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# Project Management for IT Professionals: Education and Training Issues

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**Abstract.** Information Technology Project Management is becoming an increasingly important skill for all IT professionals and one that can be imparted through either education or training. This paper begins by looking at what is involved in project management and the two main approaches to project management: PMBoK and PRINCE2. We outline a core postgraduate subject in IT-based degrees at Victoria University and how this attempts to handle both concepts and practice, and a PRINCE2 training course. The paper then examines the issues involved in each of these approaches and the benefits and drawbacks of each.

**Keywords:** IT Project Management, PMBoK, PRINCE2, Education, Training

## 1 Introduction: Projects and Project Management

A Project can simply be considered as any temporary endeavour with a one-time objective to create a unique product, service, or result [1]. It is distinguished from activities undertaken in business as usual which are repetitive, permanent or semi-permanent. Unlike business as usual where general management is centred on repetitive and stable tasks, projects are the means by which change is introduced. Projects involve a team of people with different skills working together on a temporary basis to introduce change that will impact others outside of the team [2].

The skills and knowledge of managing projects such as erecting pyramids, building cathedrals, creating aqueducts, building roman roads and conducting military campaigns has been passed down from father to son and kept within exclusive circles for generations from earliest times. Project management can be thought of as being like the art of cookery, which was also passed down from mother to daughter with good recipes kept within family circles from earliest times. Project management and cookery have this common denominator in that they are both an art and a science: both have evolved over time and both represent best practice which has worked; both require adaptation to the environment and will change according to customer needs.

The ‘science’ part of project management has been captured and documented well. Two forefathers of project management: Henry Gantt and Henri Fayol were very influential contributors. The latter set out the following management functions [3]: organising, staffing, directing, and controlling. Project Management can thus be defined as the planning, delegating, monitoring and control of all aspects of the

project including the motivation of those involved, to achieve the project objectives within the expected performance targets for time, cost, quality, scope, benefits and risks [2]. In other words, the project manager oversees specialist work on the project to ensure that the unique product, service or result is delivered fully to the agreed scope, time, cost, quality and benefit expectations of the customer who commissioned the project. The realisation of benefits, even if these are not financial, is the whole point of the project and why a customer would have commissioned it. In addition, the project manager would manage the risks that could potentially affect the project objectives as well as being focussed on the benefits that the project would achieve as a result of the creation of the new product, service or result.

### **1.1 Problematic Definition of Successful Projects**

The definition of 'success' is problematic. For example, the project that built the Sydney Opera House was considered a failure as it cost more than planned, yet the Opera House is an icon of Australia and a huge success. Conversely, the project that built the Concorde aircraft was considered to be a huge success, yet Concorde is no longer in existence due to heating, structural and costs of operation. It is therefore problematic to categorically attribute failure or success to a project. The label really can only be made on hind-sight and sometime after the desired product, service or result has been realised and when the benefits can be assessed.

According to PWC Global Survey [4], "Poor estimates during project planning are the largest contributor to project failure". The key reason is the lack of common understanding of what the project is meant to deliver when the project is being defined [5]. There are often unrealistic expectations in the early phase of the project, which is characterised by wild enthusiasm. All too often customer's expectations are not aligned with the project team's understanding of what the project entails, resulting in dissatisfaction when the project is complete. Another cause of failure is the lack of communication between members of the project team and the project board, sponsoring committee, customer and especially to the people (users) to whom the project is being delivered. Another deficiency characteristic of poorly managed projects is the inability to manage changes due to issues that impact the project.

### **1.2 IT Projects**

Project Management applies to many different domains, but in this paper we will consider its use only in relation to projects involving information technology. One justification for the need to change IT project management practices is to improve their success rate.

There are many examples to choose of IT project failure and how IT projects could have been handled better, but we will look at only a single report by the Victorian State Ombudsman [6] in November 2011 on the development of some eGovernment systems in Victoria. These projects were chosen for consideration by the Ombudsman as they were seen to be complex, high-risk, large budget projects across various agencies in the Victorian public sector [7]. The failed projects investigated were: Link

(Victoria Police), HealthSMART (Department of Health), Myki (Transport Ticketing Authority), RandL (VicRoads), Client Relationship Information System (Department of Human Services), Ultranet (Department of Education and Early Childhood Development), Integrated Courts Management System (Department of Justice), Property and Laboratory Management (Victoria Police), HRAssist (Victoria Police) and Housing Integrated Information Program (Office of Housing) [6, 7].

What the Ombudsman found was that all these projects had been poorly managed and did not achieve their intended outcomes: “On average, projects will have more than doubled in cost by the time they are finished.” [6 :4]. Singling out poor project management, the report further noted that: “... despite the extensive guidance and literature available, agencies are making the same mistakes around planning, governance, project management and procurement that our offices have observed and reported on for some years.” [6 :3]

Information technology project failure is seen by the literature to be anything from slight cost or time overruns to total abandonment. This can include situations such as: when the project does not deliver the benefits the customer expected, investment costs exceed the benefits of doing the project, the project does not meet all the client’s or stakeholder requirements, it does not meet all design specifications or quality standards, it over-runs its cost or does not meet its scheduled project finish date, it has some aspect of its project technology not operating properly, it is not fully used or it collapses completely [8].

In addition, to the lack of common understanding or scope definition, lack of communication and inability to manage changes to the project, the Victorian Ombudsman’s report pointed to the lack of clear accountability and responsibility as a key reason for project failure [6].

## **2 IT Project Management Education and Training**

The importance of developing appropriate project management skills in ICT professionals is now widely acknowledged and is included in the Bodies of Knowledge of the major IT professional societies around the world. The Core Body of Knowledge for IT Professionals (CBOK) of the Australian Computer Society (ACS) describes six knowledge areas: ICT problem solving, professional knowledge, technology resources, technology building, services management and outcomes management [9]. Project management is involved in part of the last knowledge area ‘outcomes management’ which involves:

“... an understanding of the factors required to successfully manage systems development projects. Topics include: team management, estimation techniques, cost/benefit analysis, risk analysis, risk management, project scheduling, quality assurance, software configuration management, project management tools, reporting and presentation technique.” [9 :24]

All of the internationally used Information Systems Model Curriculum guidelines give significant weight to teaching IT project management. For example, the IEEE Computer Society’s Software Engineering Body of Knowledge [10] makes frequent

mention of the importance of project management. Similarly the ACM Computer Science Curricula [11] and the Association for Information Systems Model Curriculum and Guidelines [12] make frequent reference to both Project and Change Management. The Project Management Institute produced the fifth edition of the Project Management Body of Knowledge (PMBok) [1], but this is not specific to IT projects.

### **3 Project Management Approaches: PMBoK versus PRINCE2**

There are a number of accepted approaches to project management, the Project Management Body of Knowledge (PMBok) and PRINCE2 being two of the most important. Although several other approaches (and often no set approach at all) are used in some situations, in order to keep this paper to a reasonable length we will concentrate on just PMBoK and PRINCE2.

#### **3.1 PM Body of Knowledge equates to ‘How to do’ and ‘Why to do’**

The Project Management Institute’s PMBoK [1] divides project management into ten knowledge areas and then describes what work needs to be done in each: project integration, project scope, project time, project cost, project quality, project human resources, project communications, project risk, project procurement and project stakeholders management. The latter was recently added in the latest edition published in 2013.

PMBok is a body of knowledge of good practice and offers guidance to address a knowledge area. Although there are process groups and data flow diagrams, these can be highly interpretable. This theory is rarely understood until a student actually runs a project and relates it back to the theory for guidance. Even then, successful project outcomes typically happen when a student is managing a project under the guidance of a skilled and experienced project manager. Of course, there are those who may argue that it is not necessary to have guidance from an experienced practitioner to be successful as there are ‘born’ project managers where the skills are innate and they are naturally good at this. This may apply for those whose skills are innate but even ‘born’ project managers can still learn from a skilled practitioner and reference the PMBoK to improve their practice.

To use the cookery analogy, some individuals are ‘born’ cooks and really don’t need a cookery course. However for most people, learning to cook is necessary. It is not a natural skill. Similarly, project management is not a natural skill for most people. However even the best of us can still improve with learning from others and best practice to get even better results.

The converse is also true: there is no guarantee that someone who completes a commercial cookery course can produce good food. Their work is really improved through practice in the kitchen: learning under an experienced head chef. Similarly, there is no guarantee that a person who completes a project management course can produce a project output or result that satisfies the client. If however, they are under

the guidance of an experienced project manager, then there is a greater likelihood of producing a satisfactory output and benefit to the customer. This view is corroborated by the ACS ICT Body of Professional Knowledge:

“...ICT is a practical science [13] and practical work as in project work or industry placements, is required at some point in programs of study so that learning of applied skills and knowledge can be fully developed.” [9 :7]

To use the cookery analogy, the body of knowledge is compendium of how to cook rather than a recipe book. Just like those cookbooks (particularly old ones) that have sections on ‘kitchen and meal planning’, ‘kitchen equipment’, ‘methods of cooking’, ‘entertaining’, ‘sauces’ and ‘batters’ for example, so the PMBoK can be viewed in a similar way. The PMBoK provides the theory or lens to view the project and make sense of the practice. This is very much in the same way that a student having done study of commercial cookery only really learns to turn out good food in a kitchen when under the supervision of an experienced head chef. The commercial cookery course provides the knowledge of how to cook and the theory of why things are done in certain ways but does not guarantee that the student really can turn out a good meal.

### **3.1.1 PRINCE2 Equates to a ‘What To Do’**

PRINCE2 (PRojects IN Controlled Environments 2) is described as a process-based methodology for project management [2]. Even when a project is temporary, unique and introduces change, it is still a process but one that is underpinned by principles. Although each project is unique, there are similarities between projects and hence similar processes that need to be followed. PRINCE2’s core structure is that it is made up of seven principles (business justification, learn from experience, defined roles and responsibilities, manage by stages, manage by exception, focus on products and tailor to suit the environment), seven themes (business case, organisation, plans, progress, risks, quality, change) and seven processes (Starting up a project, Initiating a project, Directing a project, Controlling a stage, Managing stage boundaries, Managing product delivery, and Closing a project).

It is significant that PRINCE2 is principles-based because processes are subject to the vagaries of the particular environment into which it is applied. There can be defects and therefore having a sound understanding of the underpinning principles of the processes assists in the efficient tailoring and application of the methodology to the unique project.

To use the cookery analogy, if PRINCE2 is viewed as a process-based methodology, it is like a recipe book with step by step activities that can be followed with specific descriptions of the documents and the fields required. It is prescriptive. It is a ‘what to do’. However, the principles that underpin the steps are important and are like annotations in the recipe book that guide the cook and state the principles for example: ‘Knead the dough till it is elastic and adjust the water accordingly’. So for a project it is like stating ‘In planning, ensure there is a product focus rather than activity focus and undertake the product based planning till a level of definition that a team member is then able to build the output from’.

However, PRINCE2 can be burdensome and misunderstood. The problem is due to a lack of knowledge of how to apply or tailor PRINCE2 to a specific project environment.

### **3.1.2 Difference between PMBoK and PRINCE2**

A whole paper could be submitted about the differences between the two approaches and there are a plethora of discussions on this. Siegelau [14] provides a concise comparison. Briefly, PMBoK is a body of knowledge and good practice. It is not a methodology. It is not principles based and it is highly interpretable.

PRINCE2 on the other hand is a methodology. The difference between these means that the former is highly interpretable whereas the latter is prescriptive with process activities, with each activity having recommended actions with corresponding templates provided for each action.

However, the elegance of PRINCE2 is the fact that it is principles-based. This distinguishes it from PMBoK that does not have any defined principles underpinning the knowledge areas. By having principles at its core, PRINCE2 provides a unified reference for a project manager to assess the extent the principle is being applied rather than blindly mandating documents and activities to follow. This is a common trap in template driven methodologies.

The advantage of PRINCE2 is that it can co-exist with any delivery approaches for IT development be it Waterfall or Agile [15]. It is limited by not specifying activities to manage procurement and not having a Change Management Strategy that manages the people impacted by the change. It is sometimes seen as overhead in governance [16].

## **4 Delivery Modes: Education vs. Project Management Training**

The focus of this paper is to examine IT Project Management Education vs. Training for IT Professionals. The fundamental difference between education and training is that in education the focus is to provide learning that lasts. *“Education can be described as what remains after one has forgotten what one has learnt in school”* (Albert Einstein). However with training, people are shown what to do rather than really ensuring that they understand the underlying theory. Training does not allow for reinforcing, monitoring and encouraging which are necessary to ensure that real learning is acquired [17].

According to the Kirkpatrick Model, training alone is not enough, there needs to be strategies in place to ensure that what is taught can be effectively translated into skills and behaviours in the workplace. The Kirkpatrick model consists of four levels: (1) Reaction (experience during training), (2) Learning (the acquisition of knowledge, skills, attitude, confidence and commitment during the training) (3) Behaviour (mentoring and support that occurs post training in the workplace) and (4) Results (extent that targeted outcomes are achieved from the training) [17].

If the reader reflects back on personal experiences of training in, for example, how Excel training was conducted, it might have been that they were shown every Excel function. This leads to some level of frustration (due to lack of skill and experience) and little ‘sticks’. It would have been better to have been taught some simple Excel skills with easy exercises to practice, followed by an explanation of what Excel is capable of and a list of functions that could be accessed when required.

#### 4.1 Training providers

The type of training provider has a bearing on the delivery mode for training. There are three types of training providers in Australia in the area of project management:

- Registered training organisations (RTOs) registered by the Australian Skills Quality Authority (ASQA) which offer the Certificate IV, Diploma and Advanced Diploma of Project Management. These can include Universities but more typically are independent training providers.
- Accredited training organisations (ATOs) overseen by the international APMG and the Global Certification Institute (not an exhaustive list) who accredit project management best practice methodologies such as PRINCE2 on behalf of AXELOS (the UK consortium who own the Intellectual Property). It is significant that Universities cannot be ATOs and therefore are not able to offer PRINCE2 training.
- Project Management Institute (PMI) registered training provider. These support the attainment of the Project Management Institute (PMI) Project Management Professional (PMP).

Delivery modes for these providers include face-to-face training, online training or a blend of these.

RTOs can deliver face-to-face classroom courses in project management and complete these in as little as four days with some homework that results in the award of the Certificate IV in project management. The Diploma takes longer and the shortest length of time could be two months which usually requires students to submit evidence from real projects that they have worked on.

ATOs can deliver face-to-face training which leads to the award of the PRINCE2 Foundation qualification in three days and the Practitioner qualification in a further two days after the award of the Foundation.

PMI registered training providers offer a short five day coaching session to prepare students for a PMP exam. However the award of the PMP is subject to a number of requirements other than the exam which includes evidence of current experience in managing projects.

Unlike the PMP and the Certificate IV and Diploma of Project Management, there is no minimal entry requirement for PRINCE2. It therefore provides more accessibility to anyone wanting to learn project management and offers an excellent starting point and clear methodology that provides real value to novice. However it is the delivery and assessment method that can pose problems in terms of real learning.



## **4.2 Outdated course material**

The accreditation system for training providers rather than the methodology can result in outdated material that does not support the aims of learning. The restrictions imposed by the accreditor for courses such as PRINCE2 stifles the ability to update courseware regularly so the same material gets churned out year after year and material is not updated regularly enough to meet the learning needs of the students. The system does not easily encourage changes to the material once it is endorsed because it costs the ATO time and money to change courseware (there is a fee payable to the accrediting body to review the revised material). Therefore good educators who intuitively would like to update material after the course from lessons learned are not able to. This is where any course under the AXELOS umbrella that awards qualification in PRINCE2 falls short.

Courseware under the ASQA authority suffers less from this. It is far more easily updated and kept current due to the lesser restrictions imposed. Courses only need to demonstrate mapping to competency levels and performance criteria. Only samples of actual courseware are necessarily reviewed (rather than the full suite of material as with AXELOS) for consistency and there is freedom for the trainer and the RTO to create new versions of courseware without necessarily incurring costs (other than their time). This means that material is likely to be current and meet the changing needs of learners. This reflects a model that fits more closely with education.

Online material is in danger of being ‘dated’ unless the training provider is willing to pay for updates to their online courseware. Online courses are ‘price sensitive’. So it is unlikely that the training provider will want to spend money and erode profit to update material as they know that their customer (the learner) has no way of knowing if the material is current. This is particularly concerning since trends published by a leading training provider sponsored by Computer Weekly state the trend in 2014 is for IT professionals to adopt online methods due to the lack of commitment by organisations to provide training to staff and if they do, the cheaper option is selected. Project professionals have a choice: they can either take the training or they can let their skills calcify [18]. According to the article, training today is shifting, faster and faster, to the Internet accessed by desktops, laptops, tablets, and mobile devices. Delivery is dispersed in ‘chunks’ of video components, webinars, and online modules. Notwithstanding the question of online learning versus classroom learning, the question is how up-to-date is the material and how well has it met the learner’s needs?

## **4.3 Limitations due to the delivery method**

PRINCE2 training courses do not equip participants with practical skills to create a project plan and to discuss issues and risks that would typically occur on a Diploma of Project Management course or one based on PMBoK delivered by an RTO or University. Furthermore, PRINCE2 training courses do not focus on techniques such as learning to use scheduling software like Microsoft Project. Whilst it is beneficial to be unencumbered by not having software to learn on a course, it does mean that PRINCE2 qualified practitioners need to undertake separate training to learn these techniques.

#### 4.4 Assessment methods

The method of assessment has a bearing on the quality of the experience during training and the learning that actually happens. Students present different learning styles with some preferring written assignments and essays whilst others prefer verbal assessment and practical case studies to work with.

The assessment method for PRINCE2® is objective testing (multiple-choice). This has merits in ensuring there is correct understanding of the concepts. The exam questions are tested and moderated from a comprehensive question bank. It is a good examination method, but the PRINCE2 Practitioner examination is based on full PRINCE2. This full methodology does not provide much value to those with little experience or opportunity after the course to apply the skills.

This is particularly obvious with those new to project management who are typically assigned small low risk projects in the work place that might not require the full application of PRINCE2 to manage them. According to Ferguson [16], these individuals may not have the knowledge or experience to tailor PRINCE2 to their projects. This could lead to an ad-hoc approach to small projects with potentially poor outcomes [16]. Hence a weakness of the standard offering for PRINCE2 training does not provide skills in using 'light' PRINCE2 which is more applicable to small projects. There is a need for 'Light PRINCE2' as a course in order to provide a simple methodology to enable the many IT Professionals who have not had the experience nor the support to know how to apply the principles lightly.

On the other hand, the assessment methods for courses under ASQA accreditation allow flexibility to cater for different learner styles. Course accreditation with ASQA requires that material caters for all learning and special needs (for example when English is not the first language). Typically these include short quizzes, case-studies worked on in class, a final written examination and the submission of a body of evidence (records of assessment) of practical work carried out by the project manager to demonstrate competency. The assessment methods are competency based on PMBoK, with students required to demonstrate attainment of performance criteria against each of the competencies stated for the qualification. For example the Diploma of Project Management requires attainment of ten competencies to match the ten knowledge areas.

In summary, training is limited in delivering the behavioural indicators that make up a successful project manager. Chaves [19] cites his organisation (a financial services company with \$100 billion in assets), opting for education rather than training in achieving the competencies required on IT projects. The students work collaboratively dissecting past projects and learning from on the job examples of project success and challenge. This approach together with a project management office offering standard templates, processes and access to mentors was found to provide much better outcomes, increased quality and reduced rework in project delivery [19] than standard project management training courses.

## **5 A Postgraduate Course on IT Project Management at Victoria University**

In designing a university course, a holistic approach should be taken so that the core body of knowledge areas and ICT role specific knowledge are planned into schemes of work. Ultimately the aim is to ensure that the students are supported and mentored. A degree of practical work underpinned by theory is required. One of the underlying tenets to designing a course is that “information is not knowledge” and that “the only source of knowledge is experience” (Albert Einstein). The objective for learning is to design a course that both internalises the learning and provides practical changes in behaviour in the workplace.

This is supported by the ACS ICT Profession Body of Knowledge that suggests that when designing a university course “structure should scaffold advanced knowledge on top of programming fundamentals and project management topics from the ICT Knowledge Area of the CBOK.” [9 :15]

The teaching of IT project management lends itself particularly well to practice reinforcing theory and this subject is based on belief in the value of integrating both theory and the practical component of any Information Systems course. This idea is not new and was articulated well by Little and Margetson over 20 years ago. They suggest that:

“No amount of learning about something will, alone, prepare a student adequately to practise a particular skill or to make use of knowledge in a sensible, appropriate, and effective way. This is even more so when the learning in question concerns the design, development, and operation of computer-based information systems.” [20 :131]

Hosseini [21] identified challenges of teaching Management Information Systems concepts to students, saying that the abstract nature of concepts around development and management of IT systems make these concepts difficult to teach in the classroom and that as they often lack a practical frame of reference students often miss the various nuances of IT issues, especially at a managerial level. Before this, Piaget [22] proposed his model of ‘cognitive information processing’ that argued that in order for a person to understand some new concept or piece of information, this new information must be integrated into the person’s own schemata of knowledge and be somehow linked to what the person already understands or knows so that they can see how it all fits in with their view of reality. Piaget named this personal view of reality a ‘logico-mathematical structure’.

IT Project Management involves a lot more than just project planning and scheduling. It is also concerned with controlling the on-going project during its whole life, and reporting on project progress. Our research and discussions with students has shown that, despite some problems currently inherent in the use of project management software, it is quite possible to provide students with useful project management skills through the use of this software. Several of the assignments are based on the use of adequate size, dynamic and on-going case studies and involve students using Microsoft Project for planning, scheduling, monitoring, controlling and reporting [23].

## 5.1 Course content

The subject Information Technology Project Management is a core subject in the masters-level information systems related courses at Victoria University. It concentrates on both the management of IT projects and the use of computer software in the management of these and other projects and aims to show how knowledge of the appropriate application of such skills is vital to Information Systems professionals and managers in the performance of their many functions in an organisation. Subject content [24] includes: Project management fundamentals, Project management methodologies (including PMBoK and PRINCE2), Project management software tools, Defining the problem – the project goal, project charter, Developing the project plan and schedule, Monitoring and control of the project once it has commenced, Building the project team, management of conflict, Implementation difficulties, Risk assessment and project failure, Innovation and the management of technological change, Cost control, Reporting on project status and Software engineering project case studies.

Assessment is based on a number of assignments related to a real project. As the course is conducted over twelve weeks, so is the duration of the project. It is usually one involving the implementation of an ERP system in a small business. The project is initiated in the first week of the course, controlled and delivered in the final week to time, cost, quality, scope and benefits when the students submit their closure report and on the same day sit a short final objective testing examination.

Students have to produce a Project Charter (containing a business case and a clear statement of scope), then plan the project (using Microsoft Project), manage the issues and changes in the project from week to week as provided by the lecturer at each session (project monitoring and control using Microsoft Project), create a benefits review plan for the project and finally report on the project once it has delivered its output to customer satisfaction.

In addition, throughout the course students present a seminar paper and work on syndicate exercises based on real case studies of project management implementations. The methodology introduced to the students is both PMBoK and a lighter version of PRINCE2. Rather than present the two approaches as competing with each other, the focus is on skills and an appreciation of the real value of the application of PMBoK and PRINCE2 in the workplace. There is no pressure to learn PRINCE2 by rote in order to pass an exam but to demonstrate its value in working on the project.

The Victoria University course seeks to inculcate real learning in IT Professionals or those aspiring to be. It offers real learning opportunities compared with the standard offering of a PRINCE2 training course.

## 6 Conclusion

Increasingly organizations use project management to drive their business objectives [4]. Outcomes in terms of project management skills, knowledge and confidence are a function of both the method of delivery and methods of assessment. Clearly project

management courses that provide real projects for participants to work with throughout the course and case studies in which they are able to constructively build their knowledge will have more value to the IT professional than bland objective testing. The former works on a deeper level and enables skills to be practised in a safe environment. This is what the Masters in IT Project Management at Victoria University aims to do.

The PRINCE2 training delivery mode does not allow time for IT Professionals to really internalise how to apply the principles to their workplace. Although the PRINCE2 course and examination is based on a scenario, the problems that an IT Professional faces in the workplace requires on-going support and mentoring that is not provided by the course once the PRINCE2 qualification is achieved.

The Victoria University course is refreshed each year with new perspectives keeping up with the latest developments in project management. After all, project management is both an art and a science and needs to keep current with the latest developments year by year in the business world.

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