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Education for IT Service Management Standards

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Abstract

Service management standards such as the IT Infrastructure Library (ITIL), and now ISO/IEC 20000, provide guidance and tools for effective management and control of IT service delivery. These standards are of increasing importance to organizations around the globe. Education about these standards and possibilities for training of IT staff are, therefore, important. Universities have a place in this education process; however, academics have not embraced these standards in either research or education about them. Regardless, demand grows for IT staff qualified to various levels, particularly basic or foundation levels, in these standards. This paper considers the training on offer and the requirement for education related to IT service management. Benefits to universities, graduates and industry are numerous including increases in student numbers, enhanced employment options for graduates and improved IT service quality but there are challenges too, in particular how to effectively transfer the knowledge to students who have not experienced the IT service environment first hand.

Introduction

IT service managers are responsible for an increasingly diverse and crucial infrastructure. They are under pressure to reduce costs while helping the organization generate revenue, and to provide fast, cost effective service to their customers. Over the last few years, many organizations have adopted the IT Infrastructure Library (ITIL) to provide effective management and control of IT service delivery and support. The ITIL best practice framework enables managers to document, audit, and improve their IT service management processes in response to business requirements.

In recent years, a quiet revolution has occurred in IT service management as the ITIL phenomenon has spread from the UK government data centers to the IT departments of organizations around the world. With the evolution of ITIL from a 'company' standard to its ratification in December 2005 by the International Organization for Standardization (ISO) as an international standard (ISO/IEC 20000), growth in its adoption is guaranteed to accelerate.

An important feature of ITIL which has facilitated its acceptance is the internationally recognized certification of ITIL training courses. Today, many consulting firms offer ITIL training in response to the demand for ITIL certified staff. Despite this sweeping adoption by industry, most academic institutions appear to be reticent in including IT service management in their IT curriculum (Watson, Pitt, & Kavan, 1998). In fact, there is very little academic research related to ITIL adoption, the exceptions being Hochstein, Tamm and Brenner (2005), Potgieter, Botha and Lew (2005), Niessink and van Vliet (1998; , 2000), and Praeg and Schnabel (2006). It is not surprising that little academic research exists as it has been noted that company standards have been neglected in standardization research (Vries, Slob, & Zuid-Holland, 2006). Furthermore, the only academic research related to ITIL education is that published by Bentley and his colleagues (Bentley, 2006; Jovanovic, Bentley, Stein, & Nikakis, 2006).

The objective of this paper is to describe the evolution of ITIL from a company standard to international standard, and to consider the growing need for training and the possible role of universities in providing education to assist students gain certification related to IT service management.

The paper is structured as follows. Firstly, the methodology used to gather evidence is described. Then a detailed explanation is provided of the ITIL framework, its origins, evolution to an international standard, and growth in adoption. The current ITIL training schemes are evaluated and the role of universities in improving education related to IT service management is then discussed. In the final conclusions section, suggestions are made for further research.

Methodology

As well as reviewing recent literature on ITIL adoption and training, the authors have conducted two surveys and six case studies of ITIL adoption with IT service managers. The analysis is based on the data gained from these sources. The case studies used structured interviews based on an instrument developed by Hochstein et al. (2005). Structured interviews were conducted with the managers of ITIL implementation projects in six large organizations between March and September 2006. The organizations were selected on the basis of their response to a survey which was conducted at the IT Service Management Forum (itSMF) Australian national conferences in 2005 and 2006. These six case studies complement the survey data and enable both a broad view of the phenomenon as a whole and a richer, more detailed picture of a few organizations. The interviews were recorded and transcribed, checked by the researchers and confirmed by the interviewees as a valid record of the interviews.

IT Service Management Standards

Evolution of ITIL to International Standard

In response to the serious economic downturn in the late 1980s, the Central Computer and Telecommunications Agency (CCTA) in the United Kingdom developed the Government Information Technology Infrastructure Management framework to reduce costs and better manage IT service delivery (Sallé, 2004). Since 2000, the ITIL framework has been administrated by the Office of Government Commerce (OGC), an independent office of the UK Treasury.

As shown in Table 1, the core of ITIL version 2 as released in 2001 comprises five service delivery processes, five service support processes and one service support function (service desk). Service support

processes apply to the operational level of the organization whereas the service delivery processes are tactical in nature.

Table 1: Description of core ITIL components (adapted from OGC, 2005)

Service Delivery – Tactical Level	
Service Level Management	Negotiates service level agreements and ensures that these are met. Responsible for ensuring that all IT service management processes, operational level agreements, and underpinning contracts, are appropriate for the agreed service level targets.
Financial Management	Manages an IT service provider’s budgeting, accounting and charging requirements.
Capacity Management	Ensures that the capacity of IT services and the IT infrastructure is able to deliver agreed service level targets in a cost effective and timely manner.
IT Service Continuity Management	Manages risks that could seriously impact IT services. ITSCM ensures that the IT service provider can always provide minimum agreed service levels, by reducing the risk to an acceptable level and planning for the recovery of IT services.
Availability Management	Defines, analyses, plans, measures and improves all aspects of the availability of IT services. Ensures that all IT infrastructure, processes, tools, and roles are appropriate for the agreed service level targets for availability.
Service Support – Operational Level	
Service Desk	The single point of contact between the service provider and the users. Manages incidents and service requests, and also handles communication with the users.
Incident Management	Manages the lifecycle of all incidents. The primary objective is to return the IT service to customers as quickly as possible.
Problem Management	Manages the lifecycle of all problems. The primary objectives are to prevent incidents from happening, and to minimize the impact of incidents that cannot be

	prevented.
Change Management	Controls the lifecycle of all changes. The objective is to enable beneficial changes to be made with minimum disruption to IT services.
Release Management	A collection of hardware, software, documentation, processes or other components required to implement approved changes to IT services.
Configuration Management	Responsible for maintaining information about configuration items required to deliver an IT service, including their relationships.

In the 1990s, ITIL gained the support of the British Standards Institution and was extended and adopted as BS 15000 (Code of Practice for IT Service Management) in 1995. The 2nd edition of BS 15000, incorporating certification, was launched in June 2003. The development of an international standard based on BS 15000 was fast tracked by the ISO/IEC Joint Technical Committee 1 (JTC1) Sub-Committee 7 (SC7). In December 2005, ISO member countries agreed to adopt ISO/IEC 20000 based on BS 15000. ISO/IEC 20000 integrates the process-based approach of ISO's quality management system (ISO 9001:2000) by including the plan, do, check, act cycle and requirements for continual improvement. The IT Service Management standard comprises two parts:

- Part 1: Specification - promotes the adoption of an integrated process approach to effectively deliver managed services to meet the business and customer requirements (ISO/IEC, 2005a);
- Part 2: Code of Practice - provides guidance and recommendations based on industry consensus to service providers planning service improvements and/or seeking to be audited against ISO/IEC 20000-1:2005, and to auditors (ISO/IEC, 2005b).

The core components of ISO/IEC 20000 (shown in figure 1) are similar to those of ITIL with a few exceptions: two relationship processes have been added (business relationship management and supplier management); service continuity management and availability management are combined into one process; and the service desk function is not included in ISO/IEC 20000.

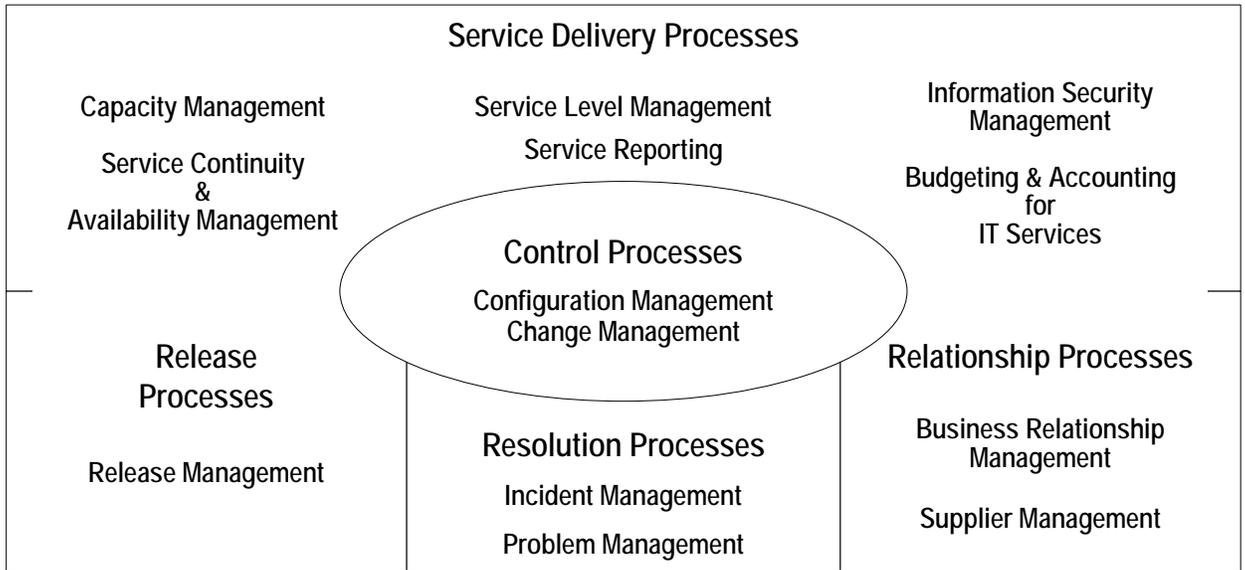


Figure 1: Core components of ISO/IEC 20000 (ISO/IEC, 2005a, p. 1)

To achieve ISO/IEC 20000 certification, companies must successfully undergo a third-party audit by an accredited conformity assessment body. The terms accreditation and certification have specific meanings in relation to international standards, and are in fact defined in ISO/IEC 17000. *Accreditation* refers to third-party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks while *certification* infers third-party attestation related to products, processes, systems or persons (ISO/IEC, 2004).

A successful compliance audit is the culmination of months of planning, training, documentation and review. The qualified auditor seeks objective evidence (records, documents, etc.) to confirm that the activities of the organization are in accordance with the documentation and the requirements of the relevant standard. The process to attain ISO/IEC 20000 certification varies depending on the size of the organization, the breadth of its operation and the prior/existing level of standardization and documentation.

There is a critical difference between ITIL certification and certification to ISO/IEC 20000: ITIL certification is awarded to individuals after successfully completing assessment from an examination institute, whereas ISO/IEC 20000 certification results from an audit of an organizational unit.

Adoption of ITIL

ITIL has a strong following in Europe, especially in the government sector, and adoption is growing in North America and other countries (Barton, 2004). Recent surveys and case studies have reported an upsurge in awareness and adoption of ITIL (Hochstein, Tamm, & Brenner, 2005).

In this section, the salient points from the interviews of the six organizations are presented and illustrated with quotations from the managers interviewed. Due to the commercial sensitivity of the information and comments, the actual names of the organizations cannot be disclosed. The six cases are referred to as Case A to F with the interviewees referred to as Manager A to F and the corresponding organizations as Organization A to F.

Table 2: Summary of key aspects of six case study organizations

Case	Organization Type	# of screens supported	ITIL start date	Processes implemented	Training approach
A	Government Department	600+	Mid 2002	Incident, problem, change, service level, configuration, availability mgmt	Self-study Foundation course & external consultants Foundation course
B	Government Department	25,200	2003	Change, configuration, incident, problem, release mgmt	Consultant firm provided Foundation course for 350 staff
C	Government Department	12,500	Mid 2001	Financial, service level, change, configuration, incident, problem mgmt	80 staff completed Foundation course – external provider
D	Government Department	35,000	Mid 2001	Change, release, incident, problem mgmt	All IT ops staff completed Foundation course provided by two external providers
E	University	11,000	2003	Incident, problem, change mgmt	Mandated Foundation training course to 200 staff (delivered by external consultants)
F	International Finance	70,000	2003	Incident, problem, change mgmt,	Training provider contracted to provide

	Company			BS 15000, ISO/IEC 20000	Foundation course for 800 staff
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The following quotations demonstrate the motivation of each organization regarding the decision to adopt the ITIL framework:

“We had built our practices and processes formerly on the ISO 9000 series of standards and we could see that the ITIL framework was much more aligned with an IT service management business. So when we started, it was clear to see that there would be an evolving standard around IT service management that we would be able to adopt. [We wanted] really to align ourselves with an industry reference framework or an industry reference model that made more sense to us than trying to adopt an esoteric principle within 9001” (Manager A).

“The major objective was to improve our services. And obviously ITIL was tried and tested and a lot of the IP was there. So, it was an obvious choice” (Manager B).

“[Previously] you had maverick and cowboy practices whereby every so often somebody would run off and do something and the whole thing would come crashing down and nobody would know who had done what” (Manager C).

“We had these feral groups doing their own thing, and we had ourselves doing our own thing, and we had IT operations. We didn’t have anything related to really best practices. There were good people and I think people were doing best practices as they knew, but in terms of process, no. There was no formal process in place” (Manager D).

“Standardization makes us more efficient and using common language, you get benefits out of using the same tools ... Our ways of dealing with issues and our ways of responding to critical

and non-critical things is the same all across the university - a standard process for service”
(Manager E).

“The director of service delivery ultimately made the decision ‘we’re going to use ITIL because it’s an industry standard’” (Manager F).

To summarize the motivation of the cases investigated in this study, all managers support the view that ITIL enables standardization of IT service management processes and terminology throughout the organization and that such standardization is vital to ensure a consistent and reliable level of service to the business. These benefits are consistent with the incentives mentioned by Hurd and Isaak (2005) in respect to adopting IT standards: clear communication about capabilities, confidence in functional capabilities, and minimization of investment in retraining.

As shown in table 2, although the sequence of implementation of processes varied, there was consistency in the approach to ITIL training. All organizations invested significantly in contracting external training providers for the ITIL Foundation certificate course.

ITIL Certification Training

Currently there are three levels of professional qualifications available in ITIL-based IT service management. The ITIL Foundation certificate is an entry-level qualification gained by successfully completing a one-hour multiple-choice examination. The exam focuses on foundation knowledge with regard to the ITIL service support and service delivery sets, generic ITIL philosophy and background.

At the next level, the Practitioner certificate can be gained either for a single specific discipline within the ITIL service support or service delivery set, or for one of two clusters (release and control; support and restore). The focus of this qualification is on practical knowledge and skills to implement, manage,

improve and execute the specific discipline. To achieve the certificate, students need to complete in-course assessments as well as a one-hour case-based multiple-choice examination.

The highest level certificate is the Manager's certificate in IT Service Management for experienced IT professionals who intend to implement and/or manage service management functions. The focus of this qualification is on comprehensive knowledge and skills to implement, manage, improve and execute processes in the ITIL service support and service delivery set. Candidates are assessed based on two three-hour written examinations as well as in-course assessments (itSMF Australia, 2003).

Of the three levels of certificates on offer, the Foundation course is by far the most popular. For example, of the 79 respondents to the survey conducted at the 2006 itSMF Australian conference, 85 percent had achieved the Foundation certificate, nine percent had completed the Foundation course but did not achieve the certificate, ten percent held Practitioner certificates and 24 percent had completed the ITIL Manager certificate training.

Training is available from many accredited training providers with the exams developed and administered by two examination institutes: the Information Systems Examination Board (ISEB) (a subsidiary of the British Computer Society), and EXIN (the Netherlands Examination Institute). As shown in figure 2, the number of ITIL certification examinations administered by EXIN International has grown exponentially since 2000 to a total worldwide of 100,000 in 2005.

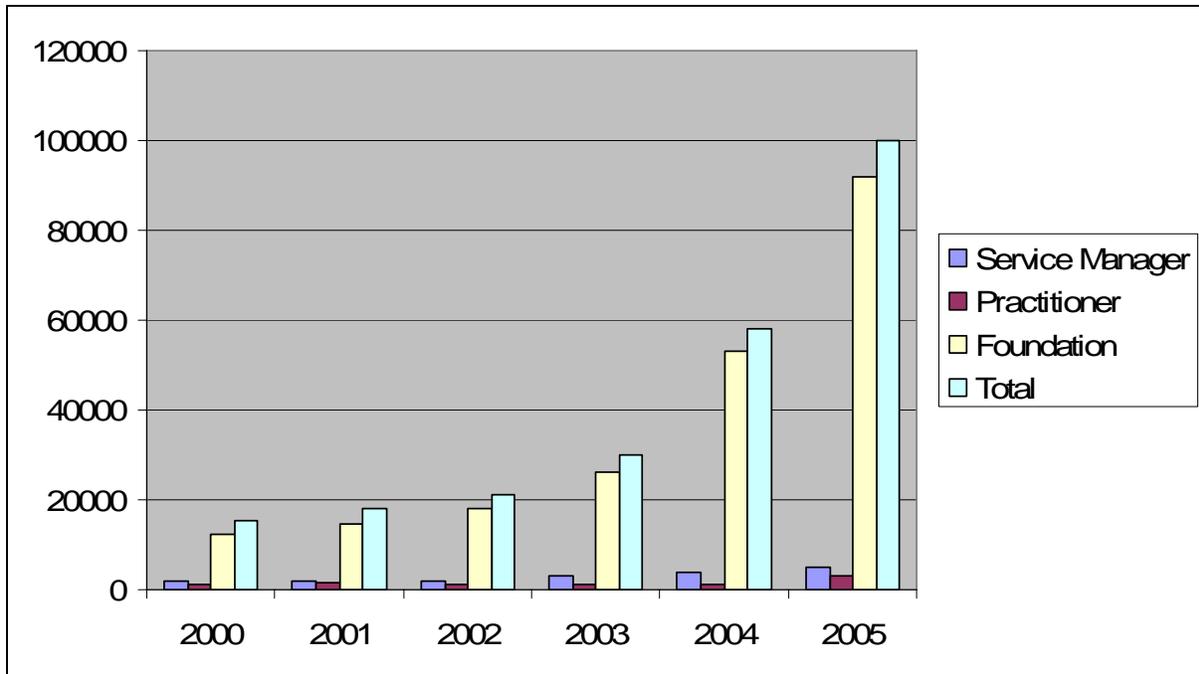


Figure 2: EXIN ITIL Examinations Delivered Worldwide from 2000 to 2005 (Cross, 2006)

Recently, training courses for ISO/IEC 20000 have been announced, for example, ISEB and itSMF have accredited ISO/IEC 20000 auditor training courses and both ISEB and EXEN have developed courses for ISO/IEC 20000 consultants.

Demand from Employers for ITIL Trained Staff

To examine the demand for ITIL certification from employers, in September 2006, the authors queried the 20,400 IT jobs on it.seek.com.au - Australia's #1 Job Site and found 550 Australian jobs requesting ITIL skills posted within that month. These positions were in the areas of Help Desk/Support, Project Management, Business Analysis, Software Engineering, Networking, and Training. This is a marked increase since May 2004 when Seek listed only 25 jobs asking for ITIL skills (Wilson, 2004). These statistics confirm reports in industry press that certification has become a 'recruiting filter' in Australia as well as in Europe (Schuller & Wheeler, 2006; Wilson, 2004). The demand by employers was confirmed

by Manager D who reported that ITIL skills have been included in the position descriptions of IT service staff and are required of IT contractors.

Although ISO/IEC 20000 was only released in December 2005, the standard ranks in ISO's top ten best-selling standards list for the first half of 2006. Consequently, there has been interest from auditors seeking auditor certification for ISO/IEC 20000. Due to the conformance between ITIL and ISO/IEC 20000, it is expected that ITIL certification will continue to be in demand as an industry qualification for IT service management staff. Therefore, based on reports in industry press and comments from the managers interviewed, it appears that there is growing demand for training in IT service management.

Evaluation of Current Training

From the interviews with the managers (as summarized in table 2), it became evident that they were convinced of the advantages of using external consultants to provide ITIL Foundation courses to staff.

At Organization A, initially the IT Service Managers used a self-study approach to achieve ITIL Foundation certificates *“but in the end, we've had more serendipitous benefits from getting 16 people from across the organization in a room to talk about ITIL Foundations than it was worth in the savings that we had by not putting that group through. The serendipitous benefits far outweigh whatever cost savings you might get. That's why I'm really not in favor of online training for Foundation. It's about people and organizational change, and about relationships”* (Manager A). Manager D also reported that the ITIL Foundation training contributed to change management by effectively getting everyone on side: *“there was a lot of opposition from Operations and it wasn't until we actually got them on the course and they saw it and they said ‘yes, okay I guess we can cooperate with this and we need these things in place’ so we started to break the barriers down”* (Manager D).

As the ITIL courses are regulated by third party examination institutes, they are consistent in their content and assessment. Employers can be confident that any staff member with an ITIL Foundation certificate

has achieved a particular standard, regardless of who conducted the training. Around the world there are many firms which offer ITIL Foundation training. This proved advantageous for Organization F as training was required in seven different cities. Furthermore, the Foundation course is suitable for staff from all levels of the organization hierarchy and staff from business units as well as IT staff.

Most if not all training providers include a simulation exercise in the ITIL Foundation course. The exercise is based on a shipping port, airport or railway and involves the students in various roles as managers, engineers, and service support personnel. Manager F described the value of the exercise: *“10-15 people at a time and it’s based on a shipping port – the idea is you’re running a company and you earn money for every ship that comes in and out. ... They throw an incident in, so your lighthouse goes out, and then you’re not making money, and they just teach you by reactive learning. You fail and therefore you learn how to do it better the next time. Eventually you learn you must manage incidents very quickly because if you’ve got an incident your business isn’t making money. You give all the information to your Help Desk; your Help Desk knows how to close the incident. I was in some of these training sessions and you can almost hear the penny drop. These people have worked for years and years in IT and know there’s a business out there somewhere, but doesn’t really affect them, and they suddenly realize that if there’s an incident, then the business isn’t making money. That affects the share price, our profits, their bonus, that affects everything, so you must work flat out to get the incident resolved, get the business back up and running, and then work on the underlying cause. It was a tremendous way of doing it” (Manager F).*

However, there may be some weaknesses to the approach of using external consultants to provide ITIL Foundation courses to staff. By relying solely on external consultants, technology transfer is not effective. Internal staff are not encouraged to develop expertise to provide ongoing training to new staff. Another related problem involves the expense: external providers charge between US\$800 and \$1400 per person for the three day ITIL Foundation course plus a further US\$150 is required for each examination.

The only form of assessment included in the Foundation certificate course is a one-hour exam comprising 40 multiple-choice questions. Consequently, the objective of course designers and trainers tends to focus on covering the necessary material in such a way that students have a good chance to achieve the necessary 70 percent in the examination. A popular model to evaluate educational objectives is that proposed by Bloom (1956). Bloom's taxonomy presented as figure 3 comprises six major categories ascending from knowledge, through comprehension, application, analysis and synthesis to evaluation.

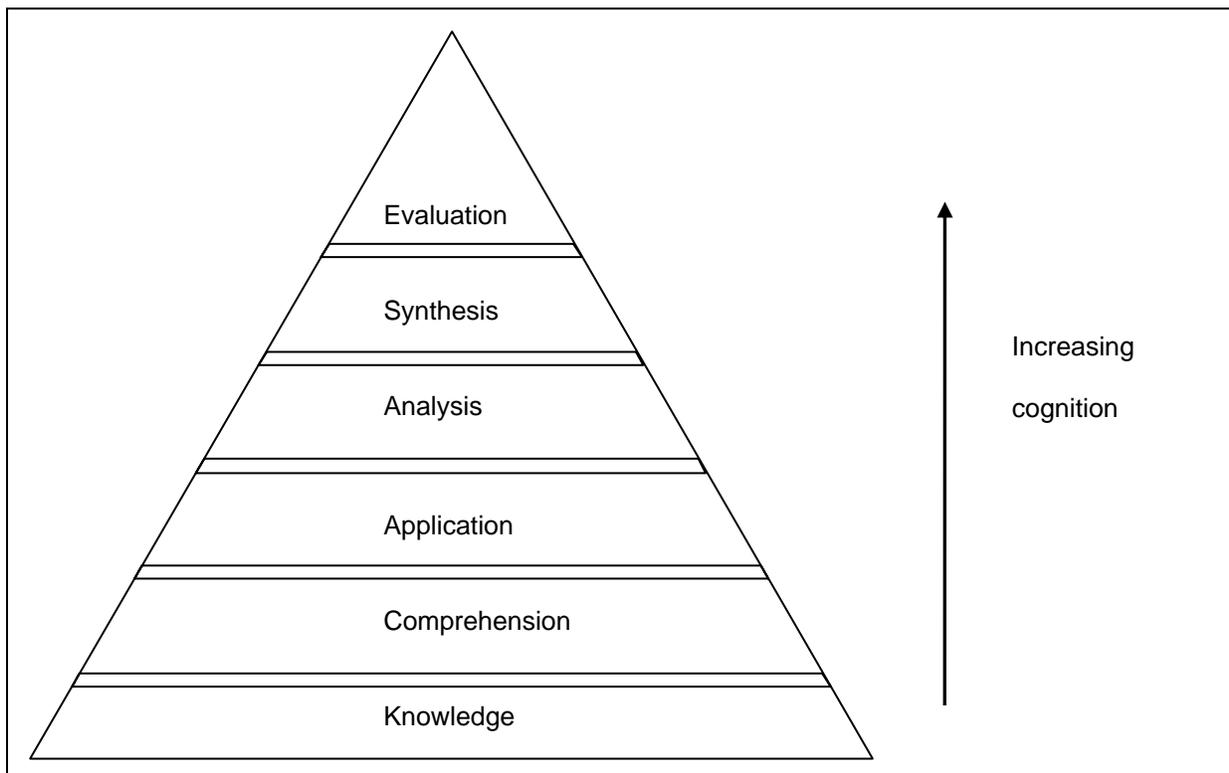


Figure 3: Categories of Cognition (Bloom, 1956)

The ITIL Foundation examination would map onto the lower levels of Bloom's taxonomy as it assesses knowledge of specifics including terminology, specific facts, ways of dealing with specifics, and categories. Although it has been claimed that multiple-choice tests can be designed to test higher levels of cognition (Higgins & Tatham, 2003), the ITIL Foundation examination does not test anything deeper than a superficial memorizing of facts. Students are advised of their examination result but are not given any

feedback regarding which questions were correctly answered. Therefore, the assessment is not formative as it does not provide opportunities for students to learn from their mistakes.

Role of Universities

The increasing number of private sector companies providing training, assessment of competencies and provision of credentials has put increased competition on traditional education providers (Flynn, 2001). The concern raised by Jovanovic et al. (2006) is that industry certification programs are perceived as *training* and are therefore not *educative*. However, to survive, universities need to respond to survey evidence which demonstrates that the “primary reason students attend university is to either find employment or improve their employment prospects” (Sutharshan, Torres, & Maj, 2001). Universities are now expected to provide training, defined as “the development of knowledge and skills to be used immediately, or in the very near future, and deals with developing people who already have, or who are just about to enter, a job” (Tovey & Lawlor, 2004, p. 24).

Professional bodies also influence university programs by emphasizing training rather than education to ensure graduates have the required skills to be admitted as members. For example, the Australian Computer Society (ACS) considers the curriculum content, academic leadership and staff qualifications when accrediting courses as prerequisites for membership for graduates. This follows the trend of ‘professionalization’ of university education where science, engineering, business and law have overtaken the traditional disciplines of arts and humanities (Tadmor, 2006).

Although there are myriad accredited commercial providers offering ITIL training courses, after consulting colleagues and searching the internet, the authors found few universities are teaching ITIL, the exceptions include the Masters of Information Science program in Norway’s University of Bergen, and two undergraduate IT programs in Australia (Bentley, 2006; Rossi, 2006). The general lack of interest by Information Systems academics in ITIL was noted by Venkatraman and Conger: “The best practice

processes and principles that are part of ITIL: Service Management, Service Delivery, Applications Management, etc. are very much in-line with the teaching objectives of MIS departments. Despite this, however, the level of understanding and interest of ITIL in academia, both on the research and teaching dimensions, significantly lags industry activity” (2006).

Curriculum Integration of IT Service Management

Although most universities have not included ITIL in their curricula to date, many have included other vendor-certified training in IT programs, for example Oracle, SAP, and Microsoft have facilitated the inclusion of their products by developing alliances with universities. However, Jovanovic et al. believe that the approach has been ad hoc and reactionary and “little has been done to investigate the implementation of IT certification programs within tertiary IT/IS programs” (Jovanovic, Bentley, Stein, & Nikakis, 2006, p. 4).

Prior to including IT service management topics, academic staff are advised to evaluate their existing curriculum, undertake industry research to determine the skills in demand, and then having identified gaps, changes can be designed and implemented, and regularly evaluated and reviewed.

Three varieties of implementation models are being trialed at Victoria University (Australia), “*course mapping, curriculum inclusive and end-on*” for SAP, ITIL, i-Net+ and Microsoft certification (Jovanovic, Bentley, Stein, & Nikakis, 2006, p. 7). For the ITIL material, the implementation model uses a combination of *curriculum inclusive* and *end-on* models. Final year undergraduate students can study *Managing IT Service Support* giving a “theoretical, practical and best practice approach to managing IT service support directly based on ITIL guidelines” (Bentley, 2006). ITIL processes have also been included in *Managing the Computing Environment* and from a practical point of view in the *Computer Project* and *Work Integrated Learning Studies*. As well, students are offered the ITIL Foundation online course from a training provider at a discounted price.

The approach recently taken by USQ is similar. Firstly, the ISO/IEC 20000 processes are covered in *Systems Planning and Management* within the IT Management major. This course identifies the objectives and activities of each of the core processes which underpin the ITIL and ISO/IEC 20000 best practice frameworks. In addition, the associated roles and responsibilities of IT service providers, management, staff and clients are discussed. The course is underpinned by the principles of service management and IT governance and emphasizes the planning and management aspects of IT service management and the need to align IT service with the organization's strategy and objectives.

The content covered is adequate to prepare students for the ITIL Foundation certificate. Additionally, existing courses are being revised to include ISO/IEC 20000 processes and terminology: *Principles of Information Security* includes service continuity and availability management, information security management, configuration management, change management, release management; and *Systems Analysis and Design* introduces business relationship management, supplier management, and budgeting and accounting for IT service. These courses include formative assessment with feedback to students on written and oral assignments and also provide opportunities for group discussions, assignments and peer feedback.

Universities should be preparing graduates for a career – not just a job. For students, there are advantages in learning about IT service management at university rather than industry training: more time can be spent on the content as the course is not restricted to 2.5 days; guest speakers from industry can provide real-world insights; the assessment can be more varied and thorough; there are opportunities to include prior rigorous research relating to core processes; by integrating the concepts into several courses students are given a broader understanding of IT service management. Consequently, by use of scenario-based tasks, case studies, and comparisons with other related frameworks (such as CobiT, ISO/IEC 17799, CMMI), courses and assessments can support the achievement of higher educational objectives such as comprehension, application and analysis.

Benefits and Challenges of University-based IT Service Management

Education

For any university prepared to provide basic training to the Foundation certificate or broader education related to IT service management, there are many benefits possible. As well as the promise of an increase in the number of student enrolments and subsequent income, the reputation of the university could be enhanced as it would be seen as providing internationally recognized qualifications in response to demands from the business community. To ease the education path of students, the possibility would exist for recognition of prior learning by offering course credit to students who have achieved the ITIL Foundation certificate. Furthermore, as demonstrated by the research partnership between the University of Southern Queensland and itSMF Australia, opportunities for research would enhance the relationship of the university and local business community (Rossi, 2006). Such benefits could be ascribed to any curriculum improvement.

As far as benefits specific to IT service management education, currently undergraduate courses tend to focus on the early stage of the information systems life-cycle, on systems analysis and development. There is little emphasis on the implementation of new or changed IT services or the ongoing management of IT infrastructure to ensure service quality. An important benefit is that students would have a broader understanding of the importance of IT investment and infrastructure in organizations. It is important for students to understand the essential ongoing role of information systems and the management of service in response to business demands.

These benefits support a positive response to the question whether or not universities should provide education in relation to IT service management.

However, there are challenges to universities that consider including education on IT service management in their academic curricula. Many of the challenges apply to the inclusion of any new courses:

identification of a suitable text book and development of teaching materials; availability of staff with appropriate expertise, or provision of funds and time for training of information systems (IS) academics in IT service management; the continual upgrading of standards such as ITIL and ISO/IEC 20000 make it difficult to keep the course materials and academic skills up to date; difficulties in overcoming the “cumbersome course curriculum approval systems” mentioned by Flynn (2001, p. 5) to change the existing curriculum and squeezing the new course into an existing crowded curriculum; the cost of the ITIL Foundation exam (currently US\$150) would probably not be borne by the university and may be prohibitive for students; and approval needs to be sought from accrediting bodies such as ACS.

In addition there are specific challenges for including IT service management in the curriculum. As the concepts apply to organizations with complex IT infrastructure, it may be difficult to effectively transfer the knowledge to students who have not experienced the IT service environment first hand. Also, organizations rely on sophisticated tool sets to support processes such as incident and configuration management. Additional cost and training of academic staff would be required to provide access to these tools for students.

Although this might appear to be a daunting list of challenges, some academic IS departments have overcome similar obstacles in providing courses related to other standards such as ISO/IEC 17799 (IT Security techniques - Code of practice for information security management) and facilitate certification to SAP and Microsoft qualifications. Many universities teach the Project Management Body of Knowledge (PMBOK) in IT Project Management courses. In the case of PMBOK, students have the option of taking the Project Management Institute exam for the certified Project Manager Professional (PMP) qualification.

Summary and Conclusion

In summary, the ITIL phenomenon has radically changed the discipline of IT service management. There is growing demand for IT staff to understand ITIL concepts and processes. With recognition of ITIL as the basis for the international standard for IT service management, it is important for universities to include ITIL concepts in programs to ensure graduates are prepared for the workplace. Curricula should include these concepts at least up to the Foundation level. Armed with this level of knowledge, graduates will be valuable ambassadors for this standard and standards generally, and may even sway their employers towards higher levels of participation in standards development activities. The benefits to students, academics, universities and industry are numerous but so are the challenges.

This research has provided a comprehensive account of the content and evolution of ITIL from company framework to international standard. The structure of ITIL certification education is described, with accounts of increasing demand for ITIL certified staff confirmed by industry research.

A clear requirement of future research is to consider how ITIL concepts can effectively be integrated into IT curricula. A starting point would be to follow the lead of the software engineering discipline in its mapping of the Software Engineering Body of Knowledge (SWEBOK) topics to Bloom's taxonomy (Abran, Moore, Bourque, & Dupuis, 2004). Detailed analysis of the underlying concepts of ITIL from an educational perspective is the first step to enable academics to design effective curricula to address the challenges posed of educating students about ITIL and ISO/IEC 20000.

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