The Star Trek phenomenon: towards a typology of curricula in information management

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Introduction

Attempts to specify the nature of information management, in terms both of its knowledge base and its core competencies, are often driven by the very practical concerns associated with curriculum design, and professional accreditation. Educators are concerned to be able to design courses that develop an individual so that he/she can function effectively as an information manager, and, accordingly, the reputation of their department in the provision of sound professional education is enhanced. Professional bodies similarly seek to specify knowledge bases and competencies, with a view to identifying courses for accreditation, or evaluating the qualifications and experience of individuals in the process of bestowing professional status on individuals. Such processes tend to yield a list of criteria against which intended professional information managers can be judged. One of the real difficulties with such lists is that they are transient. In the information systems part of the territory, studies recognise that several changes in the technology, business, and IS function areas are in process, and that these are driving revisions in the skills requirements of IS professionals (Lee et al., 1985; Gupta and Wachter, 1998). The other limitation of such lists is that they seek to extend previously established professional roles and to re-interpret these in the light of environmental, organisation and technological change. This has led to two distinct, and barely connected literatures on the nature of information management curricula and competencies: those owned by information systems professionals, and those owned by information management or information professionals. Specific examples from these different schools of thought will be explored in more detail later, but contributions from the information systems area include Farwell et al. (1992), Burn and Ma (1997) and Davis et al. (1997). From the information professional side, the debate has been most active in the context of academic libraries, where the issue of staff skills in the wake of the convergence of library and information services, and computer centres has been hotly debated (Bebbington and Cronin, 1989; Collier, 1996; Fielden, 1994). However, other commentators (e.g. Enser, 1995), have explored similar issues in other contexts, such as the corporate environment. In addition, neither of these literatures reflects on the role of the “non-professional” or the information user in information management.

This article, then, uses a metaphor, based on a spaceship, for our purposes, the Starship Enterprise, which facilitates an integrating perspective on the roles in information management. This metaphor is useful in understanding the relationship between the perspectives taken by different stakeholders who have some ownership of the discipline of information management. Roles are not constrained by the history of professional interest groups. Roles also explain the differing treatment and learning outcomes that may be associated with a common topic, which is offered in different curricula. An initial review of literature on the nature of information management serves to demonstrate the multidisciplinary nature of information management, and explores some of the aspects of this professional discipline. This also illustrates the close relationship between debates associated with the definition of a discipline and the development of curricula. Next, the metaphor is introduced, and the roles in information management are described and illustrated. Insights offered by this model are summarised. The implications of the model are then further illustrated with reference to some specific examples of, and issues in, curriculum design in information management.

In pursuit of models of information management

Ever since the early days of the birth of courses in information science and information management and the creation of bodies such as the Institute of Information Scientists and Aslib, the Association for Information Management, educators and professional bodies have sought to identify the ideal curriculum for information management.
management and to specify the core competencies and knowledge base of professional information managers. In general terms, information management can be viewed as a response to, and a search for, new and improved means of controlling the information explosion and the resultant increasing complexity of decision making by improving the flow, the control, the analysis and the synthesis of information for decision makers. Nevertheless, it has to be acknowledged that the term information management has as many definitions as the authors who have attempted to define it (Lewis and Martin, 1989).

Many of the earlier definitions of information management have been conceptualised in the context of large organisations. So, for example, Marchand (1982) regards the purpose of information management to be: “to promote organisational effectiveness by enhancing the capabilities of the organisation to cope with the demands of its internal and external environment in dynamic as well as stable conditions”.

Lewis and Martin (1989) seek to define information management in terms of the fundamental and inherent characteristics of information management, namely, that it is integrative; emphasises content; and, is organisation-wide, dynamic, and strategic. A definition might thus read: “Information management integrates both the functions of an organisation and its various component parts. Information management has an organisational focus, emphasises information content and requires high level data administration techniques based upon the planning and control of information assets in support of organisational aims and objectives. Information management is both the product and the creator of change and as the process is management-driven, it is essentially dynamic in nature with strategic significance”.

Another more holistic perspective is proposed by Cronin and Davenport (1991) who state that in a sense all of us are information managers. We all manage information on the personal level, which is formal and structured, as well as informal and less structured. Davenport (1998) places personal information management in an organisational context. She notes that it may be viewed as a higher management function since it contributes to strategy, but that, on the other hand, it may be equally argued that it applies right down the line. Fairer-Wessels (1997) attempts to integrate the personal and organisation perspective with the following definition: “Information management is viewed as the planning, organising, directing and controlling of information within an open system (i.e. organisation). Information management is viewed as using technology (e.g. computers, information systems, IT) and techniques (e.g. information auditing/mapping) effectively and efficiently to manage information resources and assets from internal and external sources for meaningful dialogue and understanding to enhance pro-active decision making and problem solving to achieve aims and objectives on a personal, operational, organisational and strategic level of the organisation for the competitive advantage and to improve the performance of the system and to raise the quality of life of the individual (by teaching him/her information skills, of which information management is one, to become a global citizen)“.

Toffler (1990) argues that the culture of industrialism rewarded people who could break problems and processes into smaller and smaller constituent parts; this led to specialisation. The rise of the information age and the information economy, however, is based on a systemic or integrative view, where the parts of the process cannot be isolated from one another. On the other hand, most educational institutions are still working under the paradigm of specialisation. For example, Fairer-Wessels (1997) suggests that in South Africa information management courses might be tutored by the Departments of Accountancy, Business Economics, Computer Science, Informatics (Library and) Information Science and by Business Schools. This is not inconsistent with earlier work on the inter-disciplinary and trans-disciplinary nature of information management. Marchand (1982), for example, proposes that the sciences of information include: information science, library science, computer science, informatics mathematical theory of communication, systems theory and systems analysis, operations research, cognitive psychology, artificial intelligence, robotics, cybernetics, decision sciences, semiotics and cognitive science. Against this background, Taylor and Farrell (1992) identify the following contributing disciplines to information management:

- business principles;
- management science;
- information systems;
- office automation;
- end-user computing;
- information science;
- information technology;
- systems analysis;
- computing science;
- cybernetics and engineering.
Fairer-Wessels and Boon (1995) propose a move from the current multi-disciplinary approach to an inter-disciplinary approach to education for information management.

In conclusion, there has been extended and continuing debate about the nature of information management and its relationship to information management curricula. This debate clearly illustrates that information management draws on a variety of different disciplines and that, from those disciplines, there are a number of stakeholders who will compete for the high ground. Here we offer a metaphor, which makes a contribution to an understanding of how information management might be embraced in the context of courses in different disciplines. This metaphor is based upon the belief that effective execution of each of our proposed roles in information management requires the acquisition of skills and knowledge, and that this acquisition needs to be facilitated and supported.

**The spaceship metaphor**

One way to seek to conceptualise information management is to define it in terms of what information managers do. Using the spaceship metaphor, we propose that there are three distinct roles for information managers: the pilot, the maintenance engineer, and the designer:

- The pilots (or end-users) drive the electronic information system and use its controls to get it to take them where they want to be, or to complete tasks that they wish to achieve.
- The maintenance engineers (or information intermediaries) ensure that the electronic information system continues to operate effectively. They undertake both regular maintenance in terms of checking that the components of the system are still working effectively, and also replace any components that cease to function effectively. Maintenance engineers are part of a team that support the pilot. For example, for the student in higher education, this team might extend to include the tutor and other students.
- The designer (information systems professional) is responsible for creating and designing new models or versions of the system. These new models take into account technological developments, changes in tasks and applications, and progress in understanding human computer interaction. With the increasing sophistication of applications, designers increasingly work as part of a multi-skilled team. Such teams might typically include the following roles: a writer, a graphic designer, an information scientist and a network and communications technician. One or more of these roles may be fulfilled by the same person.

Clearly, while the pilot, the maintenance engineer and the designer all need to interface with the electronic information system, the skills and knowledge that they bring to their tasks with the system vary significantly. In addition, appropriate outputs vary. We have conceptualised these roles in relation to an electronic information system. It is also possible to consider them in relation to mixed electronic and paper based information management systems, often designed as hybrid information systems.

Visiting what might appear to be a rather traditional question “Do we need to teach cataloguing and indexing” might perhaps serve to illustrate the distinctions between the roles and skills and knowledge base associated with the different roles. In the “old days”, all librarians were taught to catalogue and index because the detailed organisation of books and other documents was viewed as the core of the work of the library and information worker or information intermediary. This role is rapidly becoming redundant. But all three of the roles proposed above require an acquaintance with concepts associated with the structuring and organisation of knowledge, since without such structuring, users will drown in information, but thirst for knowledge (Koniger and Janowitz, 1995). Specifically:

- Pilots need to understand the information that is presented to them in bibliographic databases and how searching is performed by, say, search engines and other devices that seek to organise and structure knowledge. They need to understand what will be retrieved by a given search strategy and why and how to amend search strategies to achieve different outcomes. They do not need to understand the search algorithms used by the system or the underlying database structures.
- Maintenance engineers need to be able to maintain the information resource. This is a multi-faceted role: tasks are associated with enhancing the system so that it better meets the needs of pilots. This may include the insertion of bookmarks on Web sites, guides to Web sites and databases, design of help systems and interfaces. They may be engaged in the evaluation of Web sites for inclusion in search engines, and may take
responsibility for the control and maintenance of document management systems. Typically, their role is one of plugging new components into an existing system. They need a level of understanding of how the system works in order that they can decide which components can be plugged in to enhance system performance. They also need to be aware of how to use the system, in order to achieve optimal results.

- Designers need to be able to create new systems (or build new rockets). They are highly skilled in the detailed maintenance of systems design and, for technologically sophisticated systems, it is important that they be able to work together in a team, which pools a wide range of different skills. Some designers need to understand details of the organisation of information at a detailed level. They need to design metadata, and select types of approaches to the organisation of information such as database structures. They need to be aware of the latest development in their field so that they can incorporate these into systems design. In addition to technological advances, the latest developments in record formats, information retrieval devices and expert systems approaches might all be appropriate.

The need for maintenance engineers can be minimised by effective systems design, and experienced and competent users. As Belkin et al. (1995) indicate, this will be achieved if a limited number of scripts for interaction can be identified, and the system can be designed to respond to the potential scripts that are adopted by users. Or even better, if the underlying rules for script creation from user input could be determined, a more intelligent system might be devised which would create an appropriate script in response to the user’s initial interactive behaviour. However, this process is recognised to pose its own challenges, and the role of human intermediary is likely to persist for the foreseeable future.

This metaphor acknowledges that there are a range of distinct roles in relation to information management and offers the following additional insights:

- Members of each of the three groups need a sufficient understanding of the roles of each of the other groups and some shared knowledge base to be able to communicate with members of the other groups.

Further, the competencies and knowledge bases necessary for the effective exception of each of the three roles has some common components. Accordingly, there will be some components that appear in curricula for information management which correspond to all of these roles. For example, the database design might be of interest to all groups, although the theory, concepts and tools to which they will be introduced should match the role.

- Environmental, business and technological change will impact on all of the roles, and the tasks that those fulfilling roles may be expected to execute. Over a career, individuals can move between the different roles, collecting competencies on the basis of formal education and training, and/or experience. This means that while it may be relatively easy, at a given point in time, to categorise courses in relation to roles, it is less easy to categorise the competencies and knowledge bases of experienced professionals; many will have uneven profiles which embrace competencies that are relevant to parts of all of the roles.

Curriculum design for pilots, maintenance engineers and designers

The previous section has identified three different levels of engagement with information management. Here we introduce examples that might serve to illustrate how these levels of engagement can be translated into information management courses. These examples are offered in order to illustrate the differentiation of the roles proposed above. They show why information management appears in a range of different curricula, and characterise the different approaches that are relevant to the different roles. Attempts to design national or international curricula in this area are bedevilled by the rate of change, and the value that employers place on current skills. In addition, with increasing modularization, students often have significant choice in the selection of modules to design their own programmes (Elkin and Wilson, 1997). Students may enrol on an information systems course, yet spend only around 50 percent of their time on information systems modules; on the other hand, students may enrol on a business studies course and pursue an information systems or information management pathway through their chosen programme. In addition, it is important to remember that curriculum design is shaped by a range of other factors which have influenced higher education in recent years. Although these vary a little from country to country, higher
education in many developed countries is subject to the forces associated with the need for countries to develop their workforce to function in a knowledge-based global economy. One of the outworkings of this has been the “new vocationalism” which has swept higher education. Muddiman (1999), for example, argues that this has shifted emphasis from information and library studies, which held as a core philosophy access to public knowledge and public interest, to the narrower focus on information management, which sees information as a commodity to be harnessed for competitive advantage, as opposed to being disseminated or shared. Other trends in higher education which affect curriculum design in both information management and information systems have included: reduction in the unit of resource, increased significance (in the UK) of the Research Assessment Exercise (and similar pressures for evidence of achievement of research in other countries), and greater demands for accountability and performance assessment, as evidenced through more oppressive quality assessment regimes.

Returning to the curricula that are used for illustration purposes below, for pilots we describe a module in an undergraduate course in business management. For maintenance engineers, we describe a postgraduate programme in information management. Courses for designers embrace a portfolio of courses to cover each of the skills and knowledge bases of information science, network and communications, graphic design, and creation of database content; we explore some aspects of such courses. In the interests of simplicity, the focus is on the syllabus or knowledge base of these courses. Clearly, a more complete analysis and comparison would involve an analysis of the aims, objectives and learning outcome as well as the curriculum, and possibly exploration of the teaching and learning, and assessment strategies.

Courses for pilots
Information management skills and knowledge permeate higher education curricula, particularly in the professional disciplines. Thus in business and management studies the integration of such courses into a professional or academic programme is a key issue and different approaches may be appropriate at undergraduate and postgraduate levels. Elements of information management may be explored and developed in the areas of decision making, strategic analysis and environmental scanning, quantitative

methods and business statistics, management information systems, and a variety of other components. The scattered nature of this treatment of information management should lead to valuable integration with other disciplines but makes it difficult to be confident that an appropriate range of current (and with rapid changes in technology, currency is important) information management competencies are acquired.

Here we describe a module in an undergraduate programme in business and management studies (Appendix 1) which illustrates how an integrated foundation might be achieved. This module was designed to prepare undergraduate students in business and management for the use, handling and management of information in both their university career and their future working life. The skills developed here give the student a foundation on which to build their understanding of information management, from a personal level through an organisational level to the collection, analysis and synthesis of external information. Learning outcomes include: the appreciation of the techniques for storage and retrieval of information, both with a computer and manually; the selection of appropriate media for the communication of information, including the preparation of documentation using IT; and, the collection of data using appropriate sources to research, analyse and present the information.

It is significant that for this group of students information management is studied alongside a range of other business related disciplines, such as marketing, accounting and finance, human resource management, international business and business strategy.

Courses for maintenance engineers
Maintenance engineers need a wide-ranging skills and knowledge base that supports the maintenance of systems for information management. Courses that develop such skills may be at undergraduate or postgraduate level, and may be foundation or first professional courses, or continuing education and updating courses. Appendix 2 shows the topics in a recent course, which is being offered at postgraduate diploma level by the Department of Information Studies at the Rand Afrikaans University. This example is included for its currency and the extent to which it makes explicit those topical issues. Although as presented here it is not framed in terms of learning outcomes, the structure recognises the need to deal with information management at the personal and
organisational levels and identifies areas in which students are expected to develop their skills and knowledge base. The programme familiarises students with both personal and strategic information management, and explores techniques and concepts such as database development, indexing and abstracting, information audit and WWW management.

The debate concerning future skills and courses for information and library studies, and latterly information management, has generated an extensive literature. This has been initiated and developed in the context of the impact of IT on the role of the librarian in a variety of different contexts. The most developed literature in this area is that relating to the role of the information specialist in higher education. For example, as early as the mid-1980s Adams (1986) was discussing the training and skills requirements of future information workers. He identified the following necessary skills: designing and developing systems, retrieving and integrating data to provide usual information, and the education of users. Creth (1996) echoes some of these areas when listing activities that librarians need to carry out “aggressively” rather than “passively”. These activities were: user education, knowledge management, organisation of networked resources, information policy development, electronic publishing and strategic and operational planning. Fielden (1994) notes that the roles of LIS staff will continue to change, as users become more confident users of the technology. Collier (1996) develops this perspective by arguing that rather than different skills information, staff may need to have higher or more advanced skills than those possessed by academics. Collier (1996) continues that if librarians are to work well in multidisciplinary teams, competencies will be more significant than professional labels.

The debate is also taken up by a number of commentators on library and information studies curricula. Feather and Mann (1993) echo one of the key concerns of other when they argue that the problem for LIS educators, as for information professionals themselves, is to define the core body of competencies, skills and knowledge without defining themselves out of existence. Various authors explore the role of IT in the LIS curricula (e.g. Elkin (1996), Wilson (1993) and Pors (1995)). Others have noted that the boundaries of the LIS subject discipline have now become obscured, resulting in an identity crisis (Enser, 1995). Work carried out by the International Federation for Information and Documentation/Education and Training Committee (FID/ET) identified that a key role for the information professional was that of “intermediary” or “information counselor” (Wormell, 1995).

Courses for designers

There is insufficient space in this article to rehearse the multitude of different types of courses that the various members of the design team may have used to support skills and knowledge acquisition. It is also particularly important to acknowledge that there will be a significant element of continuing development and experiential learning, so that any foundation course, such as an undergraduate course or first professional postgraduate course in the area, is only one component in the education and training of members of the design team. Nevertheless, in order to illustrate the difference between the portfolio of skills required for designers and maintenance engineers, Appendix 3 includes a succinct list of module titles in an undergraduate course in business information technology and Appendix 4 shows the indicative content of a Masters course in information engineering. These courses cover both the use of information, in modules such as Managing and Retrieving Information, and IT Applications and systems design. Typically systems design covers areas such as: software development, programming, networks and communication systems, human computer interaction, and software engineering.

Extensive discussion on IS curricula has taken place in the wake of significant growth and change in information systems and their applications in recent years. Gupta and Wachter (1998) summarise the minimal skills that will characterise the new breed of information professionals in the twenty-first century. These are summarised in Appendix 5, which reflects one of the key preoccupations of contributors in this field, and this is with the need for the IS professional to understand the business context and strategic orientation of technological investment (Trauth et al., 1993; Lee et al., 1995; Cougar et al., 1995).

Conclusion

The search for the nature of the discipline of information management is often driven by the desire to design professional criteria or course curricula. Such curricula and criteria can be divided into two groups: those associated with information management professionals and those associated with

[281]
information systems professionals. A metaphor has been proposed that encompasses both of these groups, and in addition embraces the third group, who are important in information management, the end-user. The spaceship based metaphor identifies three roles in information management: those of the pilot (the end-user), the maintenance engineer (the information intermediary) and the designer (the information systems professional). Examples of courses that might support the development of skills and knowledge in each of these areas are offered in order to illustrate the differences, and interfaces between the roles.

Further work in this area might take the concepts of roles proposed in this paper and seek to generate a hierarchy of tasks to be associated with each of the different roles. On the basis of this analysis it should be possible to identify appropriate competence and relevant knowledge bases, and to translate these into learning outcomes for courses. However, these latter will be subject to greater change over time, than the underlying roles.

References


**Further reading**


**Appendix 1. Information Handling (Level 1 module; BAHons Business Administration, The Manchester Metropolitan University)**

1 Introduction to the computer network.

2 Personal information management: word processing basics.

Creation and production of personal documents.

3 Organisational information management:

   • Use of literature: sources, notes and recording.
   • Preparation of documents: essays, reports, papers.
   • Preparation of documents: presentation of data.
   • Preparation of documents: graphics and clip art.

4 External information management:

   • Quantitative and qualitative data collection.
   • Quantitative and qualitative data analysis.
   • Organisation of information.

5 Information storage and retrieval

Information handling: queries, reports, presentation

There are two equally weighted assignments as follows:

1 a literature search exercise;

2 a data collection and analysis exercise.

There is also an open-book examination which will require pre-submission of a prepared document and the use of a database programme.

**Appendix 2. Postgraduate Diploma in Information Management (The Rand Afrikaans University, Department of Information Studies)**

The diploma extends over a minimum of four semesters part-time; non-resident students can complete the course via the World Wide Web (full Internet access is essential). The minimum requirement is a Bachelor’s degree in any subject area. The diploma provides direct access to the department’s Magister Informationis degree.

**Course structure**

1. First year

1.1 Personal information management:

   • Information identification:
     - The information community.
     - Communication of information.
     - Information technology.
     - Internet/World Wide Web as information.
     - Infrastructure.

   • Information organisation:
     - Indexing; abstracting.
     - Personal database development.

   • Information management:
     - Principles of information management.
     - Introduction to personal, organisation and strategic information management.
     - Information as resource.
     - Information products.

   • Practical assignments.

1.2 Strategic information management:

   • Information retrieval:
     - Electronic financial sources.
     - Individualised information services (push technology).
     - Electronic document delivery.
     - Internet security.
     - WWW management.

   • Value adding:
Jennifer Rowley and Frances Stack
The Star Trek phenomenon: towards a typology of curricula in information management
The International Journal of Educational Management 14/6 (2000) 276–284

– Processes and techniques.
– Electronic applications.
– Information management:
  – Information and knowledge in learning.
  – Enterprises.
– Management/evaluation of information:
  – Systems.
  – Information for competitive advantage:
    – Information audit
    – Competitive intelligence.
  – Scenarios and forecasting.
  – Knowledge management.
– Practical assignments.

2. Second year (advanced research work in four of the following topics):
• World Wide Web management.
• Electronic publishing.
• Internet infrastructures.
• Indexing and information retrieval.
• Information management systems.
• Information management strategies.
• Information economy.
• Knowledge management.
• Research essay on approved subject.

Appendix 3. BSc. Information Systems (Joint Honours) Modules Edge Hill University College

Year 1:
• IT Applications.
• Essential IT.
• Managing and retrieving information.
• Foundations of software development.
• Programming in visual basic.

Year 2:
• Networks and communications systems.
• Database management systems.
• HCI: human factors and design.
• Integrating digital media.

Year 3:
• Intranet design and management.
• Client server applications.
• Hypertext and hypermedia systems.
• Software engineering project.

Appendix 4. European Masters in Information Engineering (European Commission DGXII/4 Telematics Application Programme)

1 Foundation course:
• Computer hardware and architecture.
• Operating systems sharing of resources.
• Basic data structures and algorithms.
• Features of 3GLs and 4GLs.
• Basics of software engineering and life cycles.
• Compilers and interpreters.
• Computer communications
• Relational and OO databases.
• The Internet and WWW.

2 Core phase:
• Organisations and management.
• Human communications and information behaviour.
• Information resources and society.
• Information management and telecommunication systems.
• Multimedia systems.

3 Push core (includes):
• Information industry.
• User interface design.
• Product development and marketing.
• Advanced information retrieval.
• Multimedia programming.
• Advanced databases.
• Hypertext and hypermedia.
• Distributed systems.
• Multimedia information retrieval.

Appendix 5. Skills for the new breed of IS professional

Interpersonal and management knowledge skills
• Ability to plan and execute and work cooperatively in a project team environment.
• Ability to work closely with customers and maintain productive user/client relationship.

Business functional knowledge
• Ability to interpret business problems and develop appropriate technical solutions.
• Ability to understand and learn about the business environment and business functions.

Technology management knowledge
• Ability to focus on technology as a means not an end.
• Ability to understand new technologies and trends.

Technical specialties knowledge
• Telecommunication, networking, distributed processing.
• Relational databases.
• Fourth generation languages.
• Systems integration.
• Data management.