

# CREATING FLEXIBLE POSTGRADUATE IT PROGRAMMES

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## ABSTRACT

*This paper examines the problems designers of IT courses face in dealing with the rapid pace of IT innovation. It argues that the ability to respond effectively to such change is essential if students are to acquire the competencies necessary to exploit the advantages of IT and courses are to remain competitive. A fourfold classification of strategies course designers may adopt to deal with change is presented and various factors that influence the selection of a particular strategy or strategies are examined. Finally, a case study of the development of an IT Postgraduate Programme at a University in the UK is used to highlight the advantages of one the strategies identified.*

**Keywords:** Postgraduate courses, emerging technology, course development

## INTRODUCTION

Wireless sensors that can monitor any aspect of the environment, communicate with one another and organise themselves in a network are hailed by David Culler of Berkely University as ‘the future of computing’. Similar claims are made for grid computing, the implementation of grid protocols that provide standard mechanisms for discovering and accessing on-line information, applications and processing power in a secure environment. Both of these technologies feature in a recent review of the top ten emerging technologies destined to ‘change the world’ (1).

The rapid development of such technologies raises important issues for the design of IT courses in Higher Education. On the one hand, it is essential that course content reflects the latest advances in IT and students graduate with skills that are in high demand. On the other, re-designing or building new courses around emerging technologies can be a high risk venture. Many promising technologies fail to make an impact; and those that do may be disseminated so slowly that they are eventually superseded by even more dramatic changes.

While it is tempting for course designers to wait until a particular technology has time to mature before deciding whether to introduce it, the competitive market in which IT education providers operate makes this difficult. Students have a very wide range of institutions from which to choose: if a course provider fails to keep up with, or anticipate trends, demand for places may rapidly decline. The emergence of Internet-based IT education providers and ‘industry universities’ poses a further challenge since they are likely to find it easier to assimilate new trends and change course content. Traditional universities tend to be bureaucratic. By the time a new course or course modules have been validated, the technology on which they were based may be outdated.

If Higher Education (HE) institutions are to respond effectively to IT innovation, they need to treat it as both a management and pedagogical problem and develop strategies for coping with

change. The process by which course designers (senior academics/management) actually respond to change, however, has not been the subject of detailed research. This paper goes some way towards filling this gap in the literature by firstly exploring some of the strategies course designers may adopt to deal with rapid change and secondly by providing a case study of the development of postgraduate IT programme in the UK which exemplifies one of the strategies identified.

## DESIGN OPTIONS

There are a number of strategies course designers can adopt to IT innovation. This section identifies four based loosely on Kotler's delineation of competitive strategies (2). The strategies are: 'pioneering', 'wait and see', 'flexible response' and 'ad hoc, opportunistic'. The 'pioneering' strategy is likely to be favoured by course designers in institutions engaged in major research programmes in emerging technologies or those seeking a competitive advantage from being 'first to market' with a new course. In the latter case, course designers keep a watching brief on emerging technologies and begin devising courses based on the most promising. Successful course design depends on analysing IT and business trends and integrating an emerging technology at the right time, i.e. before anyone else and just before the new technology becomes popular.

The main advantage of the pioneering strategy is that institutions are able to offer modules or units in areas likely to be highly attractive to employers or a particular niche market. If staff have been researching the new technology, or formed partnerships with companies already interested in it, their competitive position is likely to be even stronger. The main disadvantage of the strategy is that course designers may over-estimate the impact of the technology. If it turns out to be a disappointment, they will not only have wasted valuable resources, more interesting areas of course development may have been neglected.

The second main strategy course designers can choose to adopt is the reverse of the first. The 'wait and see' approach assumes that it is impossible to judge the likely impact of a new technology and it is best to see if (a) it is adopted in industry and (b) other institutions are teaching it. With this strategy, the course provider or institution becomes a follower rather than a leader of course innovation. The courses that are developed based on this strategy focus on teaching skills that are needed to design, build and maintain any computer system. They may be attractive to computer novices and those who need an introduction to computing/IT but who do not necessarily see themselves becoming technical specialists.

The key advantage of the 'wait and see' approach is that it is 'safe' so long as the technologies taught are likely to remain in demand for the foreseeable future. As this is difficult to predict, the pedagogy may emphasise the importance of self-tuition. In other words, students are encouraged to learn how to learn and to teach themselves new technologies. While this is a very positive feature of the approach, the disadvantage of 'waiting and seeing' is that courses can be unexciting. Unless an institution has a particularly good reputation, or some other feature students find attractive, it may find it difficult to recruit high calibre students.

A third possible strategy for dealing with rapid technological change is to build flexibility into course design and approval procedures so that changing knowledge and skill requirements can be incorporated easily into course provision. On the face of it, this seems the most sensible approach. If new courses can be added relatively easily and existing courses modified to take account of new developments, course providers will be in a good position to meet the needs of students and employers. The problem is that it is often difficult to gain consensus amongst academics on the changes that should be introduced. This might reflect genuine differences in opinion or political divisions within a department. Institutional procedures may also lack the flexibility to respond to rapid change. There may be concerns that the changes proposed fail to meet quality criteria. The process of checking quality (review and validation) can take months or years, by which time the 'new' technologies to be incorporated may have been superseded by others.

The fourth and final strategy is 'ad hoc, opportunistic'. This will be adopted by course designers in departments where the practice is create new courses or significantly alter existing ones only when some event propels them in that direction, e.g. a local employer may want to collaborate on a course because skills are in short supply or a member of staff makes a course proposal, perhaps as a result of some research he/she has been undertaking. Whatever the reason, courses are developed on an ad hoc basis to meet short-term needs and are not part of any planned process of change. The main advantage of this approach is that course designers are able to capitalise on unexpected opportunities and this can lead to the introduction of innovative courses. The disadvantage is that it is very hit and miss; organisational procedures may not be sufficiently flexible to cope with unplanned change and the lack of planning may create long-term problems for the institution.

### **FACTORS SHAPING STRATEGY SELECTION**

Elements of all the above strategies may be present in the way institutions actually design and develop courses. Some new courses will be the result of careful surveillance of new technology; others will arise because an opportunity presents itself. Some courses will change very little because course designers feel it best to teach generic skills; others will be modified frequently to take account of the need to respond to emerging or new technologies. In most IT departments, however, one or two strategies will tend to prevail. This is because the strategy selection process is strongly influenced by contextual factors such as the prestige of the institution, availability of resources, research tradition, geographical location, course approval procedures, interests of staff and cultural issues.

It could be argued that the more prestigious the institution, and the larger the resources available for course development, the more likely it is that course designers will be encouraged to pursue a 'pioneering' strategy. Such institutions are dependent for their continued success on being at the forefront of technological innovation. They may even engage teams to monitor new and emerging trends. The research academics undertake, and the links they will have forged with industry, place them in good position to discern new trends and pioneer courses based on them. Research active departments in less prestigious institutions are also likely to adopt a pioneering approach. Here, the desire to advance knowledge will create opportunities for assimilating new research into existing and new courses.

IT departments or institutions that have a strong teaching tradition and earn most of their income from this may be more inclined to adopt a 'wait and see' approach to IT innovation. Having few opportunities to carry out research, staff are not in a position to develop new technologies or foster collaborative relationships with institutions in the vanguard of change. Their dependence on teaching may also lead to a reluctance to introduce any changes that might jeopardise the stability or viability of the courses offered.

Geographical factors may play an important role in shaping strategy. Staff in small departments in remote areas, serving the needs of the local community are under far less pressure to innovate than those in densely populated areas served by a number of institutions. While the spread of distance learning and Internet delivered courses may eventually change the basis of competition, as long as students elect to attend traditional HE institutions in large numbers, geographical factors will continue to exert an influence on course design and provision.

For some departments, the key factor influencing the approach to course design will be the ease with which new courses can be introduced and modified. Some institutions (particularly those facing competition from other local providers) will streamline their procedures for review and validation. The structure and culture of the institution are thus likely to favour a pioneering or flexible response approach to course design. In other institutions where senior management fail to recognise the pressures for innovation within IT, bureaucratic procedures will slow the introduction of new IT courses. This discourages innovation and produces a 'wait and see' or 'ad hoc, opportunistic' attitude towards IT innovation.

### **DEVELOPING FLEXIBLE PROVISION**

Although the strategy or combination of strategies adopted by a particular institution will be shaped by contextual factors, the pace of IT innovation increasingly demands a high level of flexibility in course design and approval procedures. It was awareness of this which prompted the development of a new model of postgraduate course provision within the School of Computing at South Bank University in the UK. This section uses the development of the Business Information Technology (BIT) Postgraduate Programme at the University as an illustration of the way flexibility can be built into the design of postgraduate courses in the traditional HE sector.

The BIT Postgraduate Programme was introduced into the School in 2001, two years after the approval of an MSc course in BIT. This course needs to be described in some detail because it provided the foundation for the development of the Programme. The rationale for introducing an MSc in BIT was to extend undergraduate provision in the business applications of computing and to provide industry with 'hybrid managers' (3,4,5,6). Market research confirmed that postgraduate BIT courses were taught in many institutions but none focussed specifically on the strategic aspects of ICT and catered for graduates from a technical background. These two features (strategic focus, technical background of applicants) subsequently became the distinguishing features of the course. Five core units were devised, notably: the Strategic Management of Information and Communication Technologies, Systems Requirements Engineering, Strategic Decision Support and Expert Systems, Global Telecommunications and

Networking and Organisations as Complex Systems. Students were also required to study a Research Methods Unit (common to all postgraduate courses), undertake a major research project (worth four units) and to select two other units from the options available.

When it was validated in 1999, the MSc in BIT underwent the University's usual rigorous vetting procedure. It was reviewed initially at School and Faculty level, inspected by the Quality Unit and then sent for a full validation by the University. This involves representatives of senior management and external assessors reviewing course documents and ensuring that they meet quality standards and that the course is likely to be viable. The entire process of course design, validation and approval took over eighteen months. The resultant course, however, provided the basis for a much more flexible structure for postgraduate course development in the BIT area.

When the decision was taken in 2001 to develop an MSc in E-Commerce, senior management saw an opportunity to create a Programme of Postgraduate study in BIT that would extend undergraduate BIT provision and balance the specialist and conversion programmes of study within the School's postgraduate provision. The motives for introducing an MSc in E-Commerce were similar to those for introducing BIT. The proximity of the University to the City of London, however, was an additional incentive, since it was anticipated that there would be high demand amongst financial institutions for E-Commerce specialists. As the subject domain of BIT provided the theoretical underpinnings of E-Commerce and strategic management was to be a key theme of the E-Commerce course, it was agreed that the BIT and E-Commerce courses should share the core units mentioned earlier but that these would be reduced on both routes to four. Three specialist units were written for the E-Commerce course: Strategic E-Marketing, Strategic E-Commerce Solutions and Internet Technologies.

The decision to share units reduced the need for a full University validation. E-Commerce was designated as a route through the BIT Programme which led to a named award, i.e. MSc in E-Commerce. Modifications were also made to the BIT course to reflect the introduction of the new route. The optional units became compulsory and a new Unit was added to make the course comparable in structure with the E-Commerce route. Course documents were prepared according to University guidelines and presented to the relevant boards at School and Faculty level and to the Quality Unit. Having been approved by the latter, the course was subsequently validated by the Faculty.

The MSc in E-Commerce was introduced in October 2002. There are already plans to add two more courses to the BIT Postgraduate Programme: an MSc in Mobile Commerce and an MSc in Managing IT Innovation. Two main factors have influenced the decision to introduce these new routes through the BIT Programme. Firstly, staff within the School have expertise in both areas and are anxious to develop advanced courses of study, again focussed on the strategic aspects of ICT management. Secondly, it seems likely that demand will grow for graduates with skills in these areas (6, 7, 8).

Because Mobile Computing has not yet been widely disseminated, there are few institutions teaching the subject at postgraduate level. Only three have advertised courses and all are very technically oriented. The emphasis on strategic applications of mobile computing within the course will differentiate it from competitor provision and enable it to find a niche market. There

are no comparable courses on Managing IT Innovation so with this course, it could be said that the University has adopted a pioneering approach. Neither course will be introduced until 2004, allowing time for the emerging technologies on which they are based to mature a little. The delay in introducing the courses will also give staff time to develop course materials, develop links with industry and promote the course.

As the introduction of two new courses represents a significant addition to the BIT Postgraduate Programme, the University's Quality Unit will almost certainly recommend a full University validation. The core units will have to be modified to take account of the new subject matter covered in the domain areas, new documents will need to be drawn up and the help of external industrial advisors enlisted. Although this could delay implementation, the decision to introduce the courses next year (if approved) will not affect the University's competitive position because a long lead time has been deliberately built into the planning process.

Although the BIT Postgraduate Programme is still in its infancy it has the potential to grow very rapidly. Courses can be added relatively easily in response to changes in the use of technology and maximum use can be made of resources through the sharing of units. This is a very important consideration on 'specialist' masters courses which tend to attract small numbers of very high calibre students. A further attractive feature of the BIT Programme is that all the core units are studied in the first semester. This means that students can delay the decision about which route to specialise in until they have spent a few months at the University and familiarised themselves with the subject domains. Feedback from students suggests that they benefit from this flexibility.

It was suggested earlier that a strategy or combination of strategies will predominate within a particular institution. The above case study illustrates the influence of broader institutional influences towards flexibility and responsiveness to change. These institutional influences, have enabled the School of Computing to expand very rapidly and create courses that respond to perceived changes in demand for skills. The procedures for review and validation are thorough and rigorous but they have been shaped to meet the demand for rapid change. The central location of the University and the proximity of to it other universities, most of them competing for the same students, has also been a factor pushing the institution in the direction of flexibility. Within the School of Computing, the rapid growth in course provision has itself become a stimulus for change. Because this is part of the culture, staff are actively searching for opportunities to modify and introduce new courses.

## CONCLUSION

This paper has examined the problems course designers face in dealing with the rapid pace of technological change. It has been suggested that the ability to respond flexibly to change is essential if students are to develop the knowledge and skills necessary to harness the competitive advantages of IT. The strategies course designers may adopt to deal with the rate of change have been described and the various factors that influence the selection of a particular strategy or strategies considered. A case study of the development of the a BIT Postgraduate Programme was used to illustrate one of these strategies - the 'flexible response' approach - and to highlight the importance of flexibility in course design and approval procedures.

More detailed research, however, is needed to validate the strategies identified and to examine the factors that shape strategy selection. It would be particularly interesting to determine whether there are international differences in the strategy selection and course design processes. In countries where there is a high level of IT innovation, it seems likely that the 'pioneering' and 'flexible response' strategies would be the predominant response mode. The 'ad hoc', 'opportunistic' and 'wait and see' strategies are more likely to characterise countries where there is a low level of industrial and state sponsorship for research in emerging technologies. Graduates from such countries often choose to study overseas for this very reason. If course design is heavily influenced by macro-level contextual factors, there is a strong case for the transfer of technical expertise through, for example, collaboration and secondments of academic staff.

Research is also needed on the micro-level contextual factors that shape the adoption of particular strategies within institutions. The case study presented here provides only an overview of the gestation of a Programme of study and the factors that influenced its development. A detailed contextual analysis would illuminate the complex interaction of structural, cultural and political factors that shape different approaches to course design. An understanding of the role of these factors would be valuable to institutional managers and academics who need to change their approach to designing and introducing courses but who find it difficult to do so for the reasons outlined in the paper. Clearly, if IT departments do not respond to change effectively, the education of students suffers and industry lacks the skills needed to exploit advances in IT. As this paper has endeavoured to illustrate, when considering how IT departments can best meet the needs of industry, it is necessary to focus on management as well as pedagogical issues.

## REFERENCES

1. W. Rouce, Goho, A., Scigliano, E., Talbot, D., Waldrop, M., Huang, G., Fairley, P. Jonietz, E., Brody, H. (2003) 10 Emerging Technologies. Technology Review, (106), 1, 33.
2. Kotler, P. and Armstrong, G. (1994). Principles of Marketing, Prentice Hall.
3. British Computer Society (1990). Hybrids – A Critical Force in the Application of Information Technology in the 1990's. BSC.
4. Earl, M. and Skyrme, D. (1990). Hybrid Managers: What Do We Know About Them? RDP96/6.
5. Earl, M.J and Feeny, D. F. (1994). Is Your CIO Adding Value? Sloan Management Review, (35), Spring, 11-20.
6. Feeny, D. F. and Willcocks, L. P. (1998). Core IS Capabilities for Exploiting Information Technology, Sloan Management Review, (30), 3, 9-21.
7. Ahmed, A. M. and Abdalla, H. S. (1999). The Role of Innovation in Crafting the Vision of the Future, Computers and Industrial Engineering, (37), 11-2, 421-25.
8. Barnes, S. (2002). The Mobile Commerce Value Chain: Analysis and Future Developments. International Journal of Information Management, (22), 2, 91-110.