Rapid Curriculum Development: A RAD approach to MIS Curriculum Development

Bill Davey[1]
School of Information Technology, RMIT University
Bourke Street, Melbourne 3000, Australia

and

Arthur Tatnall[2]
School of Information Systems, Victoria University of Technology
City Flinders Campus, PO Box 14428 Melbourne City MC, Melbourne 8001, Australia

Abstract

Curriculum in Management Information Systems (MIS) is subject to constant pressure due to changes in business, the computer industry and technology. Clements (1989) suggests many curriculum statements are the result of conscious or unconscious copying of 'authoritative' existing statements, while Truran (1997) suggests a model somewhere between 'muddling through' and an ecological model. An examination of a major curriculum rewrite in MIS curriculum in an Australian university has shown that applying an ecological model for the forces shaping curriculum can be effective in rationalizing those forces. The idea of Rapid Application Development (RAD) can be effective and efficient if applied to curriculum development and implemented in consideration of an 'ecological' view of competing forces.

Keywords: Information Systems Curriculum, Rapid Application Development, Computer Industry

1. INTRODUCTION

Models of curriculum development attempt to find a method for developing a statement that is efficient and also incorporates all needed factors. Here is presented a model that has been found to be particularly useful for the development of curricula in rapidly changing environments such as information systems courses where the industry, the expansion of theoretical knowledge, and the requirements of graduates changes markedly in time frames similar to those of a semester. Truran (1997) postulates that the most common method of curriculum formation - to copy large parts from other curricula (what he calls the colonial echo model) - is an approximation of a much more complex process of accommodating forces and is analogous to a situation of ecology. Here we present a set of steps used in a real situation and extend the broad spectrum ecological model with input from actor network theory.

2. RAD STEPS

The process described here, both as a theoretical statement and with insight gained from using the method, is similar to applying a rapid application development process method.

In 1993 the head of department of a major Australian University department of MIS decided that the democratic model of curriculum development being used would not meet the deadlines required by an amalgamation of the two tertiary institutions involved. A small steering group was appointed and a Rapid Curriculum Development (RCD) model developed to ensure that the deadlines were met and that maximum involvement of all stakeholders was incorporated into the development process. This meant that a number of processes and milestones were identified and instituted.

[1] BillD@rmit.edu.au
[2] Arthur.Tatnall@vu.edu.au

1. Determine organisation policy (the University)
2. Determine the nature of the industry
3. Determine any real physical constraints
4. Decide on aims and objectives of the course
5. Formulate teaching and learning principles.
6. Determine content of the course
7. Find content themes in the content
8. Determine packages of content
9. Use the packages to create subjects.

3. PROCESSES AND MILESTONES

In curriculum theory we recognize many traditional forces that would usually be expected to contribute to curriculum development. Sandman (1993) offers seven principal environmental forces which he contends act to shape this curriculum and trigger its reassessment: academy, faculty, community, students, technology, competition, and organizational constraints. These forces may be seen in the steps of traditional curriculum development. For example Print (1993) recognizes three phases of curriculum development:

Phase 1 - Organisation
Phase 2 - Development
Phase 3 - Application

and identifies the components of curriculum development as analysis, instructional evaluation, learning activities content, aims, goals and objectives.

While the steps we have identified from the case study are of a similar nature, the obvious specificity of our steps arise from the situation of many MIS curriculum development exercises. In these cases it is often 'a given' that the course[3] will have certain aims, that there are certain physical constraints, and it only remains to determine what these set parameters are. Curricula are often determined by some authority: a government, an industrial body, a professional society or a funding organisation. These curriculum development exercises sometimes need considerable effort to determine what the curriculum should achieve in the most general terms.

We will now describe each of the nine steps mentioned above and how they were handled in this case.

Determine organisation policy (- the course policy of the University)

In curriculum theory we recognize many traditional forces that would usually be expected to contribute to curriculum development. Those outlined by Sandman (1993) and listed above represent one example of such forces.

[3] In this paper a *course* refers to a collection of subject studies that lead to the award of a degree.

The strongest of the seven forces postulated by Sandman (1993) is that of the 'academy', a term he uses to mean the requisite body of knowledge prescribed by one of the professional associations (e.g. ACM or DPMA). Model curricula (such as the DPMA model Information Systems curriculum for the 1990s, IS'97 etc) from these organisations are thus the most obvious manifestation of the influence of the academy. Obviously the faculty of academics who teach the program has an influence and Sandman considers that the background and experience of these academics can be a limiting factor.

In the case of a University MIS course we can make several assumptions about these external forces:

- The course is aimed at only a small subset of all possible graduate outcomes
- Many of the constraints on the curriculum will have already been set by University policies

With these restrictions, identifying requirements of stakeholders is reduced in complexity. The first step identified was that of determining the aims and objectives of the course to be described. Stakeholders in this process are normally difficult to determine and much curriculum development literature struggles with the issues of the aims of education. To a large extent the situation here is less complex than others, as the degree concerned is a very vocationally oriented one that fits in with a particularly narrow University philosophy.

The stakeholders were thus identified as students, employers, the professional association (the Australian Computer Society), and the University through its overall statements of philosophy and aims. The University of the case study has clear statements of both objectives and strategies for developing courses.

Given these constraints the course advisory committee was asked to develop a picture of the market for graduates, and general guidelines that would ensure a framework that guaranteed a useful graduate outcome. Faculty committees were concurrently working on models for all new courses that would ensure cooperation between departments allowing a broad base of business education underlying every business degree, including the MIS degree. Hence many of the philosophical questions were determined outside the MIS department.

It would not be unreasonable to expect this level of policy to exist in most Universities and hence the first step should be to find, collate and communicate clearly to the course development team the nature of these policies. In the case we are working through, this collation was done by the team and then communicated to academic staff through a working paper put out by the department head.

Determine the nature of the industry

Sandman (1993) asserts IS graduates undertake degree courses primarily in order to get better jobs and so the views of the local industrial community are an important force to take into account in developing a curriculum. Student background is another constraining factor. In common with a number of writers on IS curriculum (Nunamaker 1981; Longenecker, Feinstein et al. 1994; Cougar, Davis et al. 1995), Sandman argues that this is a technology-driven field and that emergent technologies are an important force in this dynamic area. Actor-network theory (Callon 1986; Latour 1986; Law 1999) would regard industry as an important actor, but would attribute its contribution to curriculum development somewhat differently (Tatnall 2000).

To make determinations of the nature of the IS industry two Australian national government studies:

- DEET (1990) *Education and Training Needs of Computing Professionals and Para-professionals in Australia* (Department of Education Employment and Training 1990)
- DEET, DITC, IITF (1992) *Report of the Discipline Review of Computing Studies and Information Sciences* (Department of Education Employment and Training, Department of Industry Technology and Commerce et al. 1992)

were identified as authoritative in terms of clarifying the nature of the industry and essential characteristics of any preparatory courses. In addition, the DPMA 1990 curriculum model (Longenecker and Feinstein 1990) was used as an indicator of the needs of industry.

These documents were crucial in deciding between competing contentions of academic staff. Many opinions had been expressed in the abortive first attempt at a process that were founded in the experience of individuals. Statements such as "Pick Basic is the most important language in the local industry" were often used to support content suggestions. With a set of definitive industry descriptions these arguments could be evaluated.

Determine any real physical constraints

Professionals involved in MIS understand the difference between logical and physical design. To a large extent the curriculum can be a logical design, and resources can be found to deliver it at the end of the process, but this is not sensible under some constraints. In many Universities there are limits to the division of time and the total amount of time. In Australia almost all universities are largely government funded and hence many constraints exist that cannot be changed without compromising this funding source. Since the constraints are only National, the actual outcome is not important, but the process step must be included.

Decide on the aims and objectives of the course

As with an information system where the components of design should be measured against the system requirements, the detail of a curriculum statement should be measured against the aims and objectives. To determine aims and objectives it is useful to consider:

1. Graduate characteristics
2. Course characteristics

Graduate characteristics, or generic abilities, can be generated from industry associations, research or university policy. In the university studied there were well developed statements of graduate characteristics:

- A professional attitude to work
- A broad business knowledge
- Strong technical, systems and program building skills
- Personal qualities and abilities including well developed problem solving skills, well developed communication and interpersonal skills

To some extent a University degree is a product that must compete with other products on the market. A curriculum should support unique selling features to attract the attention of potential students. In the university under study one can see from this statement that a fairly technical product was envisaged by the designers as these included:

- Leadership in technological issues
- Innovative teaching methodologies
- Responsiveness to changes in business computing and the business community
- Achieving and being seen to achieve, coverage of current business computing systems technologies in methodology, hardware, software and systems development architectures

In addition, a number of constraints were determined by the existence of a faculty structure into which the proposed course must fit. In particular at the end of second year students are required to undertake twelve months of paid work experience called 'the cooperative education year"' Hence the department head insisted on aims as follows:

> "By the end of second year of course work students should possess technical skills such that they are able to perform as effective employees on their co-operative programmes. Skills should be consistent with current practice in industry." (Millar 1994)

Taking all these factors together produced a blueprint for aims of the course which were stated as:

- Meet and exceed the minimum standards for level 1 membership of the Australian Computer Society and as an IT professional.
- Provide a sound grounding in general business disciplines

- Provide a basis for students to pursue further studies in business computing or further studies in other disciplines, for example, satisfy the requirements for ASCPA membership (Millar 1994).

Formulate a set of teaching and learning principles
Once the outcomes of the course have been determined, the development team can concentrate on writing a description that should produce these outcomes. At this stage the group we studied became difficult to keep together. It seemed at times that every academic had a different view of the learning process. Again time was spent in meetings talking at very different levels of abstraction from deciding on how many hours of practicum per week to the level of difficulty of content at each year level. Progress was again apparent when a number of overriding principles was decided upon. The best explanation of this step is to look at some of the decisions made.

Firstly, it was decided that the course structure should emphasize the need for computing to be taught within a business process context and with the main focus on the analysis, design and implementation and management of business systems applications.

It was considered appropriate that students should learn to quantify and approximate, to build working (as opposed to optimal) systems within realistic bounds of time and resources, to consider the context in which the system will operate, and to place high values on attributes such as reliability, portability and maintainability (Department of Education Employment and Training 1990 :186)

The non-technical content of the course should ensure that graduates have an adequate grasp of social, legal, ethical and management issues inherent in the IT profession. (Department of Education Employment and Training 1990 :189)

Determine the content of the course
Trends and needs were identified using the course advisory committee and the government publications. Hence content was identified from a mix of other course descriptions, especially the sample curriculum, and the current research into the nature of the industry. No information was available about the outcomes of previous graduates.

The balance between faculty core and compulsory subjects was determined and two major decisions made about the structure of the course. Typical statements at this stage included the following:

- Within this 'spine' of twelve subjects there will be some integration of systems, implementation and technology issues rather than having them arranged totally as separate subjects in the traditional way. The intention of this is to teach material when it is contextually relevant to the student. On the other hand this interleaving should not be overdone to the extent that the integrity and continuity of a discipline topic area is lost.
- The steering committee is of the view that course structure should exhibit an iterative approach. That is, students should be exposed to all the major phases of the development cycle in years one, two and four.

Find themes in the identified content
In any large project there must be a way of dividing tasks so that teams can produce input. In the case study this was done by finding themes of content. At first all staff were asked to list 'essential' and 'elective' content of a degree. This content was recorded and examined to see if common themes ran through the content list. The process resulted in the three themes: analysis and design, applications development and technology. It happened that every piece of content suggested by the staff could be easily assigned to one of these themes. Making themes like this, and recognizing that there will be some overlap between tasks, allows working groups to be set up that can produce preliminary statements.

Determine packages of content
At this stage the course was seen as a mix of faculty core, elective subjects and a compulsory stream of subjects representing three discipline areas and spread over three years of an undergraduate degree. An obvious way to proceed form the general aims and structure to the specific was to examine the course from these two orthogonal directions. Three discipline teams and three year level teams were set up to first determine content and then structure that content into a number of subjects.

Use the packages to create subjects
Once the content of a stream was classified as 'essential' or 'elective', the stream writers were required to break the essential into a number of packages. The number was determined by the number of core subjects in the stream. Once a subject had been identified as having a set amount of content, the depth of each topic can be set using the amount of time available.

4. COMPARISON OF PROCESS AND REALITY

It is now important to examine the differences between this fairly straight forward discussion and the actual operation of the process.

Curriculum development actually involves a series of negotiations between those writing the details of the curriculum. In the case cited these negotiations were influenced by the 'base positions' of a number of individual academic staff. A particular computer language, a specific teaching package and a specific set of 'important concepts' were among items that

were underlying most of the discussions that went into the curriculum statement. To understand these actions and anticipate them, we need a broad conceptual framework. Pitman (1981) sees the process of curriculum development as a series of negotiations between developers, mediators and teachers in the production of an educational product.

The Pitman model indicates a number of places where curriculum development becomes something other than a carefully directed intellectual exercise. In this case study individuals had specific inputs which arose from factors that they felt very important: a computer programming language, a specialized area of study, or a particular software package were things that were continually mentioned. Often academic input reflected summations of an individuals' experience in the industry, or of influences from recent events, particularly described in the press or discussed among each other. In the management of the process the planners were careful to make rules to inhibit the specific from taking over. Rules such as "no brand names to appear in the curriculum" were attempts at such control.

Truran (1997) postulates that much curriculum development can be described by the "muddle through method" and many of those involved in MIS curriculum development will recognize aspects of this method. A more complete explanation can be found in Truran's (1997) "Broad Spectrum Ecological Model" in which he asks us to analyze curriculum development activities in terms of a "balance between energy expended and satisfaction obtained". He also contends that events may be interpreted in terms of the interacting forces, the mechanisms for minimizing energy expenditure and the decisions which individuals make about whether to co-operate or compete.

This also is elucidated by consideration of the components of the curriculum development process as actors. Actor-network theory would ask us to see each of the components: individuals, content, software etc as actors and each actor must be considered in terms of its interactions with all other actors. For example a software package, programming language or analysis methodology must be seen not as an absolute fixed object, but as an actor that behaves in different ways in different contexts. It is not, however, possible to go further into an actor-network analysis of this development in this paper.

5. CONCLUSION

Curriculum development will inevitably happen in MIS courses, there is no stopping it. The technology, business, the computer industry and the development methodologies of the area are in a state of constant flux. If the process of curriculum development, however, is to be more than a class of personalities within an MIS department then a formal curriculum development process can be useful. The set of steps we have described: determine organisation policy (the University), determine the nature of the industry, determine any real physical constraints, decide on the aims and objectives of the course, formulate a set of teaching and learning principles, determine content of the course, find content themes in the content, determine packages of content, use the packages to create subjects, has been found to be useful in the MIS department of at least one large Australian university.

These steps can help the managers of the curriculum development project, but also need to be seen in the light of the negotiation process between a hypothetical 'curriculum product idealization' and the mediators, teachers and students involved with curriculum implementation. This negotiation process is akin to the behaviour of an ecology, where there is a "balance between energy expended and satisfaction obtained."

6. REFERENCES

Callon, M. (1986). 'The Sociology of an Actor-Network: The Case of the Electric Vehicle'. *Mapping the Dynamics of Science and Technology*. Callon, M., Law, J. and Rip, A. (Eds). Macmillan Press, London: 19-34.

Clements, M. A., Grimison, L. A. and Ellerton, N. F. (1989). 'Colonialism and School Mathematics in Australia 1788-1988'. *School Mathematics: The Challenge to Change Geelong*, Deakin University, Geelong, Australia.

Cougar, J. D., Davis, G. B., Gorgone, J. T., et al. (1995). 'Information Systems IS'95 DRAFT Report. Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems'. AIS, ACM, DPMA, USA.

Department of Education Employment and Training (1990). 'Education and Training Needs of Computing Professionals and Para-professionals in Australia'. Department of Employment Education and Training, Economic and Policy Analysis Division, Canberra.

Department of Education Employment and Training, Department of Industry Technology and Commerce and Information Industries Education and Training Foundation (1992). 'Report of the Discipline Review of Computing Studies and Information Sciences Education, Volume 2, Main Report', Canberra.

Latour, B. (1986). 'The Powers of Association'. Power, Action and Belief. A new sociology of knowledge? Sociological Review monograph 32. Law, J. (Ed). Routledge & Kegan Paul, London: 264-280.

Law, J. (1999). 'After ANT: complexity, naming and topology'. *Actor Network Theory and After*. Law, J. and Hassard, J. (Eds). Blackwell Publishers, Oxford: 1-14.

Longenecker, H., E. Jr and Feinstein, D., L. (1990). 'Information Systems (IS'90) DRAFT report: The DPMA Model Curriculum for a Four Year Undergraduate Degree'. DPMA (CTF-90), USA.

Longenecker, H. E. J., Feinstein, D. L., Couger, J. D., et al. (1994). 'Information Systems '95: A Summary of the Collaborative IS Curriculum Specification of the Joint DPMA, ACM, AIS Task Force'. Journal of Information Systems Education Winter 1994-95: 174-186.

Millar, K. (1994). 'Working Paper for the Integration of the Bachelor of Business (Business Information Systems) Degree and the Bachelor of Business (Computing) Degree'. RMIT Department of Business Computing, Melbourne.

Nunamaker, J. F. E. (1981). 'Educational Programs in Information Systems: a report of the ACM Curriculum Committee on Information Systems'. Communications of the ACM 24(3): 124-133.

Pitman, A. (1981). 'The Necessary Distortion of Disseminated Innovations'. Journal of Curriculum Studies 13(3): 253-265.

Print, M. (1993). Curriculum Development and Design. Allen & Unwin, London.

Sandman, T. E. (1993). 'A Framework for Adapting a MS/MIS Curriculum to a Changing Environment'. Journal of Computer Information Systems 34(2): 69-73.

Tatnall, A. (2000). 'Innovation and Change in the Information Systems Curriculum of an Australian University: a Socio-Technical Perspective'. PhD thesis. Central Queensland University, Rockhampton.

Truran, J. M. (1997). 'Reinterpreting Australian Mathematics Curriculum Development Using a Broad-spectrum Ecological Model'. *Old Boundaries and New Frontiers in Histories of Education*: Australian and New Zealand History of Education Society Conference, The University of Newcastle, Newcastle, Australia.