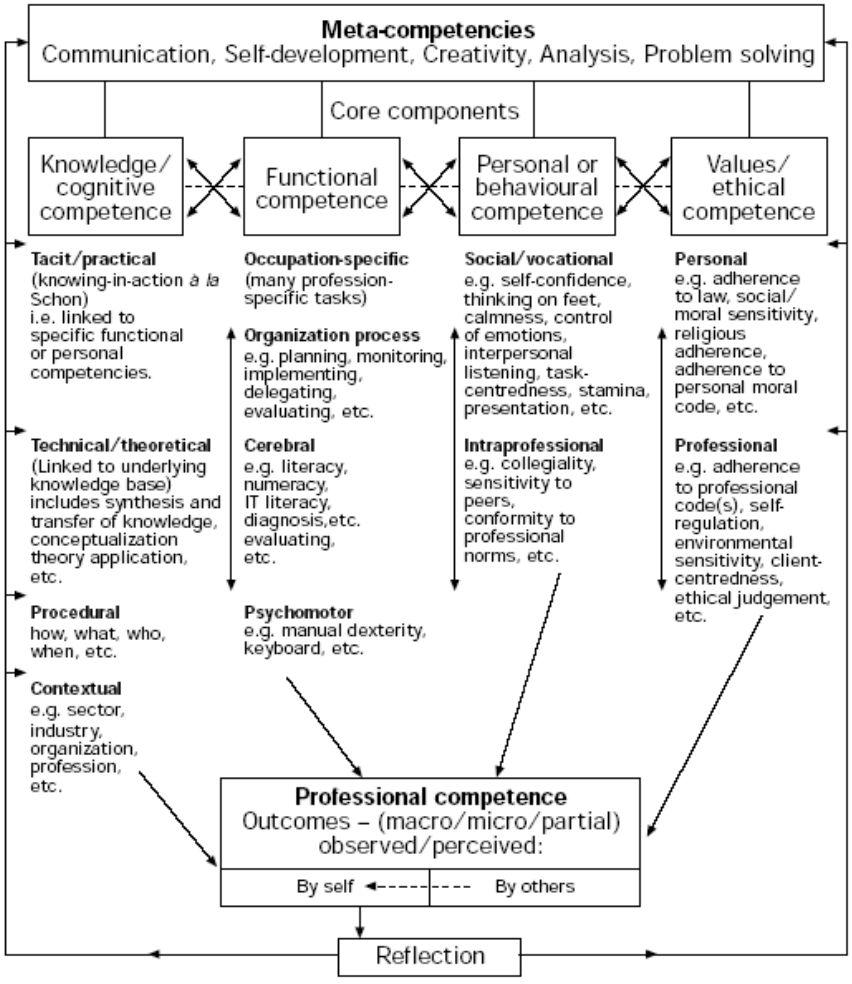

Figure 2: Provisional model of professional competence

Source: {Cheetham, 1996 #605, p. 27}

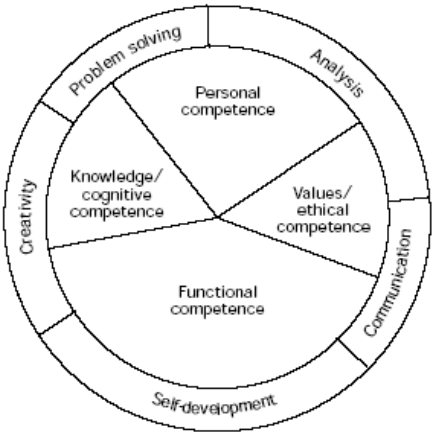

Figure 3: Typical example of occupational competence mix (including meta-competencies)
Source: {Cheetham, 1996 #605, p. 28}

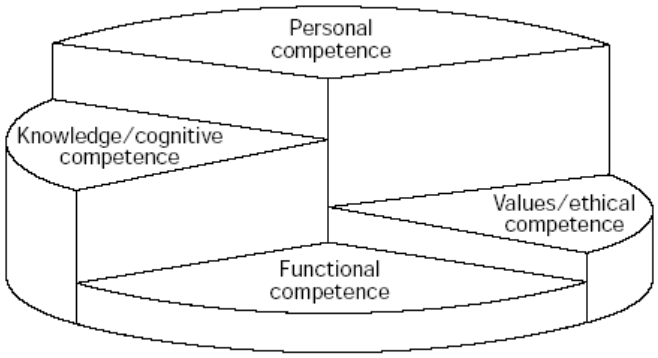

Figure 4: typical example of individual competence mix (excluding meta-competencies)
Source: {Cheetham, 1996 #605, p. 29}

Using this framework, a comparison of the utilisation of educational technology on the respective programs is illustrated in table 5. Numeric values have been allocated for the likelihood of the competence element to be facilitated or enhanced by the respective media. At this stage, there is no empirical basis for the allocation of these values and they are based on personal judgement by the author.

Table 5: Comparison of technology-based learning environments with on-campus and paper-based distance education for project management education
(based on the Cheetham/Chivers Competence Model)

Elements of professional competence based on framework by Cheetham & Chivers (scored from 0 to 5, ranking in brackets)	**Technology based learning environments**			**On-campus learning**	**Traditional distance education**
Suitability of educational technology to develop/ demonstrate professional competencies	**On-campus CBL**	**Interactive CD / DVD**	**Internet/ email**	**Face to face**	**Paper based education**
Meta-competencies (generic & over-arching)	**20 (3)**	**19 (4)**	**24 (2)**	**25 (1)**	**16 (5)**
• Communication	3	2	5	5	2
• Self-development	3	3	4	5	3
• Creativity	4	4	5	5	3
• Analysis	5	5	5	5	4
• Problem-solving	5	5	5	5	4
Core skill 1—Knowledge/cognitive competence	**15 (=3)**	**15 (=3)**	**17 (2)**	**20 (1)**	**15 (=3)**
• Tacit/practical (knowledge embedded in functional / personal competencies)	4	4	4	5	4
• Technical/theoretical (underlying knowledge base of the profession, theories & principles)	4	4	4	5	4
• Procedural (the how, what, when of routine professional activities)	3	3	4	5	3
• Contextual (background knowledge specific to an organisation or industry)	4	4	5	5	4
Core skill 2—Functional competence	**16 (=3)**	**16 (=3)**	**17 (2)**	**19 (1)**	**15 (5)**
• Occupation-specific (tasks that relate to a particular profession)	4	4	4	5	4
• Organisational/process (tasks of a generic nature, planning, delegating etc)	3	3	4	4	3
• Cerebral (skills involving mental activity—literacy, numeracy, etc)	5	5	5	5	5
• Psychomotor (skills of a physical nature)	4	4	4	5	3
Core skill 3—Personal/behavioural competence	**7 (=3)**	**6 (=3)**	**8 (2)**	**9 (1)**	**6 (=3)**
• Social/vocational (behaviours relating to performance of professional tasks—self-confidence, task-centredness etc)	3	3	4	5	3
• Intra-professional (behaviours relating to interaction with other professionals, collegiality, professional norms etc)	3	3	4	4	3
Core skill 4—Values/ethical competence	**6 (=3)**	**6 (=3)**	**8 (2)**	**9 (1)**	**6 (=3)**
• Personal (adherence to personal moral / religious codes etc)	3	3	4	5	3
• Professional (adherence to professional codes, client centredness, environmental sensitivity etc)	3	3	4	4	3
Professional competence—outcomes	**14 (=3)**	**14 (=3)**	**16 (2)**	**18 (1)**	**12 (5)**
• Macro outcomes (competencies developed over a period of time through a combination of core components)	3	3	3	4	3
• Micro outcomes (indicate proficiency in single competencies)	5	5	5	5	4
• Perceived by self (reflection)	3	3	4	4	3
• Perceived by others	3	3	4	5	2
TOTAL SCORE	**78**	**76**	**90**	**100**	**70**
OVERALL RANKING	**3**	**4**	**2**	**1**	**5**

Source: Adapted from Cheetham & Chivers {, 1996 #605}
Note: there is no empirical basis for the allocation of numerical values to the respective elements, and no weighting has been allocated to the various elements.

Conclusions from analysis

Based on the evaluation framework, the comparative analysis above suggests the following possible conclusions with regard to the development of competencies in professional project management education:

- Face to face education may be measurably superior to other educational environments
- A web-based learning environment supplemented by email communications and electronic discussion boards (such as those supported by Blackboard and WebCT) may provide a better learning environment than campus-based Computer Based Learning (CBL), CD-ROM/DVD or paper-based distance education (which ranks last of the five environments considered)
- Paper-based distance education may be particularly poor in developing the meta-competencies defined in the framework
- There may be little difference between the various modes in the development of the knowledge/cognitive competencies
- There may be marginal differences between the modes in the development of the functional competencies
- There may be noticeable differences between the modes in the development of personal/behavioural competencies and values/ethical competencies
- There may be significant differences between the modes in the overall development of the professional competencies insofar as they relate to the concept of the 'reflective' practitioner.

Further research required

Empirical research is required to confirm or refute the values attributed to the respective elements of competence in the analysis above, and this will form part of further research to be carried out by the author. Of particular interest will be how the deficiencies suggested in the learning environments associated with educational technologies of CD-DVD and the Internet can be overcome or minimised.

Conclusion

This paper has provided an overview of project management education in Australia, and identified the general characteristics of programs commonly provided. It has looked at how educational technology can be incorporated into the respective programs, and then suggested the effectiveness of the various environments for developing professional competencies using a conceptual framework developed by Cheetham & Chivers (1996). The conclusions drawn from that analysis have suggested further research to confirm or refute the assumptions for the analysis.

List of References

Australian Institute of Project Management 2002, 'Project Management Courses', *Australian Project Manager*, vol. 22, no. 3, pp. 19-31.

Benson, R, Hardy, L & Maxfield, J 2001, 'The international classroom: Using reflective practice to improve teaching and learning', paper presented to ASCILITE 2002 The 18th Annual conference of the Australian Society for Computers in Learning in Tertiary Education, Melbourne, 9-12 December.

Bloom, BS 1956, *Taxonomy of educational objectives: The classification of educational goals: Book I, cognitive domain*, Longmans, New York.

Brookfield, S 1995, 'Adult learning: an overview', in A Tuinjman (ed.), *International Encyclopedia of Education*, Pergamon Press, Oxford.

Cheetham, G & Chivers, G 1996, 'Towards a holistic model of professional competence', *Journal of European Industrial Training*, vol. 20, no. 5, pp. 20-30.

Chickering, AW & Gamson, ZF 1987, 'Seven principles for good practice in undergraduate education', *AAHE Bulletin*.

Chickering, AW & Ehrmann, SC 1996, *Implementing the Seven Principles: Technology as Lever*, AAHE, viewed 20 April 2002, <http://www.tltgroup.org/programs/seven.html>.

Conner, M, Wright, E, Curry, K, de Vries, L, Zeider, C, Wilmsmeyer, D & Forman, D 1996, *Learning: The Critical Technology: A whitepaper on adult education in the information age*, Wave Technologies, St Louis USA.

Dinham, SM & Stritter, FT 1986, 'Research on Professional Education', in M Wittrock (ed.), *Handbook of Research on Teaching*, 3rd edn edn, The American Educational Research Association, Simon & Schuster Macmillan, USA.

Farivarsadri, G 2001, 'A critical view on pedagogical dimension of introductory design in architectural education', paper presented to Architectural Education Exchange AEE2001, Cardiff, 11-12 September.

Fleming, N 2001, *The VARK Questionnaire*, viewed 12 August 2002, <http://www.vark-learn.com/english/index.asp
http://www.vark-learn.com/questionnaire.htm>.

Goodyear, P 1998, 'New technology in higher education: understanding the innovation process', paper presented to Integrating Information and Communication Technology in Higher Education (BITE), Maastricht, 25-7 March 1998.

Jaafari, A 1998, 'Project managers of the next millennium: do they resemble project managers of today?' paper presented to 14th Annual IPMA Project Management Conference, Ljubljana, Slovenia, 1013 June.

Jarvis, P, Holford, J & Griffin, C 1998, *The Theory and Practice of Learning*, Kogan Page, London, UK.

Jonassen, D 2003, *Welcome to the Design of Constructivist Learning Environments(CLEs)*, viewed 4 August 2003, <http://tiger.coe.missouri.edu/~jonassen/courses/CLE/main.html>.

Jones, T & Paolucci, R 1999, 'Evaluating the Effectiveness of Educational Technology on Learning Outcomes: A Research Framework', *Journal of Research on Computing in Education*, no. Winter.

Knowles, M 1973, *The Adult Learner: A Neglected Species*, Gulf, Houston.

Kretovics, M & McCambridge, J 2002, 'Measuring MBA Student Learning: Does Distance Make a Difference?' *The International Review of Research into Open and Distance Learning*, vol. October 2002.

Mayes, T 2001, *E-Learning: Some misconceptions and a framework for development*, Toowoomba, 5 December 2001, PowerPoint presentation and printout.

Perraton, H 2000, 'Rethinking the research agenda', *International Review of Research in Open and Distance Learning*, vol. 1, no. 1.

Phipps, R & Merisotis, J 1999, *What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education*, The Institute for Higher Education Policy, Washington, USA.

Radclife, D 2002, 'Technological and Pedagogical Convergence between Work-based and Campus-based Learning', *Educational Technology & Society*, vol. 5, no. 2, pp. 54-9.

Saba, F 2000, 'Research in Distance Education: A Status Report', *International Review of Research in Open and Distance Learning*, vol. 1, no. 1.

Schon, DA 1987, *Educating the Reflective Practitioner*, Jossey-Bass, San Francisco, USA.

Sommerlad, E 2003, 'Theory, research and practice - the problematic appearance of 'pedagogy' in post-compulsory education', *Journal of Adult and Continuing Education*, vol. 8, no. 2, pp. 147-64.

Taylor, J 2001, *Fifth Generation Distance Education*, 40, Department of Education, Training & Youth Affairs, Canberra.

Turner, JR 1999, *Is Project Management a Profession?*, viewed 10 August 2003, <http://www.pmforum.org/docs/pmprof.htm>.

Turner, JR & Huemann, M 2000, 'Formal education in project management: current and future trends', paper presented to PMI Annual Seminars & Symposium, Houston, USA, 7-16 September 2000.

Turner, JR, Keegan, A & Crawford, L 2000, 'Learning by experience in the project-based organisation.' paper presented to Project Management Research at the Turn of the Millennium: Proceedings of PMI Research Conference,, Paris, 21-24 June.

Wirth, I & Amos, SJ 1996, 'Distance learning for project management', *AACE Transactions*.