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INNOVATION AND EMPLOYABILITY IN KNOWLEDGE MANAGEMENT CURRICULUM DESIGN

S J Rees
Southampton Solent University
Southampton
SO14 0YN
John.Rees@solent.ac.uk

Jing Lu
Southampton Solent University
Southampton
SO14 0YN
Jing.Lu@solent.ac.uk

ABSTRACT

During 2007/8, Southampton Solent University worked on a Leadership Foundation project focused on the utility of the multi-functional team approach as a vehicle to deliver innovation in strategic and operational terms in higher education (HE). The Task-Orientated Multi-Functional Team Approach (TOMFTA) project took two significant undertakings for Southampton Solent as key areas for investigation, one academic and one administrative in focus. The academic project was the development of an innovative and novel degree programme in knowledge management (KM).

The new KM Honours degree programme is timely both in recognition of the increasing importance to organisations of knowledge as a commodity, and in its adoption of a distinctive structure and pedagogy. The methodology for the KM curriculum design brings together student-centred and market-driven approaches: positioning the programme for the interests of students and requirements of employers, rather than just the capabilities of staff; while looking at ways that courses can be delivered with more flexibility, e.g. accelerated and block-mode; with level-differentiated activities, common cross-year content and material that is multi-purpose for use in short courses. In order to permit context at multiple levels in common, a graduate skills strand is taught separately as part of the University's business-facing education agenda.

The KM portfolio offers a programme of practically-based courses integrating key themes in knowledge management, business, information distribution and development of the media. They develop problem-solving, communications, teamwork and other employability skills as well as the domain skills needed by emerging information management technologies. The new courses are built on activities which focus on different aspects of KM, drawing on existing content as a knowledge base. This paper presents the ongoing development of the KM programme through the key aspects in its conception and design.

Keywords

Curriculum Design, Knowledge Management, Conceptual Framework, Activity-Based Learning And Teaching, Employability Skills.

1. INTRODUCTION

Supported partly through the Higher Education Innovation Fund, Southampton Solent University is engaging in a range of knowledge transfer initiatives with business and community partners. This is a broad perimeter exercise, including business advice, consultancy and short courses supported by distinctive long course developments with employer involvement.

The long course work has developed an Honours degree programme in Knowledge Management, building on existing strengths within the School of Computing and Communications in activity-based learning and teaching while addressing explicitly the requirements of industry. This is articulated particularly through the activity set, derived from extensive analysis and discussion with the commercial sector, where technology or business-oriented activities are designed to focus on different aspects of knowledge management. At the point of completion, each activity will be reviewed by a current industry professional as to their perception of its suitability for employer needs. The curriculum overall is intended to deliver for the students a full set of demonstrable skills ready for employment embedded within the matrix of a full academic experience.

Knowledge management (KM) has become a popular topic in academic research and management practice. In order to make sense of the variety of perspectives of KM, there have been a number of attempts to categorise or group some of the concepts [1, 2]. A KM "big picture" is introduced in section 2 as a guide for considering the different perspectives during course development. A list of 16 KM activities is then proposed, both informed by the big picture and covering the range of concepts as a whole.

Section 3 presents the KM curriculum design methodology, providing a course framework which links existing units and employability skills through activity-based learning and teaching. The KM programme comprises three courses co-designed along technology, business and media themes [3]. where a red-yellow-blue colour scheme is used in the framework to represent them. Activities will be available to all students taking each course every year, so the development of learning outcomes, areas of study and assessments are principal objectives across all three levels. Differentiated learning outcomes build the skills base while testing the development of “graduateness” through the course. This mode of teaching may be challenging for staff to deliver at first, but it is flexible for students to engage in their learning. A KM skills map is then introduced from TFPL [4] which can be used to specify the employability skills achieved by individual activities.

Three sample activities have been selected in section 4 to illustrate the design approach in the context of the KM big picture, academic level and learning outcomes, and employability skills. It is shown how global concepts correspond to KM practices together with a detailed example of the development of areas of study and assessment. And, in order to make students more aware of what employers expect, KM skills are integrated in each course and mapped out in a specific activity. Post-activity reflection is encouraged by clear tasks for each activity.

The paper draws to a close with some concluding remarks, and by indicating potential pitfalls and problems in the delivery of the programme. In particular, this type of course requires a higher degree of maturity and understanding from the student population, not least with respect to their explicit ownership of their own learning experience.

2. KNOWLEDGE MANagements CONCEPTS AND ACTIVITIES

People see knowledge management from various perspectives – some emphasise intellectual capital, some focus on technology, whereas others put community building first. In this section, a KM big picture is proposed and sample KM activities are presented.

2.1 KM Global Concepts

KM as a field of study in the social technology space is driven both by the practical needs of organisations and some related broad areas including cognitive sciences, information sciences, economics and management sciences [5]. Rather than describe a complete puzzle, the KM big picture in Figure 1 is introduced through the four KM perspectives: *Knowledge Type*, *Knowledge Domains*, *KM Processes and Technologies*, and *Human and Social Aspects* [1, 6].

Knowledge Type: There is no universal way to categorise the types of knowledge, although six categories have been suggested [7]. The two fundamental types are “explicit” and “tacit” knowledge. Explicit knowledge is formal and systematic, and can be easily communicated and shared, e.g. in product specifications, scientific formulae or computer programs. Tacit knowledge is knowledge that people carry in their heads, or within organisational structures and practices, and can be difficult to access.

Knowledge Domains: Many organisations now use competency frameworks as the foundation to define and assess the capability they need within their workforce and to develop learning programmes to fill gaps. In a networked collaborative environment, knowledge and information competencies need to be incorporated into the corporate competency framework. In addition, to what extent does KM improve financial and operational performance? The impact of KM on key business results might well be the greatest through its potential for improving the productivity of business processes.

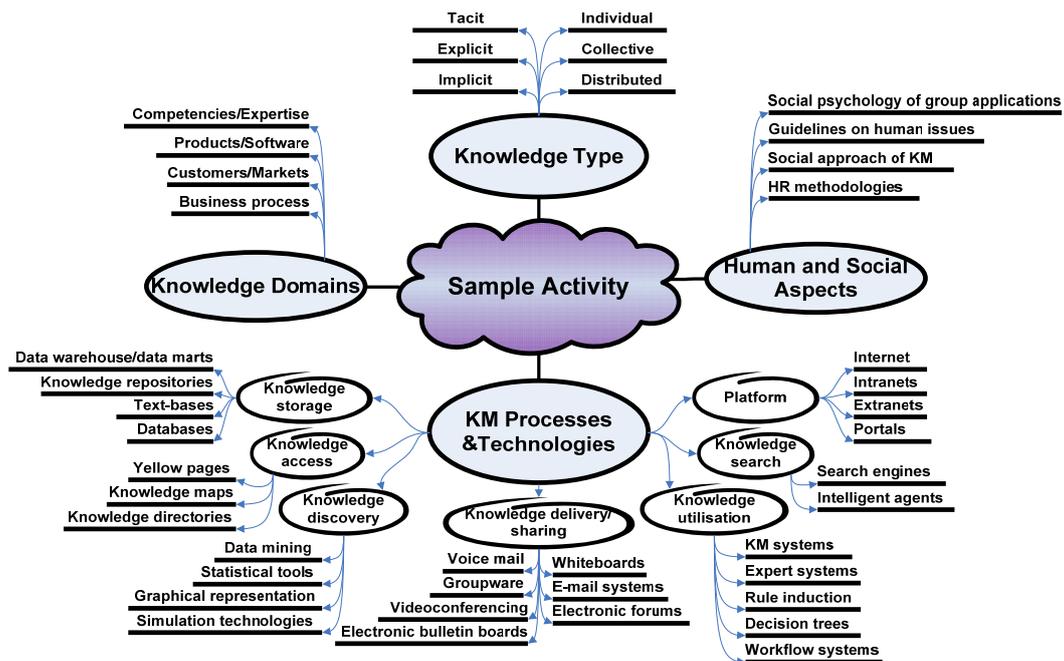


Figure 1: KM big picture

KM Processes and Technologies: KM processes can be described in relation to many different disciplines and approaches, but all focus on some basic knowledge activities. The difference typically comes in the naming and number of activities, and the importance and level of detail assigned to each activity. Based on the distinction of KM processes drawn by Alavi and Leidner [1] – i.e. knowledge creation, knowledge storage and retrieval, knowledge sharing and transfer, and knowledge application processes – Tsui [6] proposed a typology of KM technologies with seven categories. Many technologies currently in use that facilitate KM can be classified in this way, based on which knowledge process they support and what objective they aim to achieve.

Human and Social Aspects: Technology is not the answer to all KM problems. KM is broad in scope with clear reach into other management disciplines such as financial management and human resource management. Many of the issues it addresses are concerned with organisation, people and motivation. It is essential when designing knowledge management systems to consider the human and social factors at play in the production and use of knowledge [8].

2.2 Sample KM Activities

The KM courses are being organised in the form of activities which allow students from each level of the programme to work on the same project – with different learning outcomes, areas of study and assessments – where it is straightforward for staff to deliver material and provides flexibility for students to engage in learning. Some activities tend to the technology side and others are business-focused. The titles of proposed KM activities are listed in Table 1, which shows three of them highlighted – activities 1, 8 and 9 will be used as examples to explain how the activities are developed.

No.	<i>KM Activities</i>
1	Conduct an audit on a major networked information system
2	Redesign a block of business processes to meet an express purpose
3	Evaluate the state of human knowledge in a defined area and implement a method of teaching it to a given audience
4	Prepare a synthesised information feed on a given topic using existing information feeds as the source
5	Implement a personalised sensory <i>scenescape</i> using multimedia tools and integrating individual data
6	Semantically archive a section of library books/journals
7	Make a million pounds synthesised share dealing, developing tools for forecasting and analysis to enable success
8	Create a prediction model of consumer behaviour in a given area using artificial neural networks for clustering and Bayesian belief networks for forecasting
9	Present one set of information “perfectly”
10	Develop a business change strategy for a given business problem, or design a knowledge management strategy for the Faculty/University
11	Design one tertiary business knowledge product or tool
12	Redesign the informal communications process for the School (or the Faculty) to optimise the development of tacit knowledge
13	Identify and evaluate the key knowledge asset value in a given strategic business unit
14	Design an information push system for improving the performance of similar research and development centres in different divisions of a geographically diverse company
15	Develop a “sticky” virtual community on the internet
16	Implement a secondary knowledge product in a virtual environment, or make £10K in real money as a developer in an existing virtual world

Table 1: KM sample activities

3. KM CURRICULUM DESIGN

During the study of each KM course, students will develop knowledge and skills in systems and technologies supporting knowledge management themes, and gain an ability to critically evaluate KM strategy development and its organisational implications, including its limitations.

3.1 Course Framework

The KM Honours degree programme is new and different from traditional course structures in various ways, and Figure 2 shows the proposed framework for the KM courses.

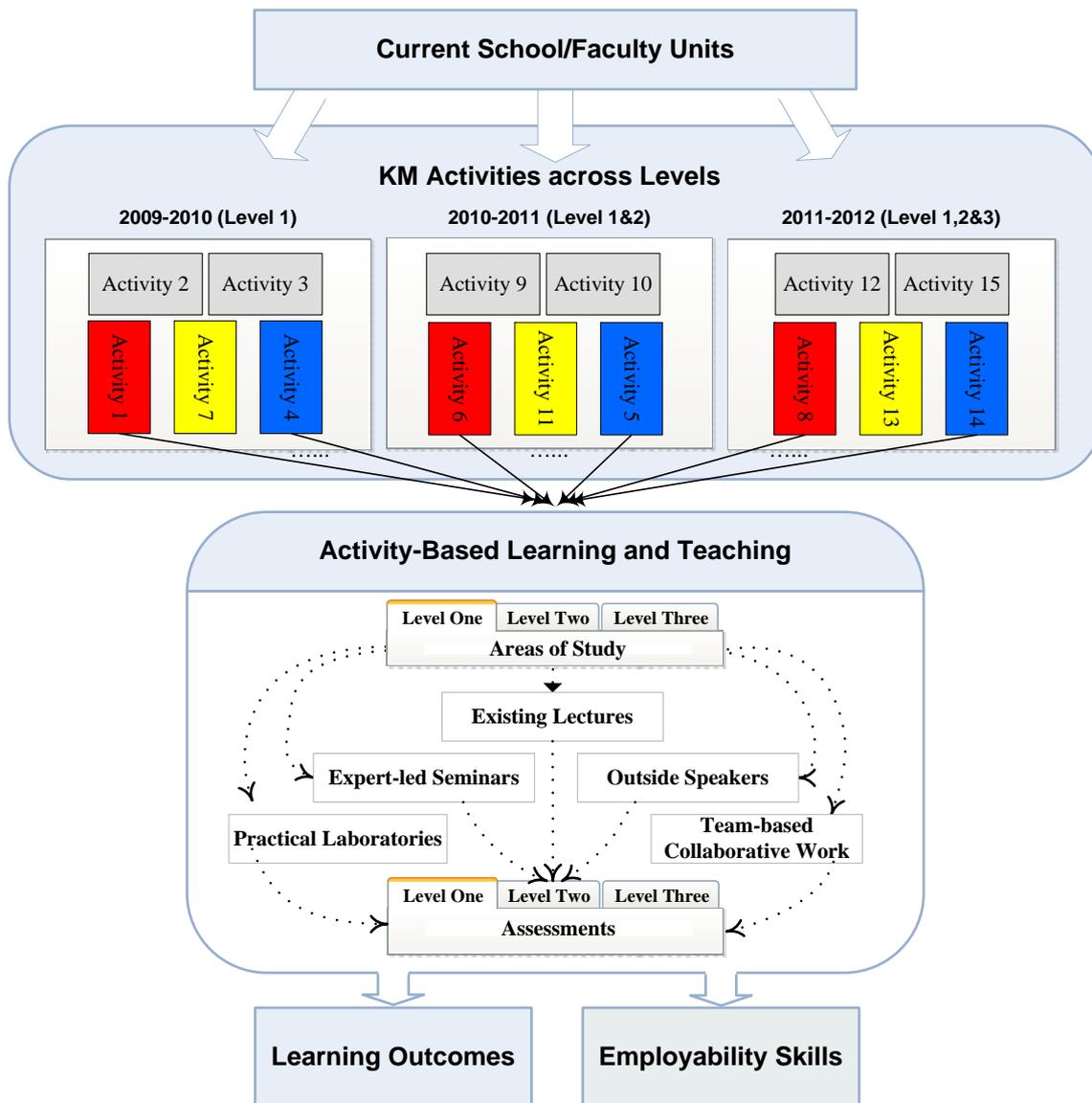


Figure 2: KM course framework

The new programme of three courses takes advantage of units within the School (of Computing and Communications), the Faculty (of Technology) and even across the University. The colourful boxes in the above figure represent a set of building blocks for each course – KM activities across all three levels. Fifteen activities will be drawn from those listed in Table 1 to underpin the KM programme over three academic years. Up to five activities are proposed every year with students from each course taking three at each level – two core/programme activities (in grey) and one option/course activity (red-yellow-blue). The result will mean that students complete a total of nine activities on their course, not necessarily studied in the same order by each cohort.

Activities are available to all three levels of students on each course and, consequently, the learning outcomes and assessments are designed for three different levels – context, however, is common. Students will gain knowledge and skills through expert-led seminars and outside speakers as well as existing School/Faculty lectures and the graduate skills strand. The latter consists of three year-long units appropriate to the level of study: Transition Studies, Progression Studies and Professional Skills. Some additional learning and teaching strategies (such as laboratory practical sessions, workshops and group work) will be prescribed for students, depending on the needs of the particular activity. Section 4 will highlight the development methodology for specific KM activities in the context of the course framework.

3.2 Compatibility with Existing Units

There are four field groups in the School of Computing and Communications, namely Computing, Computer Networking, Business Information Technology (BIT) and Media & Engineering. As part of the University's new footprint, the KM programme is being developed to integrate with and support the existing BIT programme, as well as being designed to take advantage of current School units more generally. One way to find out which of the current units may be relevant to the new course is to represent the potential relationships graphically. The School units are organised according to fields and Figure 3 shows the extent of relevant subject areas which may contribute to knowledge management.

Each of the individual boxes in Figure 3 represents a subject area which contains units across the three undergraduate levels. For example, the Databases area contains three units listed as Introduction to Databases (Level 1), Database Application Development (Level 2), and Advanced and Distributed Databases (Level 3). A feature of Figure 3 is that it shows the relationship of the current units with KM in a straightforward way, i.e. the closer the subject box to the centre circle, the more likely there will be a contribution to the new course. Units from the Business School and elsewhere are also used as support for appropriate content.

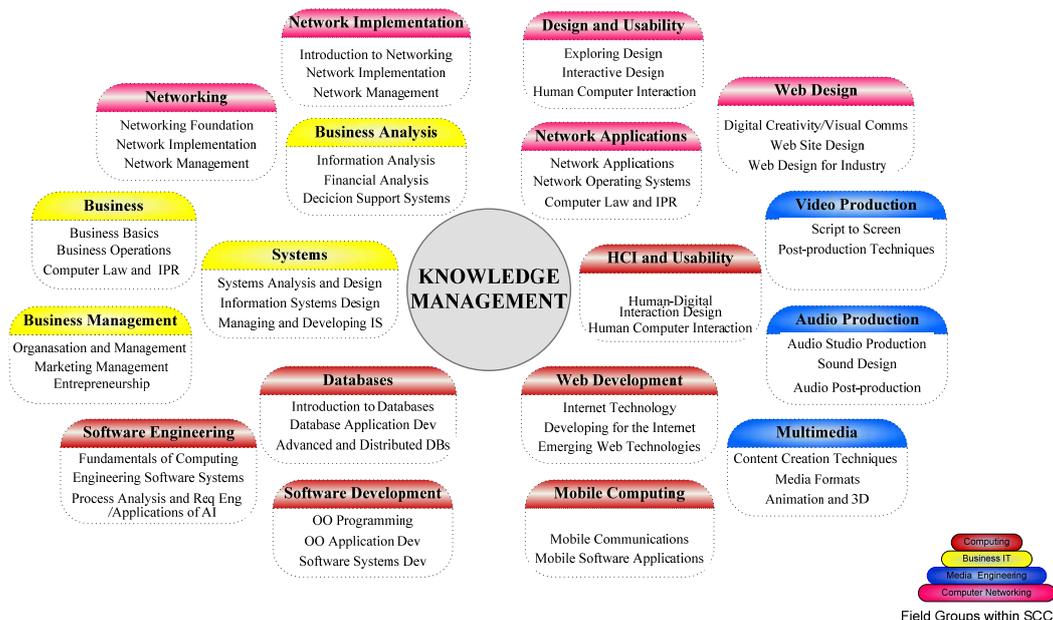


Figure 3: KM and existing subject areas/units

3.3 Employability Skills

Understanding the employment market while defining specific skill sets associated with potential graduates is always important for courses in higher education. While there is not a universal and standardised skills framework, the TFPL/KM skills map [4] has been adopted for this development as one way for the presentation of employability skills, where six categories of KM skills are proposed covering Management, Information Management, Communication and Interpersonal, Strategic and Business, IT, and Thinking and Learning.

Figure 4 shows the categories containing the particular skills which activities can be designed to achieve in the context of knowledge management. These skills are indicated graphically and provide a weighting scale for each category. Different KM activities aim to achieve different skills and a specific example will be given in section 4.

Employability skills for KM can also be drawn from the broad Information Systems area [9] through the Skills Framework for the Information Age (SFIA), where six categories of work are described as part of the reference model for skills: Strategy and Planning, Development, Business Change, Service Provision, Procurement and Management Support, and Ancillary Skills. SFIA has evolved to become the industry standard for IT skills management and is cited as the "high level UK Government backed competency framework describing the roles within IT" – see SFIA: The Skills Framework for the Information Age [10].

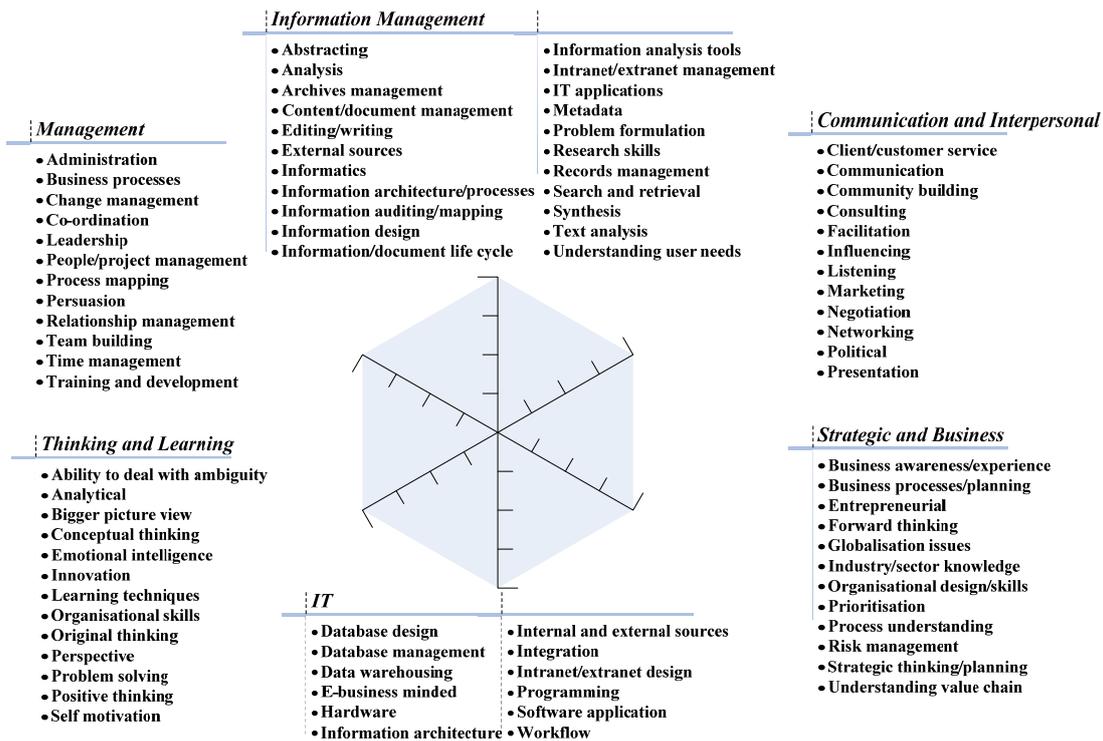


Figure 4: TFPL-based KM skills map

4. KM KNOWLEDGE ACTIVITY

A combination of learning and teaching methods – e.g. seminars, small group tutorial sessions and practical experience – will be used as ways of understanding the concepts, techniques and tools that are involved in a particular activity. Three activities are drawn from Table 1 as examples to illustrate different aspects of the activity development.

4.1 Ensuring that Activities Correspond to KM Practices

As shown in Figure 1, a KM big picture has been introduced as the reference for the perspectives of knowledge management. Each sample activity and its potential relationship with some of the KM concepts can be presented in this way.

Example 1 (Activity 1): Conduct an audit on a major networked information system. This activity aims to provide students with appropriate knowledge and skills in IS auditing, and to provide a suitable learning and teaching environment. Information systems auditing is a function that has been developed to assess whether computer systems safeguard assets, maintain data integrity, and allow the goals of an organisation to be achieved effectively and efficiently. Information systems auditing can be used not only to identify strategically significant information resources, but also to identify those tasks that create knowledge as well as those that rely on the transfer of knowledge from other areas of the organisation. "Information Systems Audit is a first step towards effective Knowledge Management" [11] and Figure 5 shows a realisation of the conceptual fit for activity 1.

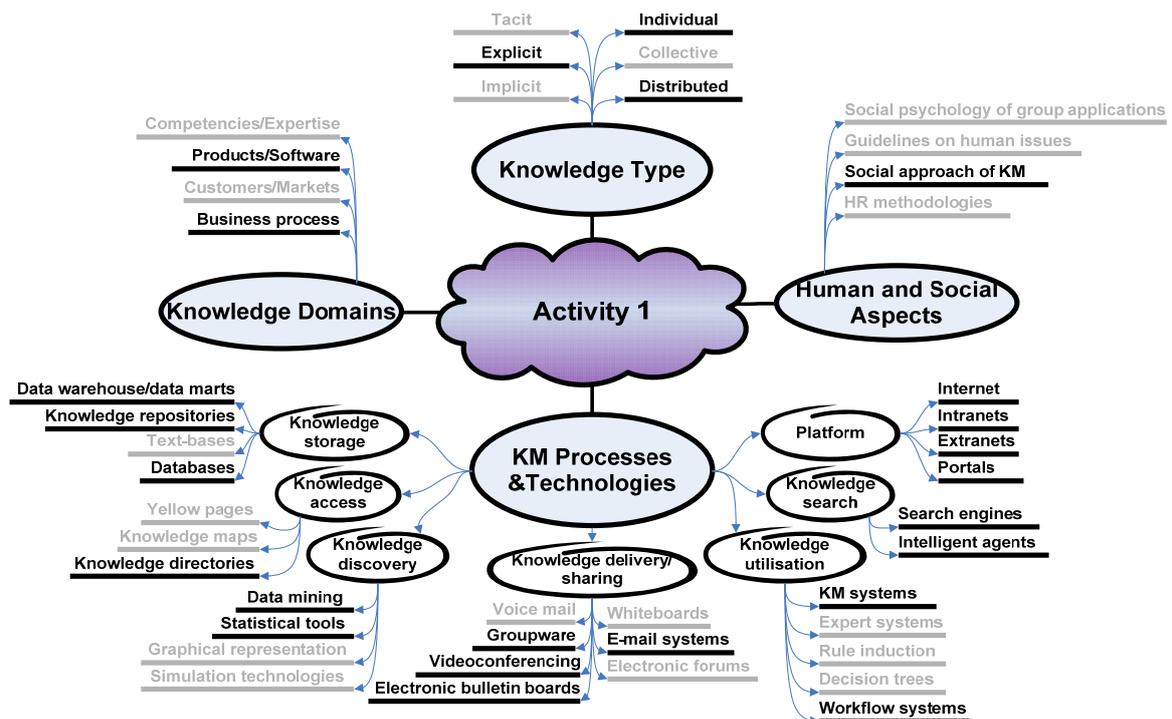


Figure 5: Example activity in KM global concepts

Those concepts which are considered to be covered by the activity are shown in bold in Figure 5 and otherwise in grey. Before pursuing the activities, students will be able to associate clearly what they are learning within the global KM context and concepts. The overlay of the big pictures is used as a tool for the evaluation of the overall domain coverage achieved by activities.

4.2 Delivering Academic Objectives across Student Cohorts

Activities will be available to all students taking each course every year, so the development of learning outcomes, areas of study and assessments are objectives across all three academic levels.

Example 2 (Activity 8): *Create a prediction model of consumer behaviour in a given area using artificial neural networks for clustering and Bayesian belief networks for forecasting* is used as the exemplar here. Marketing research and consumer research focus on understanding the behaviours, preferences and whims of consumers in the marketplace. To meet their needs, finding out what customers want from their products and finding out what they think of their products will be the most important marketing research activities.

Table 2 below shows the development of this sample activity in the form of a grid. There are three levels of learning outcomes and areas of study comprising Data/Business, Tools/Software and Predictive Model are designed to cover each level individually for the activity. Moreover the assessments are level-related too: Level 1 aims to *show what students can do* as well as their understanding; Level 2 aims to give students experience *applying techniques* to analyse data; and Level 3 aims to *evaluate a specific problem* and create a suitable predictive model. This pedagogic approach and layout is used for all of the activities making up the programme.

A series of expert-led seminars are custom-designed to provide a broad overview of the knowledge requirements of the activity, which will focus on establishing key concepts and specific issues – see Table 2 for the proposed seminars of activity 8. Since this activity covers several different areas and technologies, complex theories or detailed algorithms would generally be avoided in the seminars. In addition, workshops and tutorials will be used as an opportunity to discuss the relevant issues. Current School units which may contribute to this activity are listed at the end of Table 2 – it is worth mentioning that students are required to take part in certain lectures, but not necessarily to attend the assessment of the units from which they are drawn. There will be considerable latitude for students to follow specialisms and other interests across the Faculty curriculum.

In addition to the content in Table 2, other learning and teaching strategies are used for example:

Practical laboratories, where case studies will be used with a corresponding tool to give students experience in applying the techniques learned to practical examples covering a range of applications. The student is advised of a task, shown how to complete that task and then given time to practice in laboratories.

Team-based collaborative work, where students will be expected to research a particular application, in groups, and will have the opportunity to present their findings on certain aspects agreed in advance. Students will also be required to use appropriate tools to create predictive models.

In an activity-based course, evidence of student engagement is explicit at all stages. This has two benefits: formative feedback is continuous and forms a major element of the learning experience; and the summative burden of micro-coercion in learning is eradicated.

4.3 Representing Industry-Defined Employability Skills

Example 3 (Activity 9): *Present one set of information “perfectly”* is used here to illustrate the technique applied to demonstrate the relationship between the activity tasks and employer skills requirements as presented by TFPL. The title, of course, is a challenge to the student cohorts to define excellence in the context of knowledge presentation. The emphasis is on the development of skills relating to presentation of various forms of information. It aims to develop the student’s ability to “present the right information in the right way to the right audience”. It also provides a holistic understanding of the role and function of information together with its representation and delivery. Various techniques and tools will be viewed and evaluated as devices for “perfectly” presenting information in context.

Using the same approach as in section 4.2, the core components of the activity are developed with learning outcomes across three levels.

Level 1: Identify suitable sources of information and search for new information/primary sources; describe/interpret various types of information and make use of standard software to represent information; publish information on the World Wide Web, such as static web pages and blogs.

Level 2: Bring information together and decide what is relevant for the purpose in hand; make appropriate use of models, techniques and advanced software to present integrated information; apply analytical techniques to interpret information for making decisions.

Level 3: Derive new information from a particular application area and visualise it using specialist software; represent information orally and in writing in a professional and accurate format; plan, present and record a Webinar, providing a critical analysis of the outcome.

A KM skills map can be used to represent the employability skills developed through activity 9 and Figure 6 shows the skills which are considered to be achieved by the activity in bold.

Table 2: Activity 8 development

		Level 1	Level 2	Level 3
Learning Outcomes		Make simple use of data management tools (data acquisition, processing, administration, retrieval or mining) in sales or marketing areas	Apply the basic concepts and principles of artificial neural networks and Bayesian belief networks; make appropriate use of tools in the creation of predictive models	Describe, explain and evaluate the models to assist in the analysis of consumer behaviour
Areas of Study	Data/Business	Data Understanding in different formats (e.g. text, spreadsheet, CSV, databases ...) Business Understanding in given areas	Data Pre-processing: transforms the data into a format that will be effectively processed for the purpose of the user	Data Preparation: utilise various consumer behaviour information sources available on the Internet
	Tools/Software	Simple tools consolidation (Word, Excel, Access, etc.); apply tools recommended by the lecturers or taught in the unit (e.g. PolyAnalyst for data mining)	Further explore the features of the specific tools (e.g. PolyNet Predictor), understand the meaning of models.	Particular application: make appropriate use of tools in the construction of a consumer behaviour application
	Predictive Model	Predictive model foundations - concepts - theories - methods	Predictive model creation - artificial neural networks for clustering - Bayesian belief networks for forecasting	Model evaluation and validation: model is validated (or revised) as additional data becomes available; critical evaluation of solution in the context of the problem
Assessments	In Activity Assessment 1/ Computer based	Practice the task given to demonstrate understanding of data in different formats and from various business backgrounds; apply data mining tool, PolyAnalyst, to importing/loading data, exploring dataset statistics and analysing the data in a straightforward way.	Explore advanced PolyAnalyst functionalities, e.g. Categorisation, Clustering, Prediction, Link Analysis etc; be able to apply the techniques to a case study and be familiar with the meaning of parameters.	Apply specific analytical tools, e.g. PolyAnalyst's neural network tool – PolyNet Predictor – and explain how to interpret results.
	In Activity Assessment 2/ Individual Report	Students will be required to write an individual survey report based on the seminars.	The report should cover the available tools for the creation of predictive models and include a critical review.	The report will contain the evaluation of the problem against the aim and objectives of the activity.
	End of Activity Assessment/ Group Presentation	The group activity will allow the students to work together in a team, where they will be expected to demonstrate the basic functionalities of PolyAnalyst using real-life case studies, building the necessary working knowledge.	Encourage students to develop their oral communication and team working skills on the aspects of either using PolyNet Predictor to create neural networks or using BayesiaLab to create Bayesian belief networks.	Students will be expected to research appropriate tools to create predictive models using consumer data and write a group report; students will also have the opportunity to discuss their findings individually.
Expert-led Seminars		<ul style="list-style-type: none"> • Introduction of a Neural Network Tool – PolyNet Predictor • Predictive Modelling • Artificial Neural Networks and Clustering • Bayesian Belief Networks • Introduction of a Bayesian Network Tool – BayesiaLab • Consumer Behaviour and Marketing Strategy 		
Supporting Existing Units		<ul style="list-style-type: none"> • Introduction to Databases • Information Analysis • Business Operations • Decision Support Systems • Applications of AI 		

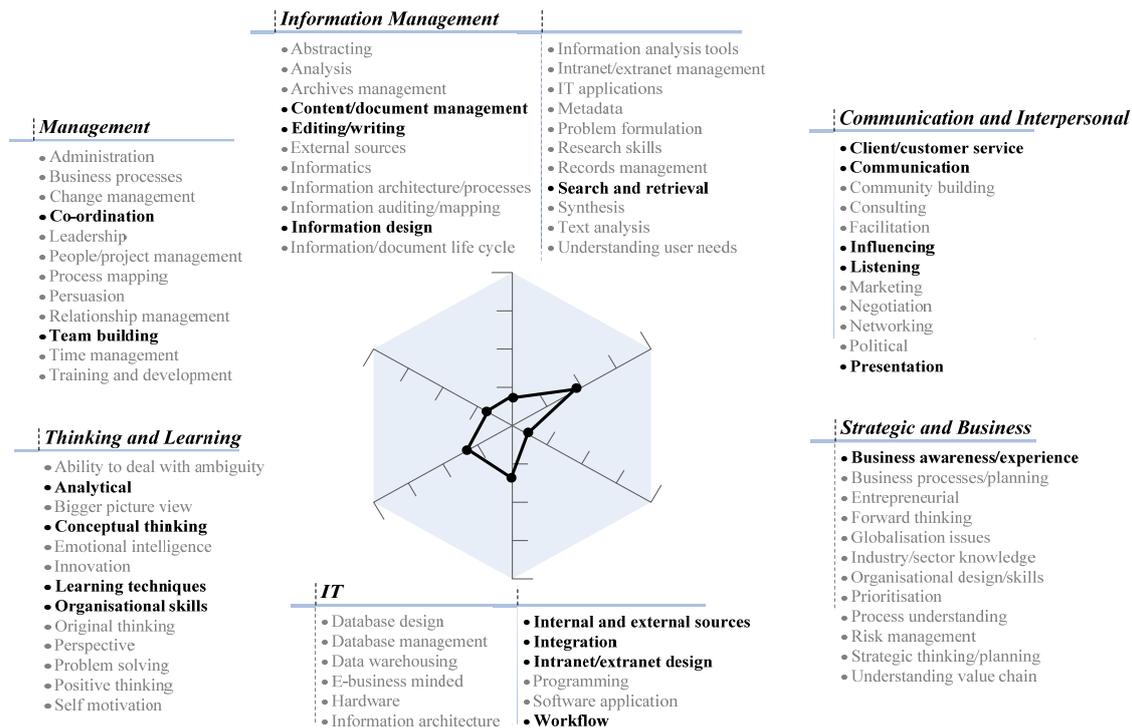


Figure 6: KM skills map for activity 9

The data points in Figure 6 have been calculated as a proportion of the KM skills within each category for the purposes of illustration. This highlights the different skills map shapes that can be generated for the activities and gives an emphasis to the types of employability skills achievable. There are other ways of quantifying this, including for example taking the absolute number of KM skills/category, which would require the scale to be normalised appropriately or extended. It is worth noting that the quality or depth of skill achieved is another factor which is relevant to the above mapping. If taken into account, this could again affect the position of data points on the KM skills map for specific activities. The representation will encourage lecturers to ensure employability skills are effectively achieved when delivered through an activity-based learning and teaching approach alongside existing course units.

5. CONCLUSION

The Knowledge Management programme here is seen as an innovative development in HE. As an evaluation of the utility of multi-functional team deployment as a tool for the development of projects in the University, with particular emphasis on innovation and change, the project is already a success. This paper has focused on the overall design of the programme, from KM global concepts to the course framework, and through detailed activity development to the integration of employability skills. The University Peer Programme Approval Panel completed its external validation of the new courses in summer 2008.

More activities are under development and, for those already in place, materials and specific bite-sized activity elements for students' learning are in preparation for 2009/10. The representational techniques used in the curriculum design have allowed the team to maintain an overall picture of the KM domain during the development process. This is more necessary when combinations of activity-based elements are in play rather than the traditional building blocks. Where the unit titles do not form a compendium description of the course outcomes, the requirement for balanced understanding by course developers is necessarily more stringent.

There remain some challenges for delivery of this new programme such as: How will KM activities be integrated into existing study and teaching programmes? How will it be staffed, especially across Schools and Faculties? While an established academic will coordinate each activity, managing the programme of seminars and leading the mediated study sessions, the overall approach will be evaluated in the light of experience. As considered at TOMFTA project meetings, the challenge in respect of "staffing issues" is consistent with the University's staff re-balancing programme, especially in adopting a strategic planning approach to respond to such new and emerging needs.

The residual risk rests with student recruitment and engagement. With regard to the former, plans for the development of A-level activities are in hand for use in school and college visits, to simulate KM activities at the University and stimulate the interest of Year 12 students in particular. The programme undoubtedly presents a more complex study environment, but controlled numbers and development of a group mentality (even an elite mentality) early on in the process of engagement will mediate this. The balance between required commitment and generated excitement – the activities, after all, compare favourably in title and aim to more conventional structured approaches – is yet to be measured.

On a final practical point, although each KM course will require focused support for the students at the point of transition, it uses few additional resources in comparison with conventional developments and places learning responsibility with the cohort early in the learning process. Ultimately, we seek to produce the model type of student from an institution focused on practical scholarship and “really useful knowledge”: able to deliver in employment from day one; academic and analytical in approach; knowledgeable in the domain and practical in their knowledge; critical in their thinking; and confident in their ability to be part of the long-term future of the knowledge management world.

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