4. Tertiary Courses in ICT

4.1 Higher Education in the KBE

The higher education sector plays a key role in the human resourcing needs in ICT. As indicated in Table 3.4, there are many high-level job tasks in ICT that requires tertiary level education to complete. The role of university education is to ensure such educational preparation is available.

But higher education does not serve this role alone. It is widely understood that formal education is only one of the many sources of input into the skills required by a member of the workforce. Other influences in skill development are illustrated in Figure 4.1.

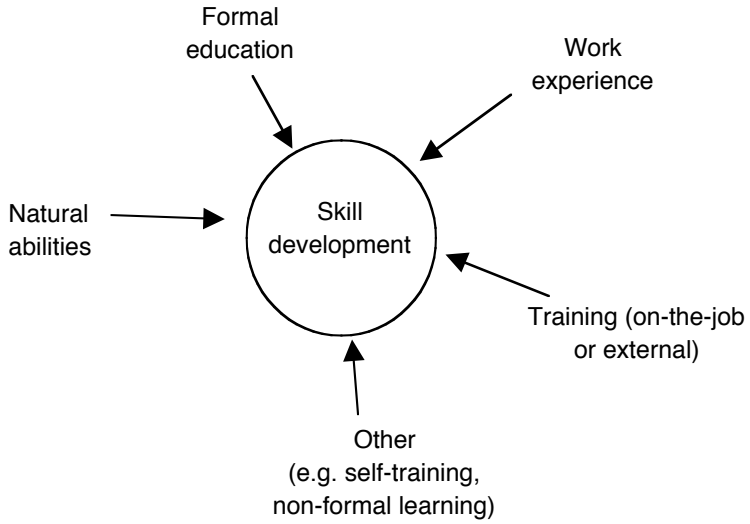

Figure 4.1: How skills are acquired. Source: OECD(2002) page 159.

4.2 ICT Qualifications in Australia

ICT qualifications in Australian higher education exist within the general Australian Qualification Framework (AQF). This framework consists of the Kindergarten to Year 12 (K-12) system, vocational education and training (VET), as well as higher education. Figure 4.2 shows the relationship between the various components.

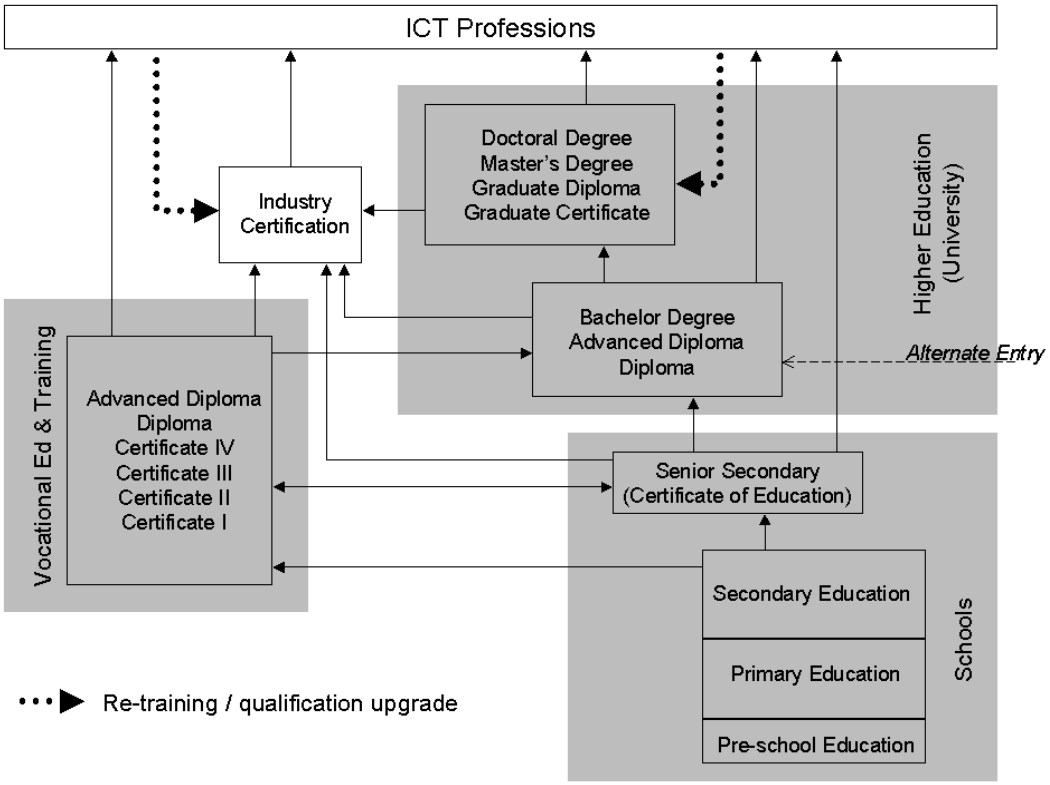

Figure 4.2: Pathways to ICT Qualifications in Australia. The qualification available in the three greyed boxes together forms the current national Australian Qualification Framework (AQF).

Due to the high rate of change in this sector, the re-training/qualification upgrade market has become a significant part of education and training.

4.3 Body of Knowledge

Within any educational area, there needs to be a coherent body of knowledge to guide the development of curriculum. In this regard, a significant international initiative is the *Computing Curricula 2001* (or CC2001) project. This is a joint task force formed in 1998 by the Institute for Electrical and Electronic Engineers' Computer Society (IEEE-CS) and the Association for Computing Machinery (ACM). Its charter was to review the old *Computing Curricula 1991* and develop a new model that is appropriate based on recent developments.

Due to the breath of the field, IEEE-CS and ACM created additional committees to deal produce curricula "volumes" on four specific areas:

1. The volume on *Computer Science* is handled by the CC2001 Joint Task Force itself[33].

2. The volume on *Computer Engineering* is also handled by the CC2001 Joint Task Force[34].

[33] See http://www.computer.org/education/cc2001/final/index.htm.
[34] See http://www.eng.auburn.edu/ece/CCCE/.

3. The volume on *Software Engineering* is handled by the Joint Task Force on Software Engineering Education Project (SWEEP)[35].

4. The volume on *Information Systems* is handled by a joint effort between the ACM, the Association for Information Systems (AIS), and the Association for Information Technology Professionals (AITP)[36].

An approved final draft of the Computer Science volume was released in December 2001 (IEEE-ACM 2001). The other volumes are still work-in-progress. ACM, AIS and AITP also have an extensive history in defining IS body of knowledge, culminating in the currently used IS'97 version, and developments in the new IS2002 model[37]. The volumes on Computer Engineering and Software Engineering are work-in-progress.

Details of IS'97 and the CC2001 Computing Science is given in Appendix D.

In Australia, the Australian Computer Society (ACS) plays an influential role in shaping the developments of computing curricula in higher education. ACS defines a set of *Areas of Knowledge* in Information Technology. ACS' developments follow from some of the work done by ACM and IEEE-CS. While recognising the difficulty in defining what exactly Information Technology is, ACS still mean for the areas of knowledge to be the "*… core Body of Knowledge in Information Technology which* ***all*** *I.T. professionals practising in Information Systems, Computer Science and Computer Systems Engineering should be expected to have.*"[38]

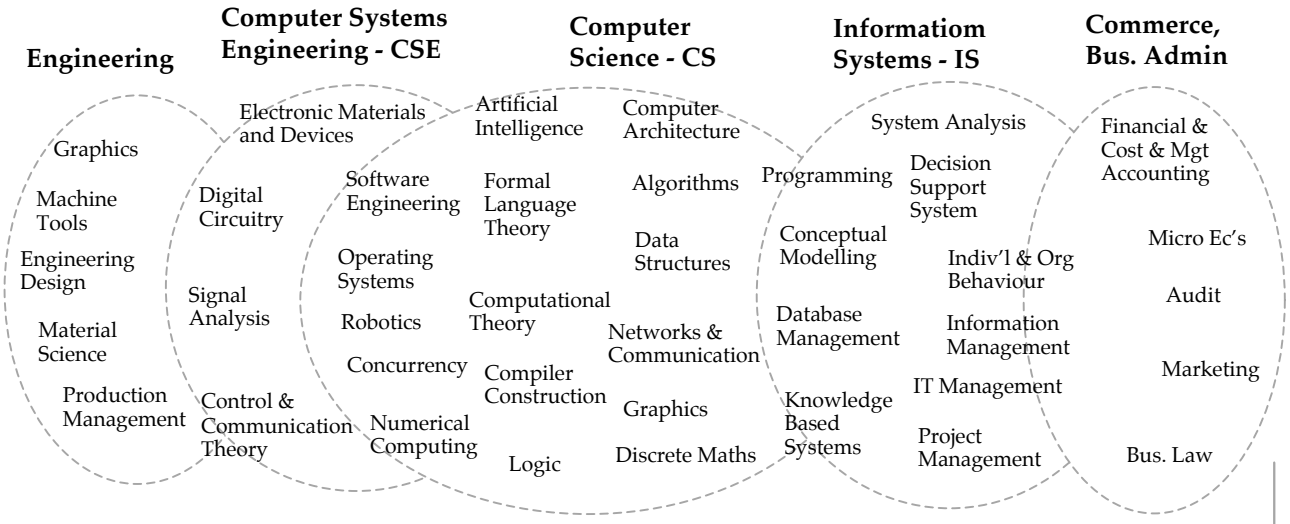

Figure 4.3: ACS' Conceptual Model of I.T. Related Body of Knowledge. Source:
http://www.acs.org.au/static/national/pospaper/attach.htm

The ACS categorises IT-related fields as in Figure 4.3. This categorisation is in keeping with some of the perspectives discussed in section 1.2. It is also in line with the breakdown of the *Information Technology* category under the Australian Standard

[35] See http://sites.computer.org/ccse/.
[36] See http://www.is2000.org/.
[37] See http://192.245.222.212:8009/IS2002Doc/Main_Frame.htm.
[38] Quoted from http://www.acs.org.au/national/pospaper/bokpt1.htm.

Classification of Education (ASCED), used by the Australian Bureau of Statistics (ABS) and the Commonwealth Department for Education, Science and Training (DEST) for higher education statistical collection purposes in Australia (see Appendix D for details on ASCED).

However, the current ACS and ASCED definitions seem to be slightly out-of-date with current international developments in ICT as outlined in section 1.2. In particular, the weaknesses include loose integration between Information Technologies and Communication Technologies (Communication Technologies are classified separate from IT as a field in ASCED), and the lack of references to other electronic content areas such as Digital Media.

There is no question that the body of knowledge constituting ICT, or IT or *computing* has changed and expanded very dramatically in recent years. This is reflected in the comments from the CC2001 task force:

> *"As indicated in our charter, the goal of the CC2001 effort is to revise Computing Curricula 1991 so that it incorporates the developments of the past decade. That task has proved much more daunting than we had originally realized. Computing has changed dramatically over that time in ways that have a profound effect on curriculum design and pedagogy. Moreover, the scope of what we call computing has broadened to the point that it is difficult to define it as a single discipline. Past curriculum reports have attempted to merge such disciplines as computer science, computer engineering, and software engineering into a single report about computing education. While such an approach may have seemed reasonable ten years ago, there is no question that computing in the 21st century encompasses many vital disciplines with their own integrity and pedagogical traditions."*
>
> (page 1, IEEE-ACM 2001)

4.4 ICT Higher Degrees in Australia

This section presents some summaries on current ICT-related degrees offered in the 43 recognised Australian tertiary institutions. The full list of the degrees is given in Appendix J.

The postgraduate degree numbers below only include ones with professional coursework components. Pure research degrees (Master of Philosophy MPhil and Doctor of Philosophy PhD) are not counted. We expect all research universities to offer MPhils and PhDs in this area, but the actual analysis of those numbers is left for a future study.

Joint degrees are not listed if the component degrees are offered as individual degrees.

Number of institutions offering ICT-related degrees:	40
Number of institutions with no ICT-related degrees:	3
Total:	43