ICIS 2008 – SIG OSRA EIS&KM

December 13, 2008

Paris, France

Program Proceedings

ICIS 2008 – SIG OSRA EIS&KM

December 13, 2008
Paris, France
Location: The European School of Management (ESCP-EAP), 11th Arrondissement

Workshops and Panels on
End-user Information Systems and Knowledge Management

December 13, 2008 (Saturday)

9:00 a.m. - 9:10 a.m.

WELCOME: SIG OSRA Co-chairs – **Elizabeth Regan**, Morehead State University, & **Roger Yin**, Univ. of Wisconsin-Whitewater

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9:10 a.m. - 10:20 a.m.

PANEL DISCUSSION: *IS/IT Curricular Redesign: When changes are inevitable, whom do we listen to for help?*

Session Chair: **Roger Yin**, Univ. of Wisconsin-Whitewater

Panelists: **Elizabeth Regan**, Morehead State University
Robert Brookshire, Univ. of South Carolina

10:20 a.m. – 10:30 a.m.

Break

10:30 a.m. – 11:25 p.m.

SESSION A **KM Methodologies & Requirements**

Session Chair: **Elizabeth Regan**, Morehead State University

Socio-Engineering Knowledge Audit Methodology (SEKAM)
for Analyzing End-User Requirements
Itzhak Aviv, Meira Levy, & Irit Hadar, University of Haifa

Determining Information Requirements for Mobile Users in a Knowledge Economy
Robert L. Leitheiser, Univ. of Wisconsin-Whitewater

An Ethnographic Study: How Chief Information Officers Manage Uncertainty and Unexpected Change Using Flexibility
Karen P. Patten, Univ. of South Carolina, &
Jerry Fjermestad, New Jersey Institute of Technology

11:25 a.m. – 11:30 a.m.

Break

11:30 a.m. – 12:05 p.m.

SESSION B **Industry and University Collaboration**

Session Chair: **Marcia James**, Univ. of Wisconsin-Whitewater

University as Neutral Convener for Regional Health Information Exchange
Elizabeth Regan, Morehead State University

The Center for Enterprise Systems Management
Robert Brookshire, Univ. of South Carolina

12:05 p.m. – 1:00 p.m.

Lunch Break

1:00 p.m. - 1:55 p.m.

SESSION C **Sustainable Business Strategies & Social/Organizational Learning**

Session Chair: **Catherine Chen**, Ball State Univ.

The Multi-Facet Selection of Knowledge Acquisition Strategy: Task, Individual, and Social Perspectives
Junghwan Kim, Jaeki Song, & Donald R. Jones, Texas Tech

What Roles Do Social Networks Play in Sustainable Businesses?
Marcia James, Univ. of Wisconsin-Whitewater

Task-driven Learning: The Antecedents and Outcomes of Internal and External Knowledge Sourcing
Yinglei Wang, Darren Meister, U. of West Ontario, &
Peter Gray, Univ. of Virginia

1:55 p.m. – 2:00 p.m.

Break

2:00 p.m. – 2:35 p.m.

SESSION D **KM & IS/IT Curriculum**

Session Chair: **Robert Brookshire**, Univ. of South Carolina

Integrating Enterprise Resource Planning into the Introduction to Business Course: Issues and Challenges
Donna R. Everett, Morehead State University

Information Sharing or Knowledge Sharing? The Potential Impact of Enterprise 2.0
Catherine Chen, Ball State Univ.

2:35 p.m. – 2:40 p.m.

Break

2:40 p.m. – 3:35 p.m.

SESSION E Learning IS/IT

Session Chair: **Donna R. Everett**, Morehead State University

Integrating Case Scenarios to Foster Critical Thinking in an Information Security Course
Roger Yin, Univ. of Wisconsin-Whitewater
Daniel Norris, Univ. of South Carolina

RIP: Optimizing Information Systems Usage - The Role of Self-Directed, Software-Based User Training
Kelly J. Fadel, & Katherine Chudoba, Utah State Univ.

A Revised Motivated Strategy for Learning Questionnaire (MSLQ) for Assessing Computer Software Learning Strategies
Catherine Chen, Ball State Univ.

3:35 p.m. – 3:40 p.m.

Break

3:40 p.m. – 5:00 p.m.

PANEL DISCUSSION: *Knowledge Management: The Dark Side*

Session Chair: **Robert Brookshire**, Univ. of South Carolina

Panelists:
Frank Land, London School of Economics
Anthony Wensley, The University of Toronto
Jimmy Huang, The University of Warwick
Gus Hosein, London School of Economics
Roger Yin, University of Wisconsin-Whitewater

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Socio-Engineering Knowledge Audit Methodology (SEKAM) for Analyzing End-User Requirements

Itzhak Aviv, Meira Levy, Irit Hadar
Department of Management Information Systems
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Abstract

Knowledge auditing has been found to be a key issue of concern for knowledge management (KM) across organizations in various industries. However, current KM initiatives often suffer from underperformed auditing, leading to insufficient compliance with end-user needs. As KM integrates social and technological disciplines, we propose a combined Socio-Engineering Knowledge Audit Methodology (SEKAM) for a systematic audit of the organizational KM and analysis of end-user requirements. The suggested framework was designed to provide means for identifying knowledge needs within mission-critical business processes, towards designing a knowledge solution, for improving work efficiency and end-user satisfaction.

Socio-Engineering Knowledge Audit Methodology for Analyzing End-User Requirements

Over the last years, there has been increased focus on KM as a major part of organizational strategy, especially in high-tech organizations (Lal, 2005). However, not all KM initiatives comply with end-user needs, partly because knowledge audit, that is a necessary first step in a KM initiative (Burnet et al, 2004 , Ahn, 2004), is being avoided or underperformed (Hylton, 2002). Aiming to improve practical knowledge auditing we developed a knowledge audit methodology, which provides comprehensive and systematic guidelines as well as practical tools, for eliciting and analyzing KM solution requirements as perceived by end-users and additional stakeholders.

Knowledge audit process includes business needs assessment, cultural assessment, and an examination of what knowledge is needed, available, missing, applied, and contained (Liebowitz et al, 2000). In addition, knowledge audit involves the collation of the inventory of knowledge resources and assets in a given working environment (Bright, 2007). Literature review identified two different approaches to system modeling that can be applied for knowledge audit: hard thinking and soft thinking (Checkland et al., 1999). Hard thinking in the context of KM is referred to as Knowledge Engineering (KE) (Schreiber et al., 2000) and includes knowledge modeling methodologies, such as 'PROTEGE' (Tu et al, 1995), 'MIKE' (Angele et al, 1998) and 'CommonKads' (Schreiber et al, 2000). These modeling methodologies refer to KE as dealing with the development of information systems, where knowledge plays a central role. Soft thinking origins from qualitative modeling for social phenomenon analysis, utilizing methodologies such as 'Ethics' (Mumford, 1995), 'SSM - Soft System Methodology' (Checkland et al., 1999) and 'Multiview' (Avison et al., 1998). In this regard, Finegan (1993) argues that the suitable approach for knowledge analysis is knowledge elicitation that uses pictures and diagrams to define and communicate knowledge structure, logic, ideas and relationships.

In this paper, we present a Socio-Engineering Knowledge Audit Methodology (SEKAM), harnessing both hard and soft perspectives. SEKAM aims at eliciting and analyzing end-user KM requirements in knowledge intensive organizations, in order to develop knowledge solutions that are aligned with their expectations and are embedded in the organizational business processes. SEKAM is a combined approach that integrates elements from CommonKads and SSM. Such combined analysis enables to develop a practical, business-value oriented KM solution.

The paper is organized as follows: The next section reviews hard and soft knowledge modeling frameworks and in particular the CommonKADS and Soft System Methodology (SSM). Next, we describe our suggested Socio-Engineering Knowledge Audit Methodology (SEKAM). Finally we conclude and discuss future work.

Theoretical Background

Reviewing KM literature identified that the two approaches of system modeling – hard thinking and soft thinking – combined together reflect the most important factors involved in capturing, disseminating and sharing of knowledge (Hildreth et al., 2002, Gillingham 2006, Sahin 2007). While hard aspects deal with formal knowledge modeling including knowledge processes, structure and technologies, soft aspects relate to informal knowledge regarding organizational culture and people behavior, which are important and complex elements (Gillingham 2006). According to Dennis et al. (1993) the KM business model should maintain a good balance between formal and informal knowledge, reflecting various modes of business analysis. Hard thinking based knowledge audit accomplishes the analysis and documentation of formal knowledge inventories of business processes, while soft thinking based knowledge audit is very useful in extracting the informal aspects of the organizational knowledge resources and assets.

KM Related Hard Audit

Knowledge Engineering (KE) is considered as a hard KM audit methodology aiming at knowledge modeling of information systems, where knowledge plays pivotal roles (Schreiber et al., 2000; Kerth, 2001). Specifically, KE deals with knowledge acquisition, formalization and refinement, as well as creation of a formal representation of that knowledge to meet end user needs (Schreiber et al. 2000). Over the past decade a number of knowledge engineering methodologies have been developed. Several well-known methodologies are CommonKADS, PROTEGE and MIKE. Each methodology has its own modeling approach. For example, PROTEGE (Tu et al. 1995) encompasses a set of tools for designing knowledge based systems. It provides a software based modeling tool for ontological analysis of organizational knowledge. Angele et al. (1998) developed the MIKE approach for developing knowledge-based systems where knowledge is represented by the Knowledge Acquisition and Representation Language (KARL). Another KE methodology is the CommonKADS that provides knowledge modeling and solution designing tools, including ontology mapping of knowledge assets (Schreiber et al, 2000). CommonKads modeling suite is organized in three levels (Schreiber et al, 2000). The first level, entailed the context level, provides a methodology and nine worksheets for analyzing the organizational knowledge environment and the purpose of the required knowledge solution. The second level, named the concept level, represents the nature and structure of the knowledge and communication involved in a business process. Finally, the artifact level provides a description of the software solution in terms of architecture, platform, software modules and implementation features.

The comparison of KE methodologies demonstrates the benefits of using CommonKads in this research. MIKE uses a very specialized modeling language and tools that are mainly used in academic research, and as far as we know there are no industrial applications of it. PROTEGE supports the idea of knowledge base design but does not provide practical, structured worksheets for knowledge auditing like CommonKads does. CommonKADS has become a de-facto standard for KE in Europe for knowledge modeling and knowledge based system design (Zhang, 2004). It provides well developed tools for knowledge modeling in the context of organizational business processes. These tools are adapted in our research to knowledge audit. Specifically, in this research we only use the context level, due to its relevancy to knowledge audit. Context level includes organization model, task model and agent model. The organization model supports the analysis of the major knowledge activities, bottlenecks and problems in order to analyze knowledge intensive business processes. The task model describes each of the tasks identified in the organization model in more details, including its required knowledge assets' characteristics. The agent model focuses on the actors of a specific task that may be human, systems or any other entity that is involved in carrying out a related task. The agent model describes in detail the capabilities, norms, preferences and permissions of agents and helps in understanding various actors' skills and competences.

KM Related Soft Audit

Soft thinking copes with the difficulty to articulate business related, social and human activity information by means of hard thinking systems modeling (Checkland et al., 1999). Soft methodologies provide social phenomenon analysis through qualitative modeling, which is based on classifications and taxonomy as well as human activity systems modeling (Clancey, 1993). Social analysis models describe how people behave and interact; gather evidence by observing and asking questions; reason about a situation both in speaking and writing; and plan to act in their environment (Clancey, 1993). The application of social approaches to system design has been debated for the last twenty years (Avison et al., 1998). Finegan (1993) argued that the appropriate approach for knowledge analysis is qualitative modeling that uses pictures, words and diagrams to define and communicate knowledge structure, logic, ideas and relationships. Over the past decade, several soft methodologies have been developed. Each of them has its own qualitative modeling approach. For example, Ethics methodology (Mumford, 1995) provides a special diagramming method used for technology system design process, describing social and cultural factors. Soft Systems Methodology (SSM) (Checkland et al., 1999) provides the Rich Picture qualitative modeling technique that represents a human communication channel for expressing the situation throughout an audit process. SSM is an approach for solving complex, unstructured problems, based on qualitative analysis. SSM applies techniques that allow different interest groups to understand each other’s points of view, express their own ideas and build consensuses or compromise solutions. The methodology is based on a seven-stage process that moves from clarifying an unstructured or ‘messy’ situation (Checkland et al., 1999) through designing a conceptual solution that would help improve the situation. These conceptual models are then compared with the initial problematic situation in order to identify desirable and feasible change. The methodology integrates thinking about the logic of how to improve a situation with what is socially and politically feasible.

Literature review indicates several examples for using SSM as a KM tool, in the context of designing and implementing effective organizational learning. The major advantage in applying SSM to KM is for the analysis of organizational processes that contain interdependent human and technological components (Fennessy et al., 2000). Gao et al. (2002) states that SSM is a valuable research approach to study knowledge management, and that part of its value is "to offer inspiration on how to learn continuously and effectively" (p. 13). Walker et al. (2003) concluded that the Rich Picture technique of SSM could be adopted for knowledge modeling. Thus, SSM was chosen as the social component of our Socio-Engineering Knowledge Audit Methodology (SEKAM), and specifically its three first stages were found relevant. The first stage of SSM is Problem Expression that helps identifying organizational areas, processes or specific situations, which require situational and problem analysis. In the second stage, SSM provides a Rich Picture technique to explore the problem situation. Rich Picture provides messy-situation modeling methods that express the degree of social interaction within the situation, which facilitates drawing out the activities that are considered purposeful, from among the uncertainty, disagreement and conflict related activities. Existing relevant information systems may also be included within the Rich Picture. Rich Picture diagram resembles cartoons that express (at times humorously) attitudes and feelings in addition to the formal information. During the third stage of SSM, root definitions of relevant activities are formulated through identifying CATWOE – Customers, Actors, Transformation process, Worldview, Owner, and Environment. In the context of CATWOE, Clients, , are workers who benefit or lose from the activity execution; Actors are workers who execute the activities; Transformation process describes the inputs and outputs of the activity; Worldview describes a wider context of the activity into which the situation fits; Owners are workers who have the authority to change or stop this activity; and, finally, Environmental constraints consists of a more general issues such as organizational culture, ethical limits and regulations.

In the next section we propose the Socio-Engineering Knowledge Audit Methodology (SEKAM), harnessing the hard and soft approaches described above. This methodology provides guidelines and tools for eliciting end-user KM requirements through analyzing knowledge inventories related to knowledge-intensive business processes.

Socio-Engineering Knowledge Audit Methodology (SEKAM)

SEKAM supports analysis of organizational knowledge by identifying and elaborating problems, opportunities, possible impacts of knowledge assets and their format and location in the context of business processes. In addition, SEKAM consists of an assessment of the current levels of knowledge usage and interchange; identification and analysis of KM activities; and evaluation of the perceived value of knowledge within the enterprise. SEKAM is a combined approach that integrates adapted elements from CommonKADS and SSM. Figure 1 in the appendix presents the SEKAM stages. SEKAM is composed of five stages, with each stage consisting of several steps, as demonstrated bellow.

STAGE 1 – Problems Expression

The first stage of SEKAM, involves an audit analyst and business managers for identifying organizational knowledge-oriented problems and enhancement opportunities. The output of this stage is a list of prioritized business processes, in which KM enhancement is expected to have significant contribution to the organizational goals. The scope of the audit depends on the project size, its desired capabilities and budget constrains.

1.1 Identify knowledge-oriented problems and opportunities

Identifying knowledge-oriented problems and opportunities in the organization through strategy, mission, goals, vision and organizational objectives, while considering the environment, culture and power. As an auditing tool in this step, worksheet OM-1 from CommonKADS (Schreiber et al, 2000, p. 29) could be used for general identification of knowledge-oriented problems and opportunities in the organizational context. We recommend carrying out several interviews with managers from different organizational levels towards defining the audit scope. Additional useful data for learning about the organization goals and activities can be collected via reviewing organizational documents, web sites and other available organizational resources.

1.2 Prioritize organizational problems and opportunities and choose the audit scope

Deciding about the specific scope for the audit according to prioritization. This however does not mean that the rest of the organization will be neglected, but rather that their audit will be carried out later. The analysis may involve applying several techniques such as checklists, question sets, and analysis models. It is important not to become fixed on the use of one technique or analytical approach only. Typically brainstorming techniques, decision matrix or force-field analysis, are useful for this purpose (Stratton, 2004).

1.3 Identify pivot stakeholders

Identifying pivot stakeholders who will participate in auditing the selected scope. These people will help, during the next step, to focus on the core business processes to be audited. The audit analyst is responsible to guide and support them during the knowledge audit, providing relevant information and know-how with regard to the audit itself, its vision, mission and the overall goals of the project. Recruiting people to the KM initiative in these early stages of the project is also very important for reducing project risks (described later). The identification of pivot stakeholders within the audited scope is achieved through conversations, interviews and/or brainstorming with mangers and focus groups.

1.4 Identify core processes. Choose a specific business process to audit

Identifying activities and processes which are both mission-critical and knowledge-intensive, following the prioritization and selection of a specific core business process to audit according to the organizational needs. We suggest involving processes' stakeholders for choosing the most suitable process to audit.

STAGE 2 – Define Audit Project

In order to provide qualitative consecutive audit process, it needs to be managed as any other organizational project, including expected outcomes, time-table, resources requirements and budget. The key disciplines of project management, such as risk management, change management and monitoring, also have to be handled. Specifically, in this stage it is possible to begin risk and change management. Risk management includes identification and assessment of the KM project's risks and finding means for controlling these risks. Change management is required for tracking earlier versions and maintaining control of the process, managers and staff changes, environment changes (e.g. new KM tools) and business processes related changes. During the audit, the audit analyst should monitor and control the project progress.

STAGE 3 – Rich Picture

This stage provides knowledge and human-related analysis, which includes process flows, knowledge inventory, boundaries, structure, information flows, and communication channels. This stage includes 4 steps that have to be carefully carried out in order to achieve successful KM implementation.

3.1 Process Description

In this step, high level process description is prepared, including identifying process flow, process environment and characteristics. This enables the audit analyst to deeply explore the process environment, people involved, knowledge resources used in the process and culture elements. The audit tool in this step is an adapted worksheet that integrates OM-2 (Schreiber et al, 2000, p. 31) worksheet from CommonKads and CATWOE checklist from SSM (see Table 1). This adapted worksheet provides an enhanced analytical tool for high level description of a KM audited business processes. Next, the audit analyst should provide detailed description of the audited process in terms of the tasks it is composed of and their main knowledge characteristics, using worksheet OM-3-4 (Schreiber et al, 2000, p. 33). Worksheet TM-1 (Schreiber et al, 2000, p. 47) is a task analysis that includes refined description of the tasks within the target process and where tasks from OM-3 are elaborated. The combination of OM-3 and TM-1 activities generates process flow chart.

3.2 Analyze Knowledge Inventory within the Business Process

In this step the audit analyst should carry out in-depth analysis of the knowledge assets involved in the audited business process, using the knowledge assets analysis worksheet OM-4 (Schreiber et al, 2000, p. 33) as well as worksheet TM-2 (Schreiber et al, 2000, p. 49). These include specification of the knowledge items involved in process tasks, possible knowledge lacks, their sources and bottlenecks. Moreover, the analyst can explore tacit knowledge sources through adapted agent model worksheet AM-1 (Schreiber et al, 2000, p. 50). To integrate the results of these steps, the analyst can use worksheet OTA-1 (Schreiber et al, 2000, p. 62) that provides impact analysis of organizational knowledge activities.

3.3 Building Rich Picture

In this step, various messy-situations occurring during a process flow are expressed through Rich Pictures that include hard elements, such as a process flow chart, and soft organizational elements, such as culture or social networks analysis. Combining Rich Picture method of SSM with engineering process flow charts enables to generate Rich Picture for each problem or opportunity that was previously identified, including process flows, social interactions, organizational culture and disagreement and conflicts associated with the process.

STAGE 4 - Analyzing KM Infrastructure of the Business Process

KM infrastructure is a key factor that intensifies the organizational KM competence (Lustri et al., 2007). Sivan (1999) has defined 3 main components of organizational knowledge infrastructure: Culture, Processes and IT. Therefore, in order to implement an effective KM initiative, a recognition of the integrated needed investments in organizational culture, processes and technology is necessary (Roberts, 2000). An important stage of the knowledge audit through SEKAM is to understand KM infrastructure components, which requires deeper understanding of the existing technologies, platforms and capabilities. For this purpose many methodologies exist, aiming at analyzing KM infrastructure components.

Process knowledge analysis in the context of KM infrastructure audit can be performed, for example, using the Knowledge Policies, Programmers and Practices (KPPP) model, proposed by McElroy et al. (2003). McElroy developed a questionnaire analyzing organizational knowledge processes, which includes three topics: background factors, knowledge production and knowledge integration. Another example is the methodology proposed by Ellis et al. (2003), the Organizational Learning Mechanisms (OLM), which is supported by a questionnaire for extracting organizational knowledge processes like formal learning procedures, information dissemination, training, information gathering, storage and retrieval.

Culture knowledge analysis in the context of KM infrastructure audit can be performed, for example, based on the learning culture analysis methodology (Ellis et al. 1999). This methodology supports analysis by learning values scale, which includes items related to issue orientation, accountability, valid information, and transparency.

IT knowledge analysis in the context of KM infrastructure audit can be performed by exploring organizational information systems related to KM, such as content management, portals, CRM, search engine capabilities, and systems and data integration availability. IT analysis has to be conducted in order to learn how it supports organizational knowledge processes.

STAGE 5 – Results Approval

In this stage the KM analyst has to review and approve audit results with the business mangers. Audit summary can be constructed using an adapted OTA-1 worksheet that integrates previous stages results, provides checklist for the solution feasibility, and suggests possible improvements.

This concludes the description of SEKAM. We suggest using SEKAM as an iterative model that provides organizations with an auditing analysis that is continuously improved, focused, and later extended to additional business processes and scopes.

Conclusion

This paper presented a knowledge audit methodology for extracting end-user requirements, in order to develop knowledge solutions aligned with end-user expectations as well as with business processes, in knowledge intensive organizations. Knowledge is a human based resource, calling for a social-oriented approach (Larsen, 2001), however formally capturing and systematically managing it requires an engineering approach (Lai, 2007). SEKAM provides an integration of both aspects – human and engineering – for augmenting KM solution design.

SEKAM emphasizes combined top-down and bottom-up audit processes, capturing end-user requirements and expectations, an essential component for successful KM implementation (Tan, 2006). SEKAM is a systematic methodology, highly connected with the business context through integrative audit of knowledge and business processes. SEKAM audit tools enable to collect and analyze a large amount of data from qualitative and quantitative perspectives, leading to comprehensive audit results.

Our on-going research aims at combining visualization techniques of both methodologies (hard and soft) to a coherent visual representation of the results obtained within SAKAM. Future work will focus on applying and validating the suggested methodology within a high-tech (thus knowledge-intensive) organization, and evaluating the benefits gained by using this methodology towards development and implementation of a KM solution.

Acknowledgement: This work is supported by funding from CA Labs, CA Inc.

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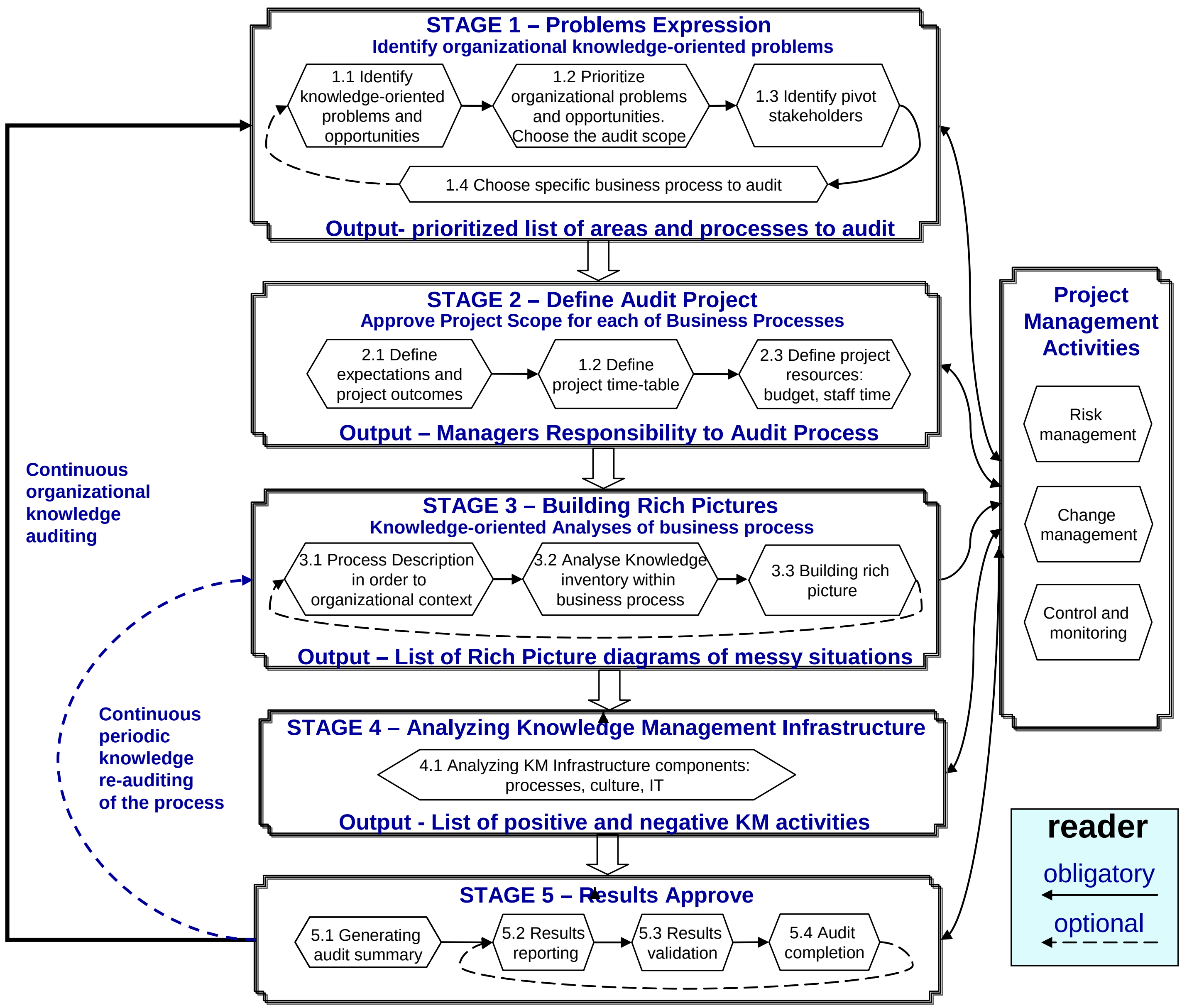
Appendix

Figure 1: SEKAM Model Suite



Integrating Enterprise Resource Planning into the Introduction to Business Course: Issues and Challenges

For Consideration for Presentation at ICIS 2008 —Paris, France

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Abstract. An increasing number of universities have entered into SAP universities and are redesigning both undergraduate and graduate curricula to help students understand the requirements and the design of enterprise-wide systems solutions through the use of an enterprise resource planning (ERP) system. Morehead State University joined the SAP alliance program in 2006 and has been attempting to determine the .most effective method of integrating ERP Different approaches have been used by various schools to introduce ERP/SAP into the curriculum. This paper articulates the issues and challenges of choosing the best integration approach for its students. The paper also highlights various technology, pedagogical, and human resource issues and challenges.

Integrating Enterprise Resource Planning into the Introduction to Business Class: Perspectives and Challenges

Introduction and Rationale

In a rapidly changing, globalized and knowledge-intensive business environment, companies are challenged to maintain competitive operations without a skilled business workforce and trained enterprise resource planning (ERP) specialists (Boyle, 2006). Consequently, it becomes increasingly important for business schools to offer a process-based curriculum to better reflect the realities of modern business (Magal, Word 2008). Considering the increasing importance of ERP, and its instructive value in demonstrating business process integration, several hundred universities have already started to reengineer curricula (Seethamraju, 2007).

To assist in this effort, SAP has provided colleges and universities with an outstanding opportunity to provide students more knowledge about a process-centered architecture. ERP is important for business and is representing a significant amount of IT investments made by organizations in the United States. Many Kentucky companies and firms in bordering states have selected SAP as the enterprise systems software to help them integrate their core business processes using a single software platform. Having organizations, such as Eastman Chemical, Brown & Williamson Tobacco, Toyota Tsusho America, Procter & Gamble, Conagra, and others nearby using SAP will provide excellent job opportunities for undergraduates. The openings are in place for the IS graduate; the need to better market business curriculum and associated skill sets to prospective students is critical to fill the identified jobs, states McGann et al. (2007).

Other benefits of the SAP educational curriculum alliance to our faculty and students include access to SAP software, full technical support, access to training, support forums, workshops and conferences, access to the ASUG (Association of SAP users) user group website, as well as access to pre-designed and classroom tested SAP curriculum materials for classroom teaching.

The integration of SAP into courses will result in a more rounded bachelor's degree, providing a living business laboratory for students. By producing "enterprise-wise" students, the college will be able to attract a wider range of companies that will recruit its graduates.

This paper articulates the issues and challenges of choosing the best integration approach for its students. The paper also highlights various technology, pedagogical, and human resource issues and challenges.

Description of School and Community

The university setting is a public regional university with an enrollment of about 9200 students located in the Appalachian region of eastern Kentucky. It serves a predominantly rural population, the majority of which are first generation college students. It serves primarily the citizens of Appalachian Eastern Kentucky through its main campus and eight extended-campus centers within a 160-mile radius.

The AACSB accredited College of Business (COB), consists of three academic departments—(1) Accounting, Economics, and Finance, (2) Information Systems, and (3) Management, Marketing, and Real Estate. The major mission of the college is to create lifelong opportunities and choices for individuals and organizations within the 22-county service region. The college faculty and staff are committed to helping its students, in many cases individuals who are the first within their family to attend college, to graduate from the BBA, MSIS, or MBA programs with a significantly different set of career and economic opportunities available to them than when they arrived at the university.

In order to pursue the university's goal of *academic excellence*, the COB has built its undergraduate curriculum to support a broad foundation of courses ranging from the liberal arts to business core, to option courses at the undergraduate level. Its graduate curriculum is built on a solid base of courses that fulfill the needs of practitioners. The curriculum for all undergraduate and graduate business degree programs was developed in consultation with external and internal stakeholders and emphasizes the acquisition of a broad range of business skills, as well as communications, global, cultural diversity, and ethical responsibility.

Background of the Mission of the College of Business with SAP

The COB has experienced significant changes during the past five academic years—largely due to the creation of assessment processes that have improved the quality of the college's curriculum, programs, learning, and services.

The COB has established an operational mission statement and strategic plan to guide the college in providing opportunities and choices for students and stakeholders. The mission to create choices was used as a basis for creating the strategic plan that includes goals, objectives, and strategies. The usefulness of the mission stems from the rigorous and inclusive process used to create the college's strategic plan. Faculty, staff, students, alumni, and the Business Advisory Board participated in the revision of the mission and these stakeholders endorse the direction of the college. In April 2005, several SAP (2006) Congress attendees from Morehead State University enthusiastically returned to campus and presented a draft plan for introducing our students to SAP. More than 50% of the tenure-track faculty attended the session and several have already begun to collaborate with others on methods for incorporating concepts into their discipline. Also, the College of Business curriculum committee requested that the college strongly consider the integration of ERP concepts and fundamentals into the business core beginning at the freshman level, after a three-day training workshop on Business Process Improvement conducted on the campus by The Rushmore Group.

Development of an SAP Task Force

The College of Business recently has established a task force of faculty members to make a recommendation regarding specific directions for a curriculum plan. Task force team members have been included have given input to the integration process and are made up of faculty from each of the three academic departments within the college. Most of the task force members have been very active in the annual curriculum congresses and the SAP workshops on business process integration.

The dean of the College of Business has asked the task force to review the SAP University Alliance document and develop a recommendation for the integration of ERP/SAP into the college curriculum. Some of the tasks include the following:

1. Determining faculty commitment.
2. Determining goals and plans, capacity of the faculty and curriculum, and sustainability of the plan.
3. Determining curriculum target: undergraduate and/or graduate programs.
4. Establishing a timeline for implementation.
5. Developing measures or strategies to assess the implementation process as well as student benefits.
6. Assessment whether ERP integration leads to or augments current levels of ERP research by COB faculty in this interdisciplinary field.

The following section puts forth a discussion of the issues and challenges from the dean's charge to the SAP Task Force.

Anticipated Implementation for ERP/SAP

The SAP initiative should involve all three departments in the College of Business at Morehead State University. SAP will be implemented in undergraduate classes, as part of the Bachelor of Business Administration (BBA) degree program, as well as the Master of Business Administration (MBA), and Master of Science in Information Systems (MSIS) graduate degree programs—although this is an ambitious plan. We propose to employ a phased-in implementation approach. Phase 1 (2 years) will begin by introducing units, demonstrations, and simulations within the existing business curriculum during the first two years as part of the University Alliance. A limited number of courses will be identified in each department for SAP implementation during this first phase. Specific learning outcomes related to ERP systems will be identified for each course, and results of Phase 1 will be assessed in relation to the intended learning outcomes.

Phase 2 will expand the number of courses that integrate SAP and, based on assessment results, expand the level of integration into some classes. Faculty members anticipate that integrating SAP may lead to significant curriculum revisions in some courses—such as Accounting Information Systems. Curriculum changes would be handled through the discipline curriculum committees and follow the established curriculum revision proposal review and approval process.

Phase 3 is that greater integration across the College of Business Curriculum in the core offerings. One of the considerations that has been discussed with the dean and some faculty is the potential of using a comprehensive case study that would be used in multiple courses across disciplines, such as the Global Bike, Inc. case study.

Anticipated Design for ERP/SAP Courses

Research has proffered several approaches to integrating ERP/SAP into the curriculum. There have been various kinds of teaching models adopted by many other schools to teach ERP courses (Kaufman, 1999; Kolb and Kolb, 2003). However, the specific approach taken will be dependent upon the SAP module and the instructor of the course.

Pedagogical approach is based on the 'learn by doing' approach. The purpose is to expose students to realistic, work-like situations, in a controlled environment. Bobbitt (1971), an educationalist, argues that education is "coming to realize the need for work-activities as the only possible normal method of preparing for the work of the world."

Enterprise model is used primarily for classroom demonstration and lectures. Students have little or no actual hands-on experience with the software except perhaps to browse or navigate. The ERP software is used to demonstrate the interrelationship of business processes throughout the firm.

Tutorials are self-guided learning activities that the student completes outside of the formal classroom environment. ERP software has an introductory sample 'pre-course' tutorial on CD ROMs as part of the university programs. These low-impact training experiences provide a brief exposure to the ERP interface and functionality. They require no experience on the part of the faculty, and yet can be implemented very quickly into the curricula.

A laboratory project is a 'hands-on' assignment in a simulated ERP environment, typically requiring several hours of student time at a computer 'lab' using the actual ERP software. The student uses a pre-supplied 'demonstration' database and completes a series of structured activities that provides exposure to the daily activities of a working business enterprise and, at the same time, hands-on experience with the software. Often the scope of the assignment will be limited to the domain of the course; e.g., Accounting or Human Resource Management.

Dedicated course is one that is specifically designed to teach skills relating to the ERP software. This course may be included in a formally recognized certification program and the course content and instructors training are dictated by the software vendor. Courses of this type are usually outside of the formal business school curriculum, but some programs do offer the courses in the curricula and are attractive options. Such programs are offered with the support of vendors and require a separate license agreement and extensive instructor training.

Technology and Infrastructure Plans

Business students at this regional university have access to excellent computing facilities. The College of Business has several computer classrooms plus an open student computer lab available throughout the week. All classrooms are on the University's wireless network and are equipped with multimedia instructor stations. We also have a laptop computer leasing program available for students, and all. Students are required to take a general education computing course to gain a basic foundation of computing skills.

The College of Business computer labs are supported by a full-time Instructional Technology Consultant and several graduate assistants. Plans are to assign one of the Information Systems faculty members as the primary contact with our assigned SAP hosting site. As part of that role, the faculty member will coordinate faculty training and technical problem resolution for the college. The existing discipline curriculum committees in each department will address curriculum planning and development related to integration of ERP/SAP concepts and practice. These curriculum activities will be coordinated through the existing College Undergraduate or Graduate Curriculum committees, as appropriate. During the initial roll-out phase of SAP, the plan is to establish a forum for collaboration among the core group of faculty working with SAP. We can continue these efforts as long as faculty members feel a need, and then move to more informal collaboration among SAP users. Faculty are also interested in joining the SAP User's Group, and they will encourage faculty to use this avenue of support.

Challenges for Introducing ERP/SAP into the Introduction to Business Course

Major areas of concern are identified in research (Tunc, *et. al.*, 2006; Vijayaraman, *et al.*, 2003; Hawking, *et al.*, 2001), such as the issues listed below.

- forming a faculty team and then getting them to agree on how the ERP system should be incorporated into the curriculum, including the order of introducing courses into the curriculum. The SAP Task Force is in place. The Introduction to Business course is a logical gateway to introducing ERP/SAP concepts; however, the sheer size of the classes (two sections of 60 students; one section of 30 students) creates a challenge for lab space and GA support (if a simulation or tutorial is chosen) or enough time in the course to absorb the concepts if the enterprise lecture approach is taken.
- acquiring adequate funding to support all of the resources needed to implement a system of this magnitude, including funding for equipment, faculty training, new teaching facilities, etc. Although the College of Business has sufficient teaching facilities, scheduling lab and GA time may be problematic.
- setting up a technical infrastructure and a corresponding support team to install, monitor and administrate the ERP systems
- properly managing the recruiting activities of companies recruiting the students. At this time, the College of Business does not have its own placement facility or staff and the staff of the University Career Services office is extremely limited. Jobs for College of Business graduates may not be the first priority of this office. And having knowledge of the importance of ERP/SAP skills and experience may require additional time and training on the part of faculty in the College of Business.

- retaining the faculty that have SAP experience in a competitive market that offers financial rewards well in excess of academic salaries
- insufficient funds to continue the SAP University Alliance will be a challenge when sending faculty to SAP congresses and workshops for initial and ongoing training in the SAP materials.
- lack of interest in, commitment to, and knowledge of ERP/SAP by the faculty. These issues are at the heart of the dean's charge to the SAP Task Force.
- lack of interest by college or university administration. College of Business faculty interest and commitment will lead to increased support if students are being recruited by companies who seek prospective employees with ERP/SAP skills and knowledge.

All of these issues must be addressed by the SAP Task Force in order to successfully implement an ERP system. These issues coincide with the charge from the Dean of the College of Business. If the phased-in approach is supported by the Task Force after its determination of commitment, then the Introduction to Business course is the logical first gate.

Success Measurements for ERP Curriculum Integration

Morehead State University's College of Business has developed several objectives and measures to help determine the success of the SAP initiative on campus. Assessment of the SAP implementation will be integrated into the annual assessment that is conducted for AACSB accreditation that is tied to the learning objectives for each course. One of the programs of study (Business Information Systems) in the Department of Information Systems has the goal of displaying an understanding of business process integration and ERP fundamental concepts.

Objectives for measuring success of the SAP University Alliance initiative may include the following: (1) Integrating ERP (SAP) curriculum into the college's on-going assurance of learning goals and assessments (2) Examining enrollment rates for the SAP integrated courses within the College of Business (3) Tracking the ability of the College of Business to attract new companies to the MSU job fair and campus visits to recruit students with a background in ERP (4) Obtaining feedback from Alumni using a survey to measure their current work with SAP or other ERP systems and the influence their education in the SAP initiative had on landing or pursuing their current job (5) Tracking the number of classes that integrate SAP content and (6) Tracking faculty involvement in workshops and training as well as successful recruitment of qualified faculty in this area.

One important assessment measure is to determine the interest by the students in the Introduction to Business course in continuing to learn about ERP/SAP as they progress through their selected option coursework. An exit measure at the end of the semester should be utilized to make the determination.

Summary and Concluding Remarks

Our global economy is not the business world in place five years ago. Many regional companies have expanded into national companies and these organizations have expanded into global companies. Consequently, many companies are turning to ERP tools and web services to help redesign their business operations for strategic advantage (Cameron, 2008). Our business students will not be able to compete successfully or interview for the new corporate job postings without business process integration skills.

The sustainability of being in the SAP University Alliance program is ensured when a steady, interested, and qualified pool of candidates for positions in the College of Business presents itself. Potential faculty members will be drawn to the opportunity to become part of a college that has embraced and infused SAP into its programs. New faculty members who are content specialists and SAP trained and qualified will have an enormous effect on the curricula, course design, and reputation and visibility of the college.

To survive in the flat world, to be competitive, and to assist companies in this change, educators must re-engineer and update business offerings**,** as well as enhance their own professional development (Friedman, 2005). An increasing number of university faculty are very committed to this vision and believe a primary vehicle for exposing students to information technology and business theory is enterprise systems, such as SAP. Just one search on www.monster.com or other job search sites quickly solidifies and validates the efforts to ensure that students will be the beneficiaries**—**through internships and immediate employment**—**if they graduate with current enterprise systems skills.

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Determining Information Requirements for Mobile Users in a Knowledge Economy

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Keywords: Mobile Computing, information requirements, system modeling, location analysis

Determining Information Requirements for Mobile Users in a Knowledge Economy

Abstract

In a knowledge economy, it is essential that knowledge workers have the information they need to perform their tasks in a timely and effective manner. For this to happen systems need to be designed to provide this information whenever and wherever it is needed. The standard methodologies for defining user requirements have been around for some time. Given the advances in technology, especially in mobile computing, it is time to review these methodologies to see if they still meet the needs of analysts and users. Since the primary difference between "mobile" computing and "stationary" computing is a change in location; location is the focus of this analysis. In fact, this paper argues for a location perspective, to go along with the traditional functional, structural and behavior perspectives that are part of system modeling.

This paper begins by reviewing the challenges that any information requirements methodology faces in achieving accurate and complete requirements. It then compares different approaches to determining information requirements in terms of the primary cues used, the information cues used, and the information emphasized. The paper argues that location is not emphasized enough to support mobile applications and presents a methodology for defining location based information requirements. The multi-step methodology includes the following steps: (1) identify system users, (2) identify locations, (3) define location tasks, (4) create a location by task matrix, (5) define necessary task information, and (6) develop a location by information category matrix. A simple, hypothetical example is used to show how the approach would work. The paper finishes with some examples of how the analysis will affect system design and it proposes future research to confirm the paper's arguments.

Determining Information Requirements for Mobile Users in a Knowledge Economy

Introduction

Workers in a knowledge economy need up to date information and access to business applications at multiple locations. This requires some combination of computing/communication device(s) and network connections. Possible combinations are:

- disbursed computing: all devices are in fixed locations with fixed network connections and the user moves to the device (e.g., ATMs or information kiosks),
- portable computing: portable devices have one or more points of fixed connection to networks (e.g., office and home) but are disconnected at other locations,
- remote computing: portable devices can be connected to networks from a variety of remote sites using phone lines or other fixed links,
- limited mobile computing: devices can connect wirelessly to public or private networks in specific buildings, sites, campuses, neighborhoods, or urban areas but lose the connection when leaving the area,
- extreme mobile computing: devices connect “anywhere” to public or private networks, continuously or on-demand.

As mobile users go from disbursed/portable computing to extreme mobile computing, location becomes less important in terms of ability to access computing services. Conversely, as the capability of accessing computing services becomes location independent, the ability to deliver location specific information becomes more important. As users change locations we now have the ability to change the applications and information we provide them. The support a sales manager needs at a customer’s site is different from what he or she needs at a company retreat. The purpose of this paper is to explore the implications of this change and to propose a location perspective as a way to identify the information needs of mobile users.

Determining Information Requirements

It has long been known that defining the specific information needs for any user is a challenging task (Taggart & Tharp, 1977). This has not changed and significant efforts are being made to manage and improve this process (Leffingwell & Widrig, 2000; Ferdinandi, 2002). In an important paper, Davis (1982) suggests some reasons for why information requirements are difficult:

- there are limitations on users as information processors,
- the target requirements are numerous and complex, and
- coming to a common understanding of requirements among users and analysts is challenging.

Various strategies and associated methods have been proposed to overcome these difficulties. Davis (1982) goes on to propose a framework for these strategies that has the following categories:

- asking – direct questioning about what information is needed,
- deriving – analysis of existing systems to determine what information is provided,
- synthesizing – using models of the “utilizing subsystem” to determine information requirements,
- experimenting – providing users with an opportunity to experience a system prototype or mock-up, and then give feedback to analysts on information needs.

In most cases, there is an assumption that the future users of the system can identify their requirements if they are given the right cues. In the direct asking strategy, the assumption is that the users have thought about their information needs already so a direct cue like “what are your most important information needs” will trigger memories that can be captured and recorded as information requirements. Davis extends this category to include group techniques like brainstorming but the underlying cues are the same.

In the deriving strategy, an existing system is analyzed for the information it provides and this information set becomes the cue to the user. Users are asked if the derived information will meet their needs and if there is additional information that should be added to the set. Users who may not have been able to respond to the direct asking cue may be able to respond to examples of information and hopefully, be able to extend it to new information items.

In the synthesizing strategy, an abstraction or model is created of the organization, environment, and/or processes that the system is to support. This model is then used to determine the information requirements for the application. Popular abstractions are based on (1) decisions, (2) data flows, (3) critical success factors, (4) entities and relationships, (5) classes and relationships, (6) ends/means analysis, (7) use cases, (8) business process flows, etc. The abstractions are the basis of the cues that are given to users to help them define their information requirements. Decision analysis (Munro & Davis, 1977), for example, would begin by asking users about their decisions and then ask about information that is important to making those decisions. The underlying assumption is users have thought about the decisions they make and can respond to cues about them. Once a particular decision is identified, it can act as a cue to recall information that was used to make it or to trigger reasoning about what information should be used to make it. To be effective, the decision cue should produce better information requirements than a direct asking cue.

The experimentation strategy relies on a number of different kinds of cues. In order to create the initial prototype or mock-up system for the user to experience, the analyst must use one of the other strategies: i.e., direct asking, deriving from an existing system, or synthesizing using an abstraction. The initial analysis is only a beginning and is expected to be incomplete. An experimental system is created based on this initial analysis and then it becomes the cue. Final information requirements are based on the user's experience with the prototype or mock-up.

Let us assess each of these strategies in terms of a location perspective. The asking strategy uses information needs as a cue. If the user has been thinking about information needs in terms of location, this cue will identify them. Since few users are used to doing this, it is unlikely that this strategy will capture many location based needs. The deriving strategy depends on finding a suitable existing system and using it as the basis for the cues used to elicit information needs. Since most existing systems have not been designed with mobile users in mind, this approach is also unlikely to identify a complete set of information requirements.

The synthesizing strategy depends critically on the abstraction that is chosen and the cues that support the abstraction. Table 1 summarizes some of the popular approaches and includes a new one that focuses on location.

Table 1: Information Requirements Determination Approaches

Approach (abstraction)	**Primary Cues**	**Information Cues**	**Requirements Emphasis**
decision analysis (Munro & Davis, 1977)	what important decisions do you make?	what information do you need for decisions?	information to support decisions
Critical Success Factor analysis (Rockart, 1979)	what factors that are critical to your success?	what information do you need to support CSFs?	information to support Critical Success Factors
data flow analysis (DeMarco, 1979)	describe data flows and processes	questions about data flow structures and definitions	information in data flows
entity-relationship analysis (Chen, 1976)	questions about entities and relationships	questions about attributes	information to represent entities, relationships, and attributes
object-oriented analysis (Coad & Yourdon, 1991)*	questions about classes and relationships	questions about attributes	information to represent classes, hierarchies, relationships, and attributes
ends/means analysis (Wetherbe, 1991)	what goods & services do you produce (ends)? how do you produce them (means)?	how do you know your ends are effective? how do you know your means are efficient?	information about effectiveness and efficiency

Table 1: Information Requirements Determination Approaches			
use case analysis (Jacobson, et. al., 1999)*	what should the system do for each actor?	questions about messages between use cases and actors	information needed to support a sequences of actions providing value to a user
location analysis	what locations does the user visit? what tasks does the user perform at locations?	what information is needed to perform tasks at a location?	information needed at a location (i.e., a location perspective)

* Object-oriented analysis and use case analysis have been combined with other modeling approaches (e.g., collaboration modeling, deployment modeling, state machine modeling, and configuration modeling) in the Unified Modeling Language (Booch, et. al., 1999). Only class modeling and use case modeling are included here because they focus more on information requirements. The other modeling approaches focus more on how the requirements will be met.

In all but the last of these cases, location is a secondary or tertiary concern. Only location analysis tries to identify all information needs at a particular location. This analysis brings in a location perspective that is necessary to provide complete and integrated support for the mobile user.

Experimentation must start with an initial analysis which will focus on support for the particular abstraction that was part of the method. If the initial analysis is not location analysis, it will take significant experimentation to identify all location specific information needs, if those needs are ever identified. An initial location analysis with experimentation at the various locations identified could be an effective way to define requirements when a high degree of uncertainty exists in them.

Location Analysis

The purpose of location analysis is to identify information requirements for specific locations; i.e., to create a location perspective. Other methods of information analysis focus on decisions, existing data, transactions, critical success factors, use cases, etc. The proposed approach focuses on locations which are visited by mobile users. The process involves the following steps:

1. identify system users,
2. identify locations users visit (regularly, occasionally and potentially),
3. define tasks users perform at a location,
4. create a location by task matrix to identify common tasks across locations,
5. for each task define the information necessary to perform it and indicate if there are location specific elements,
6. develop a location by information category matrix and standard definitions for all categories.

The location-based information requirements are then given to analysts and designers. Analysts must decide how the information will be obtained (i.e., through existing, modified, or new applications) and designers must apply the technical constraints of platforms and networks to create a design which will meet the information requirements.

We will illustrate the process by using a hypothetical case of a university professor.

1. Identify System Users

The example sponsor is a university and the targeted users are faculty. The goal of the process is to support faculty so that their teaching, research and service productivity is improved. Given that faculty perform professional tasks in multiple locations, they quality as mobile users and location analysis is used to assist in developing systems to support them.

2. Identify Locations

For this step, representative users are asked to think back over the last year and identify locations they have visited during the course of their working day. Locations faculty visit might include (1) university office, (2) home, (3) classrooms, (4) colleagues' offices, (5) administrator's offices, (6) research sites, (7) consulting sites, (8) university service offices (e.g., Human Resources, Audio Video), (9) libraries, (10) conference sites, etc. Representative lists are obtained from multiple users of the different types that are to be served by the system. For example, part time instructors are interviewed as well as full time professors.

3. Define Location Tasks

For this step take each location and ask users about tasks that are performed there. One way to do this is to ask users to mentally walk through the time they have spent at particular locations and describe the tasks that they do. For example, at their university offices, faculty:

- meet with students,
- prepare lectures, tests, quizzes, and assignments,
- write papers or reports,
- communicate with colleagues, internal and external,
- analyze data,
- review literature for research, instruction, or consulting,
- review papers for journals or conferences,
- correspond with university offices and staff,
- meet with colleagues,
- order books and other materials,
- grade,
- prepare for meetings,
- write grants,
- communicate with external agencies and companies,
- personal communications,
- etc.

Similar lists are compiled at the other locations that have been identified in the previous step.

4. Create a Location by Task Matrix

Lists of tasks for individuals are collected and combined. Some tasks may be viewed as inappropriate for university supported computing while others may be dropped because they are too idiosyncratic. Care must be taken, however, because the task that is only performed at a location by one person today may be useful to others tomorrow. Table 2 shows a partial location by task matrix. The numbers indicate how important support for that task is at that location with 1 being most important.

Table 2: Location by Task Matrix

Task \Location	Office	Home	Classroom	Research Site	Consulting Site	Colleague’s Office	Administra-tive Office	University Services	Library	Conference Sites
Meet Face-to-face with students	1	3	2	2	3					
Prepare lectures, tests, quizzes, assignments	1	1								3
write papers and reports	1	1		2	2	3			3	3
communicate/meet with colleagues	1	1		2	2	1				1
analyze data	1	1		1	1					
review literature	1	1		1	2	3			1	
review papers	1	1								
communicate with university offices	1	1				2	2	1		
order books and other materials	1	1								
grade	1	1							3	3
prepare for meetings	1	1		1	1	1	3			2
write grants	1	1		1	2	1	2		3	3
communicate with external entities	1	1		1	1	2				
deliver lectures, demonstrations, discussions			1		3					
collect data			2	1	2					

For example, the task of meeting with students is done primarily in a faculty member’s office but may also be done in a classroom before and after a lecture, at a research site where the student is assisting, at a consulting site where the student is working, or even at home. Similar information will be needed at each site but with different degrees of importance.

5. Define Information to Support Tasks

Information needs are elicited by picking a task (e.g., meeting with students) and a location that is given the highest importance rating for that task (e.g., faculty office), and then asking users what information they need to perform the task at that location. This set of information requirements becomes the standard for that task. Users are then asked if the information needs for the task are different at other locations. Any location specific differences are recorded as exceptions to the standard. Important location differences between individual users are also captured.

For the "meeting with students" task, the following information might be required:

- class performance,
- university grades,
- class syllabus and other materials,
- class assignments and tests,
- student address, phone, e-mail information
- etc.

It may be decided that providing information on university grades is inappropriate outside of the confined privacy of the faculty member's office. This constraint is noted along with the information list.

6. Develop a Location by Information Category Matrix

The final step in location analysis is to develop a location by information category matrix and final information category definitions. This matrix will allow information categories that support multiple tasks to be consolidated. Table 3 is an example of a partial location by information category matrix. For example, class performance information is used in meetings with students, meetings with colleagues, and grading tasks. University grade information is more restricted.

Table 3: Location by Information Matrix

Information \Location	Office	Home	Classroom	Research Site	Consulting Site	Colleague's Office	Administra-tive Office	University Services	Library	Conference Sites
class performance	1	3	2	2	3	2			3	3
university grades	1					3				

As part of the final documentation for the location analysis, definitions are given for each of the information categories in the matrix. The complete set of users, locations, tasks, and information categories along with the matrices and definitions is the product of the location analysis. This information is given to the analysts and designers who determine how the location specific needs are to be met.

Applying a Location Perspective

To demonstrate the value of location analysis, we will briefly examine three ways the results can be used. One way the information can be used is to help determine display priorities. Information that has a high priority at a particular location should be brought to the forefront at that location. For example, class performance for students should be easy to get at in a faculty member's office. While this information might be useful at a conference site (e.g., to respond to student questions via email), it is not as important at the conference as other information (e.g., time and place of presentation to be given). The information could be available but not presented as an option on the opening page of the application. This is especially critical when the display capability of the mobile device is severely constrained as it is with many handheld devices and smart phones.

Another use of the location information concerns information and application security. If sensitive data has a low priority at a location or is not needed at all, a decision could be made to not make that data available at that location. On the other hand, if sensitive data has a high priority at a location, an extra investment in secure design and technology may be warranted.

A third way location analysis can help is in determining when data/information and applications should be loaded into and unloaded from mobile computing devices. On arrival at a conference or at a consulting site, the device could load all pertinent data/information for the site, especially if it has been given a high priority. When the knowledge worker opened up the device the most important data would not only be easily accessible but would also be preloaded for fast access. When the knowledge worker left the location, the updated information could be moved off the device and replaced by information required at the next location.

There are two important requirements that systems must meet in order to effectively use the location analysis results. First, the data/information and applications must be tagged with locations. If all of the data/information for a particular application is to be available at every location where the application is to be run, there would be no need to place additional location tags on the data. If only certain data used by an application is to be made available at a particular location, then data within the application would need to be tagged and the application would need to supply only the appropriate data at each location. In most applications this would probably be handled on the server side of the system so that a mobile client could be simplified.

The second requirement is that the system needs to know the location of the user; or more specifically, the user's computing device. Ideally, both automatic location detection and manual location selection would be provided. Automatic location detection would allow the automated modifications of display, security and data/application loading suggested in the above scenarios. More and more mobile devices have this ability through GPS, tower triangulation, and/or WIFI pattern matching. There would still need to be a way to manually choose a location, however. For example, to prepare for a conference a knowledge worker may want to manually select the conference site location while sitting in an airport so he/she could review presentation slides, conference schedule, hotel reservation, and other pertinent information.

Conclusion

This paper has argued that supporting mobile users in a knowledge economy requires an additional perspective when identifying information needs. A process is described and illustrated with a simple, hypothetical example. The approach needs further refinement and to be tested in a real world situations to determine if it has merit. Further research should consider (1) different ways to represent the location perspective (e.g., extension to UML?), (2) ways to validate the requirements identified in the location analysis, (3) characteristics of users and organizations that determine the need for defining a location perspective, (4) how the location perspective can be systematically implemented in a mobile application, and (5) how the importance of location perspective changes as mobile computing technology changes.

The knowledge economy demands well informed knowledge workers, no matter where they are located. As the technical limitations to supporting mobile users are overcome we must evolve our information requirements processes to accommodate increasingly mobile users. This paper suggests one way to move toward that goal.

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A Revised Motivated Strategy for Learning Questionnaire (MSLQ) for Assessing Computer Software Learning Strategies

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Abstract

One of the widely used instruments to access students' use of learning strategies is the Motivated Strategy for Learning Questionnaire (MSLQ). Although the instrument is effective in accessing strategies used in processing information from texts and lectures, research findings using the learning strategy section of the instrument tend to contradict general beliefs when the learning activities involved hands-on, applied learning. With 201 students participated in the study, this research reports the initial validity and reliability of a revised version of the learning strategies in the MSLQ. The revision reflects the unique learning strategies involved in learning computer skills. After iterations of refinements, the final version of the learning strategy scales consists of 5 scales and 24 items. With confirmed convergent validity and discriminant validity, the new version exhibits construct validity. The reliability test showed alpha values ranging from .820 to .679, with only one alpha value lower than .7.

Keywords: MSLQ, Learning Strategy, Self-Regulated Learning, Computer Skills, Validity and reliability study

Introduction

Instructional theories have shifted from viewing students as reactive learners, in the mid-1980s, to the current view of students as proactive learners. Emphasis is no longer placed on the teachers to adapt instructions to meet individual student's mental ability or social-cultural background. In contrast, students are viewed as active participants in their own learning process (Perkins, 1992; Zimmerman, 2001). Based on this view, Zimmerman defines self-regulated learners (SRL) as students who "are metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 2001, p.5).

Self-regulated learning is often regarded as an event as opposed to an aptitude. When viewed as an aptitude, learners have relatively stable approaches to selecting and managing the strategies they use in learning. Viewed as an event, on the other hand, learners monitor their engagement and learning outcomes and dynamically adjust their use of strategies as the task proceeds (Butler & Winne, 1995; Pintrich, et al, 1991). Pintrich (2004) stated that there were four phases in self-regulated learning: (1) planning and goal setting; (2) monitoring; (3) controlling and regulating different aspects of the self, the task, and the context; and (4) reactions and reflections on the self, the task, and the context. In the planning and goal setting phase, learners create a profile of the task, their existing knowledge, and the context. Therefore, the nature of the classroom context plays an important role in facilitating self-regulating learning (Zimmerman, 1994). Activities students participate in can have an important impact on students' motivation and level of self-regulated learning in the classroom, and the use of cognitive strategies often depends on environmental cues and the features of the tasks (Cohen, 1994).

Classroom studies confirmed that the type of task that teachers asked students to engage in can influence the learning strategies that students adopt for their learning (Ames, 1992; Maehr & Midgley, 1991). Due to this view that self-regulation is an event, Schunk (2005) called for research on contextual influences on self-regulated learning in different content areas. He suggested that such knowledge would be useful in creating curriculum and classroom designs that facilitate greater self-regulated learning.

Motivated Strategy for Learning Questionnaire (MSLQ)

Self-regulated learning researchers seek to explain how students improve their performance using a systematic or regulated method of learning, and one of the most widely used instruments to access students' use of learning strategies is the Motivated Strategy for Learning Questionnaire (MSLQ). Based on a self-regulatory (SRL) perspective on student motivation and learning, the questionnaire assesses student motivation and self-regulated learning in college students (Pintrich, 2004). The development of the MSLQ began in 1986 at the University of Michigan when the National Center for Research to Improve Postsecondary Teaching and Learning was established, and the process had gone through three major waves of data collection with more than 2,000 students in the 1980s (Garcia Duncan & McKeachie, 2005). Over the years, a junior high school version was developed and the instrument was translated into numerous languages, including Chinese (Rao & Sachs, 1999), Italian, (Mason, 2003), Norwegian (Dahl, Bals, & Turi, 2005), Turkish (Büyüköztürk, Akgün, Özkahvecý, & Demýrel, 2004), French, German, Spanish, Finnish, Swedish, Dutch, Hungarian, Greek, Japanese, Hindi, and Arabic (Wolters, Pintrich, & Karabenick, 2003). Moreover, the MSLQ instrument has been used to investigate students' motivation and learning strategies in a wide variety of content areas, including statistics, chemistry, social studies, physical education, educational psychology, accounting, dietetics, computer literacy, and teacher education (Wolters, Pintrich, & Karabenick, 2003; Chen, 2002).

The learning strategies section of the MSLQ consists of cognitive, metacognitive, and resource management scales, and mainly it assesses students' use of strategies for processing information from "texts and lectures." (Garcia, Duncan, & McKeachie, 2005). As aforementioned, research on learning strategies has found that students' use of strategies seems to be dependent on the tasks and domain; therefore, strategies may not transfer across situations (Wolters & Pintrich, 1998). Citing others' work in learning strategies used in different subject areas, Wolters and Pintrich (1998) concluded that

> Taken together, our results on student reports of cognitive strategy use and Stodolsky and Grossman's results on disciplinary differences suggest that the level of self-regulated learning in terms of strategy use can very as a function of subject area differences in classroom context. (p. 43)

Although the MSLQ has been used in numerous studies in many content areas, the majority of the research has examined students' processing information from texts and lectures, even though the delivery systems might be web-based or computer-based (Chang, 2005; Eom & Reiser, 2000; McManus, 2000). MSLQ has been a very valuable, useful instrument for this type of research. However, when the learning activities involved hands-on lab exercises, the research findings on students' use of learning strategies tend to contradict general beliefs. Niemczyk and Savenye (2001) conducted a study in a computer literacy course that involved lecture and computer hands-on labs. They found that peer learning was negatively related to course grade. Although it was not significant, critical thinking was negatively related to course grade as well. In a similar study, Chalupa, Chen, and Charles (2001) found that both organization and critical thinking had an inverse relationship with course grade in a hands-on computer application course. These findings contradict the general belief that if students use critical thinking in learning, they are more cognitively engaged; therefore, the use of the learning strategy should not have hindered their grades. Chalupa, Chen, and Charles then raised the question of whether learning strategies such as ‘I often find myself questioning things I hear or read in this course to decide if I find them convincing” (item 38 in MSLQ, Critical Thinking Strategy scale) were appropriate to assess students’ learning strategies when the goal was to learn specific software functionality with hands-on activities. In another study, Chen and Chalupa (2003) investigated motivation and learning strategies with students in Computer Literacy and Computer Application courses. The Computer Applications course consisted of teacher-led demonstration followed by hands-on activities while the Computer Literacy course was approximately 65 percent lecture and 35 percent hands-on activities. In this study, cluster analyses were used to categorize students into two categories: heavy studiers and light studiers. Heavy studiers exhibited high use of elaboration, organization, and metacognitive self-regulation, while light studiers were less likely to use any learning strategies listed in MSLQ. Interestingly, heavy studiers tended to have higher grades than light studiers in the Computer Literacy class; yet, heavy studiers in the Computer Applications class tended to have lower grades than light studiers. Once more, this study showed that students who used rehearsal, elaboration, or organization learning strategies tended to have lower grades in courses that required hands-on learning, not textbook learning.

Applied Learning versus Conceptual Learning

Applied, hands-on learning is very different from conceptual, textbook learning. In conceptual learning, students learn concepts and theories, attend lectures, take notes, and study their notes and textbooks. Generally, students demonstrate their mastery of the materials by taking written, paper-and-pencil exams. In applied learning, on the other hand, instructors may demonstrate the tasks, and then students practice the tasks, with or without written instructions. Oftentimes, tools are used in applied learning. Clinical skills and computer skills belong to this category.

Andrew and Vialle (1999) conducted a study to compare the learning strategies used by students in different subject areas: a science course and a nursing practice course. Topics in chemistry, physics, and human bioscience were discussed in the science course, while the nursing practice course had a theoretical component and a practical-clinical skills component. A questionnaire was sent to more than three hundred students, and forty were selected for telephone interviews. Students were asked about their use of learning strategies in the science and the nursing practices courses. Although this study did not use the MSLQ, it was based on the self-regulated learning theoretical foundation and the interviews identified learning strategies that were comparable to those found on MSLQ. This study found that students used different learning strategies in the science course (a conceptual-learning course) and in the nursing practice course (an applied-learning course). Students did not discuss summarizing or paraphrasing course materials for the nursing practice course. On the other hand, organization, rehearsal, peer learning, reading textbooks and notes, and study environment strategies were more specific to the Science course. In addition, the course-specific learning strategies for nursing practice included participation in extra clinical practice, the completion of the course workbook and making links between science knowledge, clinical and the course.

Another subject area that involves applied learning is computer software. Computer skills are important for students to be successful in today's information age. To prepare students for employment upon graduation, universities and colleges are incorporating software skills in their curricula. In addition to a computer literacy course, many software applications are used in classrooms to prepare students to be proficient in using the 'tools of the trade' before graduation. These could be computer-aided design tools, accounting software, econometric software, enterprise resource planning software, database design software, multimedia software, statistical analysis software, or many other tools specific to particular career fields and areas of study.

Learning to use software requires frequent practice and experimentation with different software functionality. The effective learning strategies used in a conceptual learning environment may not be applicable in these types of courses. This might be the reason why students' reported use of some learning strategies in the MSLQ had an inverse effect on grades (Niemczyk, Savenye, & Wilhelmina, 2001; Chalupa, Chen, & Charles, 2001). When the learning goal is to acquire computer skills, learning strategies such as "memorize key words," "write brief summaries of the main ideas from the readings and my class notes," "practice saying the material to myself over and over," and "trying to decide if there is good supporting evidence" are not applicable. Good software learning strategies may be to practice and experiment with different software functionality on the computer, to use the software to solve various problems or to complete projects, or/and to troubleshoot software problems when they arise. In other words, to learn software well, students must ‘use’ the software. In addition, productivity software often provides built-in or online Help; this feature generally provides timely information on how to perform a task or how to solve a computer problem. Therefore, using Help ought to be one of the resource management strategies.

Based on the literature and prior research, the purpose of this study was to revise the learning strategies section of the MSLQ to reflect the unique learning strategies involved in learning computer skills. The new questionnaire was then administrated to students enrolled in a computer application course. To develop a robust survey instrument, many waves of data collections are needed to refine the instrument. This paper reports the initial validity and reliability. Further studies will be needed to refine the instrument.

Method

This section describes the procedures used in revising the learning strategies items and in establishing validity and reliability.

The Revisions of the Learning Strategies Items

The original learning strategies in the MSLQ consisted of nine scales: Rehearsal, Elaboration, Organization, Critical Thinking, Metacognitive Self-Regulation, Time and Study Environment, Effort Regulation, Peer Learning, and Help Seeking. The 50 items in these learning strategies scales (numbered 32 to 81) were renumbered to 1 to 50. Then, the statements were revised to be more applicable to learning computer skills. One of the strategies in learning computer skills is to use the built-in or online Help features to learning how to perform a function or how to solve a software problem, and this software-relevant learning strategy was incorporated into MSLQ without adding new items. For example, item 8 “I ask the instructor to clarify concepts I don't understand well” was rewritten to incorporate using Help. The new item reads “I frequently use the software Help function or online Help when the instructor is not readily available.” Using Help is also incorporated into item 37 by adding “or use the software Help feature” at the end of the statement. Appendix A lists the original items from MSLQ and the revisions made to the items. The words with strikethrough lines were removed from the original items, and the underlined texts were added.

One senior instructor with 20 years of teaching computer software experience revised the instrument, and the second senior instructor with 10 years of teaching experience reviewed the revision. Minor changes were made and then the first draft of the revision was reviewed by two junior instructors. Suggestions and clarifications were discussed and changes were made. This second draft was then administered to two graduate and two undergraduate, one female and three male, students. These four students were interviewed individually to discuss the items. Minor wording changes were made. Feedback from these students showed concern about some items sounding very similar, so items 8 and 27 were exchanged and items 13 and 31 were exchanged to move similar sounding items farther from each other.

Subjects

Students enrolled in seven sections of an Introduction to Microcomputer Applications course in a large Midwestern university were invited and 201 students participated in the study. Responses were scored using a 7-point Likert type scale, from 1 (not at all true of me) to 7 (very true of me). The Introduction to Microcomputer

Applications course was a required course for all business students. All instructors used the same textbook, which provided detailed steps to use the software.

Analysis Procedures

Exploratory factor analysis using principal components factor extraction was used to determine if the learning strategies items correspond to the learning strategies scales. To ensure that it was appropriate to perform factor analysis on the data, measure of sample adequacy (MSA) statistics were calculated prior to performing the factor analysis (Hair et al., 1987).

Confirmatory factor analysis was used to investigate the internal validity. A path model was used as a basis for testing convergent validity and discriminant validity. Both convergent and discriminant evidence are fundamental in test validation (Messick, 1990), and both are considered subcategories of construct validity. Convergent validity measures constructs that theoretically should be related to each other are, in fact, observed to be related to each other. Discriminant validity, on the other hand, demonstrates measures that should not be related are in reality not related. Following the factor analyses, the internal consistency of reliability was computed using Cronbach's coefficient alphas (Cronbach, 2004).

Findings

Exploratory Factor Analysis

All but five survey items were found to have a measure of sampling adequacy exceeding .7. The items that had strictly inadequate MSA statistics were items 2 (.589), 14 (.692), 21 (.694), 30 (.446), and 46 (.676). Since three of these MSA statistics were very close to the cut-off value, it was determined that the MSA criterion was almost completely satisfied. Next, an exploratory factor analysis using principal components factor extraction was conducted. Nine factors were arbitrarily extracted, because there were nine learning strategy scales. The factor loadings reported in the following tables were the correlation coefficients between the variables (rows) and factors (columns), and a factor loading of lower than .4 was not presented in the tables. The tables also provide the communality values, which were the variance explained for each item. A low communality suggests that the factor model was not working well for that indicator, and a communality of lower than .5 was considered inadequate.

The factor loadings did not correspond well to the pre-specified learning strategies scale definitions. In most cases, each factor contained items from several different scales. The loadings for the Elaboration scale were scattered across five different factors as shown in Table 1; therefore, the exploratory analysis clearly did not correspond to the Elaboration scale.

(insert Table 1 here)

The exploratory analysis seemed to suggest that an Organization scale could be identified to some extent with factor 1. Unfortunately, many other items in other scales loaded on factor 1 as well, such as Rehearsal, Elaboration, and Metacognitive Self-Regulation scales.

Table 2 showed that items associated with the Metacognitive Self-regulation scale loaded on six of the nine factors extracted by the exploratory factor analysis. The existence of this scale in the data was not confirmed by the exploratory analysis.

(insert Table 2 here)

In the similar fashion, items associated with the Time and Study Environment Management scale loaded on three different factors (factors 1, 2 and 6), and the Effort Regulation scale loaded on multiple factors (factors 2, 6, and 8). Although factor 3 loaded relatively well on the Critical Thinking scale, several items from other scales loaded on this factor as well, such as item 13 (Elaboration), item 10 and 24 (Metacognitive Slef-Regulation), and item 9 (Help Seeking). Table 3 showed all items loaded on factor 3.

(insert Table 3)

The Peer Learning scale was another scale that relatively clearly identified as factor 4 in the exploratory factor analysis, although item 19 had multiple loadings (factors 1 and 4). The main problem was that the Help Seeking scale was also fairly clearly identified as factor 4 as illustrated in Table 4. There seemed to be no difference between Peer Learning and Help Seeking in the data. The analysis suggested that these two scales could be identified as one scale.

(insert Table 4 here)

Reliability

Although the exploratory factor analysis produced some adverse results, the pre-specified scales were subjected to item analysis. Based on the results in exploratory factor analysis, Peer Learning and Help Seeking were combined as one scale in this analysis. Table 5 listed the initial results of item analysis, and the improved Cronbach's alpha. The improved Cronbach's alpha was achieved by eliminating items in some learning strategy scales to increase the alpha value. Note that the alpha values of Critical Thinking and Time and Study Environment scales could not be increased by deleting any items in the respective scales.

(insert Table 5 here)

Cronbach alpha reliability coefficient for each scale ranged from .607 to .797. The alphas of Rehearsal, Organization, and Effort Regulation failed to reach the adequate level of .7, indicating that they were not reliable for this study.

Validity

The next phase consisted of testing the learning strategies scales for internal validity. Several such forms of validity can be tested with confirmatory factor analysis. A path model was used as the basis for testing both convergent validity and discriminant validity. This model included a full ex-ante specification of the learning strategies scales with one exception. When item 28 was included in the path model, an admissible solution could not be obtained. After an examination of the correlation coefficients between the items in the Rehearsal scale, item 28 was removed due to the existence of a negative correlation coefficient between that item and another item in the scale.

Convergent validity. Convergent validity shows a correspondence (or convergence) between similar constructs. In other words, it showed items in the same learning strategy were correlated if convergent validity existed in the collected data. There are two tests for convergent validity. The first was to test if the unstandardized regression weights (path coefficients) were statistically significant. The second test was to test if the factor loadings (standardized regression weights) were .5 or higher. Table 6 listed the estimates of the path coefficients for the model and the factor loadings from the confirmatory factor model.

(insert Table 6 here)

As shown in Table 6, none of the items in the Metacognitive Self-regulation scale passed the first test (path coefficients needed to be statistically significant). In addition, item 8 failed to pass the first test in the Help Seeking and Peer Learning scale. Many items failed the second test (factor loadings needed to be > .5). The only scale exhibiting convergent validity based on the second test was the Critical Thinking scale.

Discriminant validity. Discriminant validity refers to the ability of measurement scales to measure the concept or construct they are intended to measure rather than some other related concept or construct. Discriminant validity is measured by comparing the square root of the average variance explained for each scale with the correlations between the scales. If the average variance explained is larger than any correlation, then a measurement scale is measuring its own construct rather than some other construct. Table 7 compared the square root of the average variance explained for each scale with inter-scale correlations as estimated in the confirmatory factor model.

(insert Table 7 here)

Only some covariance arcs were estimated in the confirmatory factor model. Most were not significant and were taken to be zero. Inappropriately large correlation coefficients were noted in the table. To determine if a scale exhibited discriminant validity, a root average variance explained in Table 7 was compared with correlations in the same row and column in the table. If no larger correlation was found, the measurement scale in question exhibited discriminant validity. As shown in Table 7, Rehearsal, Organization, Metacognitive Self-regulation, and Help Seeking-Peer Learning exhibited discriminant validity. Elaboration was confounded with Critical Thinking and Critical Thinking was confounded with Elaboration. Effort Regulation was confounded with Time and Study Environment management and vice versa. Another test of general discriminant validity in confirmatory factor models was the root mean square residual from the fit statistics. If this statistic is .05 or less, general discriminant validity can be viewed as being established. For the factor model under consideration, this statistic was .534. Thus the existence of discriminant validity could be rejected on this basis as well.

Development of Refined Scales

The original learning strategies scales failed all validity tests. An exploratory factor analysis restricted to a number of factors equal to the number of scales did not reproduce the scales in the extracted factors. A confirmatory factor analysis failed to provide any reasonable fit, although some scales met the criteria for either convergent or discriminant validity.

It was decided to remedy these deficiencies. The order of analysis was changed in this section. Confirmatory factor analysis was performed (and refined) first; in other words, issues of validity were addressed before issues of reliability. The items that did not have factor loadings of .5 or higher in the initial factor loading (as listed in Table 6) were eliminated when constructing the confirmatory factor model for the refined scales, with the exception of item 34. In the initial test, item 34 had an inadequate factor weight of .474 (< .5), but it was left in the model due to estimation problems with the new model if it was omitted.

The fit statistics for the refined confirmatory factor model showed that the ratio of the chi-square statistic to the degrees of freedom was adequate (2.437), but goodness-of-fit statistics was .742, which does not meet the criterion of .9.

Discriminant validity. The same comparison of root average variance explained and inter-scale correlation was produced for the refined model. The only scale clearly exhibiting discriminant validity was Peer Learning-Help Seeking. Thus the refined scales did not exhibit discriminant validity.

Convergent validity. The convergent validity statistics showed that all regression coefficients were statistically significant, and all factor scores were at least .5 with the exception of item 34. Although the scales in the refined model exhibit convergent validity, this information should be considered in light of the knowledge that the overall model fit was poor.

In addition, exploration factor analysis was carried out on the reduced set of variables and the number of factors was restricted to eight in order to reflect the combination of the Help Seeking and Peer Learning scales. The results showed that most factors contain items from several different scales, and most scales loaded into more than one factor. For example, both Rehearsal and Organization loaded into factor 3, and no other scales loaded into this factor than one item from the Help Seeking-Peer Learning scale. Factor 1 contained all items from Effort Regulation and most items from Time and Study Environment Management.

Reliability. The analysis was only a partial success. Four scales satisfied the criterion that Cronbach's alpha be .7 or higher. One additional scale could be rendered reliable by the removal of one item.

Combination of Scales

As aforementioned, the exploratory factor analysis continued to show that Rehearsal and Organization loaded into the same factor (factor 3), and both Effort

Regulation and Time and Study Environment Management loaded into factor 1. In addition, discriminant validity analysis showed that Rehearsal and Organization were confounded, and Effort Regulation was confounded with Time and Study Environment Management. An intermediate confirmatory factor analysis, then, was conducted using six scales, with Rehearsal and Organization combined as one scale and Effort Regulation and Time and Study Environment Management combined as one scale. Table 8 reported the intermediate analysis of discriminant validity.

(insert Table 8 here)

The result represented an improvement over previous analyses of discriminant validity. As noted in Table 8, no confounding existed with the exception of the combined Effort Regulation and Time and Study Environment Management scale and Metacognitive Self-regulation scale. This led to the specification of five scales in the model. A decision was made, then, to combine Effort Regulation, Time and Study Environment Management, and Metacognitive Self-regulation into one scale. The exploratory factor analysis was carried out, and only five factors were extracted as shown in Table 9. Unlike that of previous models, the exploratory factor analysis showed that each factor contains only items from one single scale, and each scale can be identified to only one factor, with the exception of item 15.

(insert Table 9 here)

Reliability. The combined scales were subjected to item analysis to assess the reliability. Table 10 showed the results of this analysis. With the exception of Elaboration, all scales met the minimum reliability criterion of .7. As shown in Table 10, no deletion of any item would increase the alpha of any scale, including Elaboration.

(insert Table 10 here)

Convergent validity. A confirmatory factor model was constructed for the combined scales. Table 11 listed the estimates of path coefficients and factor scores. As shown in Table 11, all path coefficients were statistically significant, which satisfied the first test of convergent validity. The second test of convergent validity was mostly confirmed since all but two items in the MSR/ER/TSE scale (item 25 and 34) had satisfactory factor loadings of higher than .5. The fit statistics of this model showed that the model has a Goodness of fit index (GFI) of .866, which approaches the satisfactory level of .9.

(insert Table 11 here)

Discriminant validity. To test discriminant validity, the comparison of root average variance explained and inter-scale correlation was produced for the combined-scale model. Table 12 showed the results. The average variance explained in each scales was larger than any correlation coefficient with another scale; therefore, the combined scales appeared to exhibit discriminant validity

(insert Table 12 here)

There are 24 learning strategies items in the revised questionnaire. Appendix B listed the items and their new numbers. Table 13 showed the item numbers and the learning strategies scales. The new scale that consisted of Metacognitive Self-regulation, Effort Regulation, and Time and Study Environment management was shortened to Self-Regulation scale. The combined Rehearsal and Organization scale was labeled Organization since the items were about organization studying materials.

(insert Table 13 here)

Discussion

The first revision of the revised learning strategies scales failed both convergent and discriminant validity tests, and only five of nine scales exhibited adequate reliability. To remedy the deficiencies, items with a factor loading of less than .5 were removed to construct a refined model. Nonetheless, the refined model did not satisfy the goodness-of-fit criterion, nor did it exhibit discriminant validity when the original scales were maintained. The researchers then reexamined the literature review.

Pintrich (2004) viewed self-regulated learning as a four-stage feedback loop during learning: planning, monitoring, controlling and regulating different aspects of the learning, and reaction and reflections. The enabling cognitive activity of self-regulated learning was metacognition. Metacognition refereed to the awareness, knowledge, and control of cognition. In the MSLQ manual, Pintrich and his colleague stated that the three processes that make up metacognitive self-regulatory activities were planning, monitoring, and regulating (Pintrich et al., 1991). Other aspects of self-regulated learning included time management, regulating one's own physical and social environment, and the ability to control one's effort and attention (Zimmerman & Risemberg, 1997; Pintrich, 1995).

Based on the analysis results and the theory that time management and regulating one’s effort and learning environment are different aspects of self-regulation, Effort Regulation, Time and Study Environment, and Metacognitive Self-regulation are combined into one scale. The combined scale is labeled as Self-Regulation. In addition, Rehearsal and Organization are clearly identified as one scale in the exploratory factor analysis. After reviewing the four items in the new combined scale, it is decided to label the scale as Organization since the items are about organizing materials when study for the class.

The revised questionnaire is condensed to only 24 items and consists of 5 scales: Organization, Elaboration, Critical Thinking, Self-Regulation, and Help Seeking-Peer Learning. All items in each of the new scale are loaded into only one factor, and each factor contains only loadings from items in the same scale in the exploratory factor analysis. The reliability test shows alpha values ranging from .820 to .679, with only one alpha value lower than .7. The alpha values of the learning strategies scales in the original MSLQ were reported as .8 to .52 (Pintrich et al., 1991).

The revised questionnaire exhibits construct validity because both convergent validity and discriminant validity are confirmed. Validity refers to the degree of adequacy and appropriateness of the interpretations and actions based on the observed scores (Kane, 2000; Messick, 1990). It is the interpretation that is being validated, not the test or questionnaire. Based on the observed scores in this study, the revised questionnaire exhibits construct validity; therefore, the interpretation that students who responded high on the learning strategies scales in the questionnaire do use the learning strategies is validated. For example, if a student responded a 7 (very true of me) on the 7-point Likert type scale on the Critical Thinking scale, the students probably did use critical thinking in their learning of the course material.

Validation is a continuing process. It justifies the current use of the questionnaire and guides future research to advance understanding of the meaning of the scores and their function in the applied context (Messik, 1990). This pilot test of the computer skills learning strategies questionnaire suggests that only 24 of the original 50 items are relevant and they contribute to only 5 learning strategies scales. To improve the validity of the questionnaire, many more waves of data collection will be needed.

Validity and reliability testing are best served with large amounts of data collection and refinement of instruments. Further iterations of data collection and analysis of results will allow the wording of questions to be refined, the number of questions to be stabilized, and even more importantly, the categories (Organization, Elaboration, Critical Thinking, Self-Regulation, and Help Seeking-Peer Learning) to be further defined and improved.

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Appendix A

1. When I study the ~~readings~~ material for this course, I outline the material to help me organize ~~my thoughts~~ the concepts and computer functions.

2. During class time I often miss important points because I'm ~~thinking of~~ distracted by other things.

3. When studying for this course, I often try to learn by explaining the material to a classmate or friend.

4. I usually study in a place where I can concentrate on my course work.

5. When reading for this course, I make up questions to help focus my ~~reading~~ studying.

6. I often feel ~~so lazy or~~ bored when I study for this class ~~that I~~ and quit before I finish what I planned to do.

7. I often find myself ~~questioning things I hear or read in this course to decide if I find them convincing~~ experimenting on the computer to find the most efficient way to complete a task.

8. ~~I ask the instructor to clarify concepts I don't understand well.~~ I frequently use the software Help function or online Help when the instructor is not readily available.

9. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone.

10. When I become confused about something I'm ~~reading~~ learning for this class, I go back and try to figure it out.

11. When I study for this class, I go through the readings and my ~~class notes~~ lab exercises ~~and try~~ to find the most important ~~ideas~~ points.

12. I make good use of my study time for this course.

13. I try to relate ~~ideas~~ the computer skills in this ~~subject~~ class to those in other courses whenever possible.

14. I try to work with other students from this class to complete the course assignments.

15. When studying for this course, I read my class notes and ~~the course readings~~ practice on my computer over and over again.

16. When a ~~theory, interpretation, or conclusion~~ concept is presented in class or in the readings, I try to ~~decide if there is good supporting evidence~~ test it using the software.

17. I work hard to do well in this class even if I don't like what we are doing.

18. I make simple ~~charts,~~ diagrams~~, or tables~~ to help me remember how to navigate through the software that I am learning. ~~organize course material.~~

19. When studying for this course, I often set aside time to ~~discuss course material~~ go over the material and work out computer problems with a group of students from the class.

20. I treat the course material as a starting point and try to ~~develop~~ experiment with the software and solve my own ~~ideas about it~~ problems.

21. I find it hard to stick to a study schedule for this course.

22. When I study for this class, I pull together information from different sources, such as lectures, readings, ~~and~~ or ~~discussions~~ computer exercises.

23. Before I study new course material thoroughly, I often skim over it to see how it is organized.

24. I ~~ask myself questions~~ often experiment on the computer to make sure that I thoroughly understand the ~~material I have been studying in this class~~ software functions.

25. I try to change the way I study in order to fit the course requirements and the instructor's teaching style

26. ~~I often find that~~ I have been trying to understand the materials ~~reading for~~ covered in this class but ~~don't know what it was all about~~ I still have trouble getting it.

27. When I study for this class, I practice ~~saying the material to myself~~ the computer functions ~~over and over~~ more than once to make sure I understand them.

28. I ~~memorize key words to remind me of important concepts~~ try to remember the steps to perform important computer functions learned in this class.

29. When course work is difficult, I either give up or only study the easy parts.

30. I try to ~~think through a topic and decide what I am supposed~~ focus on the software functions that are important to learn ~~from it rather than just reading it over when studying for this course~~ instead of looking at all the information equally.

31. If course readings are difficult to understand, I ~~change the way I read the material~~ try approaching the material in new ways.

32. When I study for this course, I go over my class notes and make an outline of ~~important concepts~~ the most important parts.

33. When ~~reading~~ studying for this class, I try to relate the material to what I already know.

34. I have a regular place set aside for studying.

35. I try to play around with different software functions ~~ideas of my own~~ related to what I am learning in this course.

36. When I study for this course, I write brief summaries of the ~~main ideas~~ computer functions from the readings and my ~~class notes~~ lab exercises.

37. When I can't understand the material or cannot solve the computer problems ~~in this course~~, I ask another student in this class for help or use the software Help feature.

38. I try to understand the material in this class by making connections between the ~~readings and the~~ concepts from the lectures and the lab exercises/assignments.

39. I make sure that I keep up with the weekly readings and assignment for this course.

40. Whenever I ~~read or~~ hear ~~an assertion or conclusion in this class,~~ or have a computer problem, I think about possible ~~alternatives~~ solutions.

41. I make lists of important computer functions ~~items~~ for this course ~~and memorize the lists~~.

42. I attend this class regularly.

43. Even when course materials are ~~dull and~~ uninteresting, I manage to keep working until I finish.

44. I try to identify students in this class ~~whom~~ that I can ask for help if necessary.

45. When studying for this course I try to determine which concepts I don't understand well.

46. I often find that I don't spend very much time on this course because of other activities.

47. When I study for this class, I set goals ~~for myself if order to direct my activities in each study period~~ to complete during each study period.

48. If I get confused taking notes in class, I make sure I sort it out afterwards.

49. I rarely find time to review my notes or ~~readings~~ to practice on computer before an exam.

50. I try to apply concepts learned ~~ideas~~ from ~~course readings in other class activities such as~~ lectures ~~and discussion~~ to computer assignments/projects.

Appendix B

1. When I study the material for this course, I outline the material to help me organize the concepts and computer functions.

2. When studying for this course, I often try to learn by explaining the material to a classmate or friend.

3. I usually study in a place where I can concentrate on my course work.

4. I often find myself experimenting on the computer to find the most efficient way to complete a task.

5. I make good use of my study time for this course.

6. I try to work with other students from this class to complete the course assignments.

7. When studying for this course, I read my class notes and practice on my computer over and over again.

8. When a concept is presented in class or in the readings, I try to test it using the software.

9. I work hard to do well in this class even if I don't like what we are doing.

10. I make simple diagrams to help me remember how to navigate through the software that I am learning.

11. I treat the course material as a starting point and try to experiment with the software and solve my own problems.

12. When I study for this class, I pull together information from different sources, such as lectures, readings, or computer exercises.

13. I often experiment on the computer to make sure that I thoroughly understand the software functions.

14. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.

15. When I study for this course, I go over my class notes and make an outline of the most important parts.

16. I have a regular location set aside for studying.
17. I try to play around with different software functions related to what I am learning in this course.
18. When I can't understand the material or cannot solve the computer problems, I ask another student in this class for help or use the software Help feature.
19. I try to understand the material in this class by making connections between the concepts from the lectures and the lab exercises/assignments.
20. I make sure that I keep up with the weekly readings and assignments for this course.
21. Whenever I hear or have a computer problem, I think about possible solutions.
22. Even when course materials are uninteresting, I manage to keep working until I finish.
23. I try to identify students in this class that I can ask for help if necessary.
24. When studying for this course I try to determine which concepts I don't understand well.

Table 1

Factor Loadings for the Elaboration Scale

	Factors									
Item	1	2	3	4	5	6	7	8	9	Communality
13			.621							.543
22	.432						.458			.535
33					.476					.556
36	.723									.590
38							.567			.646
50									-.403	.588

Table 2

Factor Loadings for the Metacognitive Self-regulation Scale

Item	Factors									Communality
	1	2	3	4	5	6	7	8	9	
2									.659	.520
5	.574									.433
10		.462	.579							.619
23					.574					.585
24			.510							.505
25		.449			.437					.568
26								.557		.695
30								.634		.567
31									.455	.459
45		.674								.629
47	.454				.413					.567
48	.500									.429

Table 3

Factor Loadings for Factor 3

		Factors									
Scale	Item	1	2	3	4	5	6	7	8	9	Communality
Elaboration	13			.621							.512
Critical Thinking	7			.697							.624
	16			.582							.538
	20			.590							.504
	35			.710							.681
	40			.699							.566
Metacognitive	10			.579							.619
Self-Regulation	24			.510							.505
Help Seeking	9			.442	-.485						.664

Table 4

Factor Loadings for the Peer Learning and Help Seeking Scales

		Factors									
Scale	Item	1	2	3	4	5	6	7	8	9	Communality
Peer Learning	3				.627						.555
	14				.793						.699
	19	.561			.483						.598
Help Seeking	8							.601			.603
	9			.442	-.485						.664
	37				.645						.645
	44				.738						.711

Table 5

Cronbach's Alphas of the Revised Learning Strategies

	Cronbach Alpha		
Learning Strategies Scale	Initial	Items Removed	Increased
Rehearsal	.532	28, 41	.607
Elaboration	.690	36	.727
Organization	.676	11	.690
Critical Thinking	.797	—	—
Metacognitive Self-regulation	.731	2	.758
Time and Study Environment	.709	—	—
Effort Regulation	.595	6	.655
Peer Learning-Help Seeking	.626	8, 9	.776

Table 6

Estimates of Path Coefficients and Factor Loadings

Scale	Item	Estimate	Standard Error	Critical Ratio	p-value	Factor Weight
Rehearsal	15	1.000				.736
	27	0.783	0.218	3.588	.000	.592
	41	0.580	0.164	3.537	.000	.417 [b]
Elaboration	13	1.000				.475 [b]
	22	1.333	0.261	5.106	.000	.547
	33	1.204	0.231	5.217	.000	.570
	36	0.363	0.171	2.115	.034	.175 [b]
	38	1.580	0.283	5.577	.000	.657
	50	1.547	0.279	5.549	.000	.649
Organization	1	1.000				.814
	11	0.592	0.103	5.745	.000	.490 [b]
	18	0.574	0.096	5.954	.000	.512
	32	0.649	0.100	6.471	.000	.571
Critical Thinking	7	1.000				.670
	16	0.949	0.121	7.869	.000	.673
	20	0.821	0.118	6.979	.000	.582
	35	1.045	0.127	8.254	.000	.717
	40	0.953	0.012	7.842	.000	.670
Effort Regulation	6	1.000				.285[b]
	17	-2.457	0.683	-3.599	.000	-.736
	29	1.344	0.429	3.129	.002	.410 [b]
	43	-2.395	0.665	-3.600	.000	-.739
Time-Study	4	1.000				.543
Environment Mgt.	12	1.182	0.177	6.678	.000	.683
	21	0.737	0.170	4.325	.000	.369 [b]
	34	1.051	0.200	5.255	.000	.474 [b]
	39	1.231	0.202	6.096	.000	.587
	42	0.678	0.158	4.292	.000	.366 [b]
	46	0.577	0.155	3.724	.000	.310 [b]
	49	0.743	0.165	4.496	.000	.387 [b]
Metacognitive Self-	2	1.000				.001 [b]
Regulation	5	345.200	21651.8	0.016	.987[a]	.446 [b]
	10	220.391	13823.5	0.016	.987[a]	.323 [b]
	23	598.274	37525.8	0.016	.987[a]	.651
	24	432.429	27123.0	0.016	.987[a]	.513
	25	579.757	36363.7	0.016	.987[a]	.672
	26	209.534	13142.7	0.016	.987[a]	.213 [b]

(table continues)

Table 6 (continued)

Scale	Item	Estimate	Standard Error	Critical Ratio	p-value	Factor Weight
Metacognitive Self-Regulation	30	49.008	3074.4	0.016	.987[a]	.066 [b]
	31	329.169	20646.3	0.016	.987[a]	.432[b]
	45	487.049	30548.8	0.016	.987[a]	.609
	47	651.969	40893.0	0.016	.987[a]	.701
	48	482.179	30243.4	0.016	.987[a]	.549
Help Seeking-Peer Learning	3	1.000				.613
	8	0.236	0.131	1.803	.071[a]	.143 [b]
	9	-0.441	0.117	-3.776	.000	-.309 [b]
	14	1.205	0.160	7.523	.000	.731
	19	0.763	0.013	5.804	.000	.507
	37	0.983	0.146	6.745	.000	.616
	44	1.182	0.156	7.591	.000	.744

[a] Path coefficients not statistically significant

[b] Factor loadings $< .5$

Table 7

Comparison of Root Average Variance Explained and Inter-Scale Correlation

Scale	REH	ELAB	ORG	CT	ER	TSE	MSR	PLHS
REH	0.596	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ELAB		0.538	0.000	0.714[a]	0.000	0.000	0.000	0.337
ORG			0.611	0.000	0.000	0.459	0.000	0.000
CT				0.664	0.000	0.000	0.000	0.000
ER					0.578	-0.852[a]	0.000	0.000
TSE						0.480	0.000	0.000
MSR							0.486	0.000
PLHS								0.563

Note. REH: Rehearsal; ELAB: Elaboration; ORG: Organization; CT: Critical thinking; ER: Effort regulation; TSE: Time-study environment management; MSR: Metacognitive self-regulation; PLHS: Help seeking/Peer learning.

[a] Inappropriately large correlation coefficient

Table 8

Comparison of Root Average Variance Explained and Inter-Scale Correlation—Intermediate Analysis

Scale	REH/ORG	ELAB	CT	ER/TSE	MSR	PLHS
REH/ORG	0.673	0.508	0.000	0.000	0.452	0.000
ELAB		0.763	0.000	0.000	0.310	0.000
CT			0.665	0.567	0.428	0.000
ER/TSE				0.622	0.694[a]	0.268
MSR					0.654	0.000
PLHS						0.674

Note. REH: Rehearsal; ELAB: Elaboration; ORG: Organization; CT: Critical thinking; ER: Effort regulation; TSE: Time-study environment management; MSR: Metacognitive self-regulation; PLHS: Help seeking/Peer learning.

[a] Inappropriately large correlation coefficient

Table 9

Results of Exploratory Factor Analysis on Reduced Scale Variables

Scale	Item	Factors 1	2	3	4	5	Communality
Rehearsal / Organization	1				.746		.625
	15				.525	.427	.559
	18				.713		.584
	32				.762		.603
Elaboration	22					.753	.700
	38					.652	.679
Critical Thinking	7		.790				.645
	16		.648				.582
	20		.615				.431
	24		.597				.456
	35		.744				.635
	40		.702				.567
Metacognitive	4	.597					.425
Self-Regulation /	12	.561					.566
Effort Regulation /	17	.737					.609
Time and Study	25	.456					.450
Environment	34	.507					.340
Management	39	.620					.566
	43	.798					.687
	45	.609					.556
Help Seeking-Peer	3			.690			.583
Learning	14			.784			.640
	37			.672			.576
	44			.792			.728

Note. Factor loadings of less than 0.4 have been omitted. The plot indicated that the correct number of factors was five. Five factors explain 57.5% of the variation in the items.

Table 10

Results of Item Analysis on Combined Scale Items

Scale	Alpha	Item	Alpha if Item Deleted
Rehearsal / Organization	.731		
		1	.637
		15	.690
		18	.679
		32	.674
Elaboration	.679		
		22	-----
		38	-----
Critical Thinking	.816		
		7	.776
		16	.786
		20	.800
		24	.797
		35	.773
		40	.785
MSR / Effort Regulation /	.820		
TSE		4	.805
		12	.792
		17	.791
		25	.806
MSR / Effort Regulation /	.820	34	.814
TSE		39	.801
		43	.789
		45	.794
Help Seeking-Peer	.767		
Learning		3	.743
		14	.712
		37	.728
		44	.661

Note. MSR: Metacognitive self-regulation; TSE: Time-study environment management.

Table 11

Estimates of Path Coefficients and Factor Scores for the Combined-Scale Confirmatory Factor Model

Scale	Item	Estimate	Standard Error	Critical Ratio	p-value	Factor Weight
Rehearsal /Organization	1	1.000				.684
	15	0.737	0.114	6.475	.000	.558
	18	0.741	0.116	6.384	.000	.561
	32	0.897	0.127	7.055	.000	.662
Elaboration	22	1.000				.660
	38	1.137	0.159	7.132	.000	.759
Critical Thinking	7	1.000			.000	.673
	16	0.942	0.118	7.993	.000	.671
	20	0.806	0.115	7.003	.000	.575
	24	0.895	0.119	7.489	.000	.621
	35	1.054	0.124	8.508	.000	.726
	40	0.917	0.118	7.758	.000	.647
MSR / Effort Regulation / TSE	4	1.000				.546
	12	0.970	0.155	6.236	.000	.564
	17	1.146	0.168	6.807	.000	.686
	25	0.867	0.162	5.361	.000	.460[a]
	34	1.074	0.198	5.435	.000	.487[a]
	39	1.257	0.200	6.293	.000	.602
	43	1.144	0.165	6.912	.000	.705
	45	1.103	0.170	6.483	.000	.632
Help Seeking-Peer Learning	3	1.000				.545
	14	1.186	0.185	6.425	.000	.639
	37	1.166	0.180	6.489	.000	.650
	44	1.523	0.214	7.111	.000	.852

Note. MSR: Metacognitive self-regulation; TSE: Time-study environment management.

[a] Factor loadings < .5

Table 12

Comparison of Root Average Variance Explained and Inter-Scale Correlations, Combined-Scale Model

Scale	REH/ORG	ELAB	CT	MSR/ER/TSE	PLHS
REH/ORG	0.654	0.466	0.316	0.122	0.000
ELAB		0.711	0.567	0.588	0.330
CT			0.654	0.474	0.000
MSR/ER/TSE				0.625	0.437
PLHS					0.681

Note. REH: Rehearsal; ORG: Organization; ELAB: Elaboration; CT: Critical thinking; MSR: Metacognitive self-regulation; ER: Effort regulation; TSE: Time-study environment management;
PLHS: Help seeking-Peer learning.

Table 13

New Learning Strategies and Item Numbers

Scale	Item
Organization	1, 7, 10, 15
Elaboration	12, 19
Critical Thinking	4, 8, 11, 13, 17, 21
Self-Regulation	3, 5, 9, 14, 16, 20, 22, 24
Help Seeking-Peer Learning	2, 6, 18, 23

University as Neutral Convener for Regional Health Information Exchange

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Category: Research in Progress
Keywords: Case study in Regional Engagement, health information technology (HIT), health information exchange (HIE), regional health information organizations (RHIO), organizational change, innovation, transformation

University as Neutral Convener for Regional Health Information Exchange

With so much attention on the need for change—in government, industry, healthcare, and more—how does one get beyond the talk to gain support to successfully DO something? Change—especially transformational change—is extremely difficult to implement. Most change efforts fall significantly short of achieving the intended outcomes. Moreover, most changes are driven by leaps in technology that sweep away long-standing paradigms about how things are done. Thus, successfully implementing change requires not only understanding processes but also technology. Most transformational change falls at the intersection of technology and process innovation. Thus today, we have much talk about the opportunities of e-commerce, e-government, e-health, and e-learning (online learning).

From a university perspective, one might raise a question about what is the proper role of university for involvement in transformational change. The current focus on service learning and regional engagement at universities might lead one to suggest that universities should perhaps be playing a larger leadership role in transformational change. This paper presents the case of a university that has done just that – in stepping up to the plate and taking a leadership role in healthcare transformation.

Healthcare transformation has become a national issue. Many healthcare leaders see health information technology (HIT) and health information exchange (HIE) as the only strategy that has the potential to bring major change. Although technology is central, most leaders believe it's not the main issue. The technology is there. The tougher issues relate to changing behaviors and medical practice. Meeting these challenges will require rethinking the dynamics of healthcare delivery and transforming processes. These goals never come easy.

The first major step is convening the stakeholders.—many with competing interests-- to work toward a solution to improve healthcare quality and efficiency to better serve consumer healthcare needs. The key to transformational change is to focus on improving the systems and not to blame individuals. It's essential to get stakeholders focused on the larger common goals from which everyone can benefit and away from narrow self-interest. The university is in a good position—not having a direct stake in the healthcare game—to serve as a neutral convener in bringing all the stakeholders to the table.

This paper discusses the experience of one regional university in central U.S. that is serving as the neutral convener for bringing diverse stakeholders together in the interest of establishing a regional health information organization.

The venture grew out of the relationship between the College of Business, Department of Information Systems, and the CIO at the regional medical center. A common interest in the evolving fields of health information technology and health information exchange led to many discussions about the challenges and opportunities faced by the healthcare industry in transforming practice. These discussions ultimately led to the organization of a steering committee to explore the feasibility of establishing a rural e-health network. That network has now grown to 11 organizations and 20 members of the steering committee. Further expansion is anticipated. Considerable ground work has now been laid, and the e-health network has just incorporated as a 501c3 not-for-profit corporation and is in the process of developing an operational plan and financial model for the first phase of the e-health network.

Participants anticipate that, in the long-term, establishing a regional e-health network will significantly improve quality, safety efficiency and outcomes and reduce adverse medical events through better decision making and information sharing supported by the network. Objectives for establishing an e-health network in Northeastern Kentucky are to support widespread adoption of electronic medical records (EMRs) by providers throughout the region, to support regional health information exchange (HIE), and ultimately to interconnect with a statewide Kentucky e-Health Network (KEHN) and the National Health Information Network (NHIN). These capabilities can significantly improve the quality and efficiency of health care delivery and empower consumers to more effectively meet their healthcare needs. This initiative also will contribute to economic opportunities within the region through increased investment and job creation in health information technology and a healthier and more productive workforce.

The potential benefits to the university are many:

- Opportunities for students
    - At both undergraduate and graduate levels
    - Service learning
    - Internships
    - Student research
- Faculty research, consulting, & professional development
- Regional Engagement mission
    - Showcase projects
    - MSU Enterprise Center
    - Innovation Center
    - Economic development
- Curriculum implications

Curricular Panel

When changes are inevitable, whom do we listen to for help?

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According to the longitudinal study of Computer Research Association (CRA), the enrollment of post-secondary computer science and computer engineering related programs in North America has declined approximately 50% between 2000 and 2007. Though certain programs have seen more or less change of enrollment numbers and placement rates, the drop of graduates in computing disciplines is apparent.

Since the dot come boom came to and end in the beginning of the new millennium, the majority of CS, CE, CIS, MIS, IS, and IT programs had gone through many curricular redesigns based on input from industry advisory board, focus groups of students and graduates, and model curricula developed by professional associations. On the one hand, enrollment management continues to be a great challenge especially if the college or school is going through accreditation processes governed by AACSB, ABET, or other organizations. On the other hand, the expectation gap between employers, students, and faculty members sustains if not widens. With the shifting nature of technology literacy among the younger generation who embraces social networking and get influenced easier and faster by the peers (e.g., instant messaging, MySpace, Facebook, LinkedIn, etc.), pedagogical approaches, delivery methods, and content coverage become increasingly debatable.

How do we know we continue to do a credible job to strive, sustain, and improve the livelihood of our programs with all the aforementioned issues surrounding us? Is it time for us to examine what constitutes to a professional in the field we are in? As the world becomes flat and the time allowed to get the job done is often compressed, this curricular panel seeks to start a forum among faculty and mentors in computing disciplines to discuss the existing issues and consequences of our curricular changes.

The Multi-Facet Selection of Knowledge Acquisition Strategy: Task, Individual, and Social Perspectives

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Keywords: Knowledge acquisition strategy, knowledge transfer, task structure, individual and social cognitive beliefs.

Abstract

Knowledge plays a critical role in enhancing individual and organizational effectiveness as the business environment evolves (Drucker 1993; Harris 2001). Nonetheless, in spite of the growth and development of knowledge management, many organizations still have experienced the lack or failure of knowledge transfer to the detriment of their operations (Babcock 2004; KPMG 2004). Organizations can be more successful when they facilitate the conditions in which knowledge providers effectively share their knowledge and knowledge recipients effectively acquire and apply that knowledge (Argote et al 1990; Quigley et al. 2007). While there has been extensive research on knowledge transfer from various perspectives, most studies to date have neglected the knowledge recipient aspect, and has instead targeted the knowledge provider aspect such as knowledge contribution and sharing. Therefore, there is a critical need to examine how knowledge recipients choose their strategy to acquire the specialized knowledge needed for their work in any given context. Understanding the knowledge acquisition selection process could inform the construction of knowledge management systems and infrastructure for more effective knowledge transfer in organizations.

In order to address the knowledge gap regarding knowledge acquisition, the present study has the following research questions: 1) What are the salient factors which influence effective knowledge transfer in terms of the knowledge recipient's perspective (i.e., knowledge acquisition)? and, 2) How does the knowledge acquisition strategy change or evolve depending on the salient factors (i.e., task structure and the knowledge recipient's individual and social beliefs)? In answering these research questions, we develop a conceptual framework to explain the multi-facet selection of knowledge acquisition strategy, as influenced by task, individual, and social perspectives.

The framework developed in this study has three aspects. First, we propose that task structure (simple and complex task) affects knowledge acquisition strategy (learning by self-investment, learning by doing, and learning from others). Second, we propose that individual and social cognitive beliefs (perceived self-efficacy, potential absorptive capacity and social tie strength) influence the knowledge recipients' acquisition strategy in the given task structure. Third, we examine how knowledge recipients' acquisition strategy evolves as the level of task structure changes from simple to complex or from complex to simple.

Contributions of this paper include 1) a suggested knowledge transfer framework for helping organizations construct effective knowledge structures, repositories, and management systems, and 2) an explication of the knowledge transfer phenomenon from the knowledge recipient's perspective.

References: References are available from authors

An Ethnographic Study: How Chief Information Officers Manage Uncertainty and Unexpected Change Using Flexibility

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Abstract

Chief Information Officers (CIOs) lead enterprise information technology (IT) organizations that provide end user information technology services, applications, and support in an uncertain and changing dynamic competitive environment. CIOs deal with external and internal environmental changes, changing internal end user needs, and rapidly changing technology. Business literature abounds with articles on organizational change and how to design and lead the 'new flexible firm,' but there is little theory on how CIOs manage uncertainty and unexpected change. Studies suggest that enterprise IT leaders should create enterprise IT organizations that are more flexible, but the same studies do not define what is meant by flexibility, nor how to integrate flexibility into the enterprise IT organization.

This paper describes how ethnographic research methods were used on a completed study to determine how CIOs currently manage uncertainty and unexpected change, if organizational flexibility can be specified and systematically integrated into the enterprise IT organization, and if a proposed enterprise IT organizational flexibility framework would be useful to CIOs. The study researchers collected data from in-depth interviews with twenty diverse CIOs in a three-state area in northeast United States, from large to small enterprises, different industries, and a variety of formal IT education and functional / IT enterprise experiences. The researchers also used exploratory and iterative data analysis techniques to identify the study findings and CIO recommendations. The ethnographic descriptive research method was used because the research problem was complex and embedded into multiple systems, the study explored associated factors with the problem domain, and unexpected outcomes were expected.

What Roles Do Social Networks Play in Sustainable Businesses?

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Keywords: Social networks, sustainable business, gender communication, knowledge sharing, collaborative technology

In order for businesses to be sustainable, they must be responsive to the economic, political, and sociological factors impacting their industry. These "open systems theory" businesses respect that their younger employees may use their computers to complete their work **by participating** in social networks.

As young employees enter the workplace, they bring with them a variety of computer skills to help get the work done. Given the proliferation of social networks such as Facebook, MySpace, Friendster, and dozens of others, employers are guaranteed that their younger employees bring with them a unique set of computer skills. These employees use the computer for more than email, gaming, shopping, and surfing; a mainstay of their social life includes active participation in these virtual communities. When did these social network pages cross from the social world to the business world? Since Facebook premiered in 2004, school districts have requested that their human resource managers check prospective employees' pages before hiring them. Also, law enforcement agencies have researched the pages to find evidence of law violations. Since this line has been crossed, where do social networks fit in the organizations? An analogy can be drawn that when personal computers were placed on employees' desks, employers were alarmed that their employees were found to be playing Solitaire and other packaged games. Many employers ordered that the software be removed but wise employers quickly had the software reinstalled. They changed their minds as they realized that as long as the employees got their work done, some leisure time (previously spent at the copy machine or the water cooler) may enhance their satisfaction and possibly their productivity.

Therefore, the research question of this study is to determine if future business professionals believe that companies will embrace social networks. Almost 100 College of Business & Economics MBA students were surveyed to determine if they participate in social networking. They were then asked if they believed social networks would be recognized by their employers and if so, how the networks would be utilized in a business environment. The data were analyzed by gender.

So what do MBA students believe they will find or are finding in the workplace? Will their social networking skills be highly regarded? Will the culture of their organization include social networks and embrace collaborative learning? The results of this study will be revealed in an engaging session!

RIP: Optimizing Information Systems Usage - The Role of Self-Directed, Software-Based User Training

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Keywords: End user training, software training, self-directed training

Today's organizations rely on complex information systems (IS), such as enterprise resource planning and human resource management systems, to support business processes and gain competitive advantage. Despite prodigious investment in these systems, their purported benefits often lag behind expectations or fail to materialize at all. A critical factor determining IS use outcomes is effectiveness of end user training (Davis and Bostrom 1993). While training can be provided in many ways, a growing trend is toward self-directed, software-based training that provides IS users with context-specific guidance on demand, such as the User Productivity Kit (UPK) offered by PeopleSoft. Self-directed training programs offer several advantages (Bell and Kozlowski 2002; Brown 2001; Piccoli et al. 2001); but because of their nascence, little is understood about how and when users engage in self-directed training and its effectiveness in promoting the type of value-added IS use that organizations seek. This research is targeted toward understanding factors that contribute to successful self-directed IS training programs. The goal is to examine how and when individuals engage in self-directed IS training, and the effectiveness of such training in realizing optimal IS use outcomes.

To investigate the effectiveness of self-directed, software-based training, we are conducting a two-phase field study at a large, multinational firm that has recently adopted the human resources and financial modules of the PeopleSoft ERP software system. To meet its training needs, the firm has adopted PeopleSoft's User Productivity Kit (UPK), a software package that provides business-process based, on-demand software training for PeopleSoft system users. Because of the global distribution of its software users and the overhead associated with traditional, classroom-based software training, the firm relies exclusively on the UPK to provide self-directed training to its PeopleSoft users around the world. Our proposed study entails a two-phase mixed methods research approach. First, interviews will be conducted with 10 to 20 representative PeopleSoft users regarding their use of the UPK software and its effectiveness in promoting system use outcomes. Data obtained from these interviews will be used to inform the second phase of the research: development and administration of an employee survey that assesses employees' perceptions of the UPK software, how and when it is being used, and outcomes resulting from its use. By the time of our presentation at ICIS, we expect to have completed the interviews and designed the survey instrument.

As organizations and information systems continue to grow in scope and complexity, the demand for self-directed, software-based training is likely to increase. To successfully manage this trend, IS researchers and practitioners need better theoretical understanding of how and when self-directed, software-based training programs work. For research, our goal is to advance theory in the area of self-directed, software-based training by combining extant theories of self-directed learning with empirical observation of behaviors and outcomes in a contemporary organization. Ultimately, the application of this theory will help IS practitioners to improve their self-directed training programs in order to optimize use of their information systems.

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Task-driven Learning: The Antecedents and Outcomes of Internal and External Knowledge Sourcing

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Keywords: individual knowledge sourcing, learning, task characteristics, knowledge integration

Helping individuals accomplish tasks effectively is an essential goal of knowledge management. Organizations usually undertake this by providing individuals with various knowledge resources, such as electronic knowledge repositories and knowledge directories, in the hope that sufficient knowledge supply would lead to superior performance. Nevertheless, research has suggested that knowledge resources can only be effective when individuals engage in seeking knowledge from them.

In line with the demand perspective of knowledge management, we examine how individuals leverage both internal and external knowledge in light of the strategic importance of knowledge integration in this study. We take a job-related learning perspective and theorize that individuals mobilize different knowledge resources to cope with different tasks and achieve learning outcomes that improve performance.

Based on the survey data collected at a leading global IT manufacturer, our analysis reveals that interdependent and non-routine tasks drive individuals to acquire knowledge from internal sources (internal knowledge sourcing) while complex tasks entail knowledge seeking from external sources (external knowledge sourcing). Furthermore, internal knowledge sourcing improves individuals' capabilities in replication and adaptation, and external knowledge sourcing results in enhanced competence in adaptation and innovation.

This research contributes to the literature in two ways. First, we complement existing research on individual knowledge sourcing by including external knowledge as an important component, and thus offer a more comprehensive view. Second, our study provides insights into how knowledge integration unfolds at the individual level, which has been mostly examined at the group or firm level. The results also provide managers with detailed guidelines to facilitate knowledge use according to task characteristics and expected outcomes.

Discussion Panel

Knowledge Management: The Dark Side

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Jimmy Huang, The University of Warwick
Gus Hosein, London School of Economics
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Knowledge Management has become an important arena for study and practice in the past two decades. Although the topic has many strands it has developed a kind of orthodoxy which stresses the importance of knowledge as a critical resource in the modern globalized economy. Information technology is seen as a crucial component in delivering and permitting the sharing of knowledge.

The panel is based on the observation that there is much more to knowledge management than suggested by the orthodox view. Knowledge has been and is managed (and manipulated) to meet many objectives. In politics it is well known that knowledge is managed by spin and propaganda. Censorship is an example of explicit and unashamed knowledge management. Education authorities lay down what should be taught and what should be omitted.

But in the business world, too, the practice of knowledge management in the sense of manipulation, is widespread. One of the tenets of scientific management as defined by Frederick Taylor is the ‘need to know’ principal where management defines the knowledge to be given to the worker. The apparatus of PR and advertising is founded on the ability to control and define how and what knowledge is to be provided for business partners and customers. Customer Relations Management, in that sense, is another manifestation of the black art of knowledge management. Fraud, as epitomized by ENRON, often uses knowledge management to achieve its nefarious ends. Enron’s technology of knowledge management was the shredder.

Another area in which knowledge management plays a crucial role is that of intellectual property rights. The example of the human genome project is an illustration of the debate between those who want to control knowledge by such means as patents, as against those who believe scientific progress is improved by open access to new knowledge.

The panel will challenge what has become the orthodox view in the form of a debate between the advocates of the orthodox view and the challengers.

Information Sharing or Knowledge Sharing? The Potential Impact of Enterprise 2.0

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Keywords: Knowledge creation, Knowledge sharing, Enterprise 2.0, Knowledge management 2.0, Social software, Web 2.0

Since Nonaka and Takeuchi published their book entitled "The Knowledge-Creating Company" in 1995, many businesses have made large investments in technologies to capture, store, retrieve, and distribute explicit knowledge (Grover & Davenport, 2001). This type of traditional knowledge management (KM) systems tends to be information-centric. Knowledge is codified with limited context, assuming that once knowledge is captured and codified, others can make sense of it and can apply it in other situations. Unfortunately, this information-centric, technology-driven KM has not capitalized on the value of knowledge sharing (Malhotra, 2005).

Based on the constructivist's view of learning, it is proposed in this research that the traditional knowledge management, at best, enables information sharing, not knowledge sharing. Knowledge sharing occurs primarily in conversation where rich context is provided by the person who is sharing in an informal, conversational fashion. The rich context allows others to construct their own understanding and then apply the new knowledge to their own situation. Furthermore, corporate tacit knowledge can merge only when employees exchange their tacit knowledge. Therefore, to achieve the ultimate goal of becoming a knowledge creating company, appropriate parameters/elements must exist for employees to connect with each other, to form relationships, to develop trust, to make the sharing of tacit knowledge a commitment instead of a compliance, and ultimately to create new corporate knowledge. Although successful traditional KM recognizes the importance of trust and organizational culture, KM 1) is information centric, 2) has a top-down approach, 3) is likely tied to incentive systems, 4) has employee compelled to comply by a push from upper management, 5) has limited context sharing, and 6) based on static information. To enable effective knowledge sharing, however, the KM should 1) be people centric, 2) have a bottom-up approach with self-organized conversations by employees, 3) capitalizes on employees' intrinsic motivation to share, 4) gain employee's commitment, 5) allow the sharing of knowledge in rich context, and 6) encourage dynamic and fluid knowledge sharing. This last characteristic creates new knowledge. Enterprise 2.0 tools have great potential for effective knowledge sharing. Tools such as wikis allow members to edit knowledge that has been shared; in other words, the edited knowledge became collective knowledge, and corporate tacit knowledge may emerge. This platform provides the potential for knowledge creation.

This research will use a case-study approach to investigate, in depth, the impact of Enterprise 2.0 tools in knowledge sharing and creation. The results of this research will provide information on the level of knowledge sharing in an information-centric versus a people-centric KM environment, as well as reveal the potential of Enterprise 2.0 tools to facilitate knowledge sharing and knowledge creation.

The Center for Enterprise Systems Management

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Numerous sources have identified a looming crisis in information technology staffing as baby boomers begin to retire. The decline in enrollments in technology majors this century has created a “perfect storm,” in which the supply of new graduates will be dramatically less than the demand. Several organizations have attempted to address this dilemma with a variety of programs. This presentation describes the process of creating the Center for Enterprise Systems Management, which will conduct programs in workforce development, curriculum design, and applied business research. Its objectives are to stimulate student interest in technology majors, reform curricula so that more emphasis is placed on the information technology profession, train or retrain information technology professionals in the management of enterprise systems, and conduct research on large scale business information systems. The process of working with business partners and technology manufacturers to create the Center will be discussed, along with the different programs the Center is conducting.