Putting the University Online: A Learning Organization Model for Electronic Transformation

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Abstract: This paper investigates the process of electronic transformation from the perspective of a learning organization. Specifically, we shall discuss the context of a virtual learning university, in the process of educational renewal led by the new roles of both teachers and students, to be collaborators and active participants in the renewed educational setting. We also describe our philosophy in designing the virtual university (VU), covering such areas as the VU's emerging new roles as educational services providers, some techno-pedagogic scenarios, the renewed mindset for university education, and the underlying challenges in learning management. The paper further presents a formulation of the learning organization model for electronic transformation in terms of such important architectures as: the transformation architecture, and the knowledge architecture. Essentially, this paper serves as an expression of the author's ongoing action research to document the efforts in blending the bricks-and-mortar campus university with the technical enhancement of its clicks-and-mortar counterpart, the virtual university.

Introduction

With the rapid advances in networking technologies and the commercialization of the Internet today (Vat 2001; Hamalainen, Whinston, & Vishik, 1996), universities are well poised to deliver customized educational services worldwide for life-long learners. In order to take advantage of such new technologies and opportunities, it is often required that an electronic infrastructure within the physical university be conceived and established. We hereby call this digital counterpart of the campus-based university, the virtual university (VU) (Chellappa, Barua, & Whinston 1997), which is an electronic entity constructed to enable a re-engineered vision of the university's educational process. In practice, the design of the VU, according to Mowshowitz (1994, 1997), could be expressed as a set of principles for managing goal-oriented activity based on a categorical split between task requirements and their satisfaction (Harrington, 1991; Mowshowitz, 1997). In this formulation, the electronic transformation from the bricks-and-mortar university to its clicks-and-mortar counterpart can be conceived as an approach to management that explicitly recognizes the conceptual distinction between functional requirements and the means for their realization in practice, as well as providing a framework for accommodating dynamic changes in both requirements and available services. In a dynamically changing organizational and technological environment, it is essential that we can logically separate the requirements from the means for their satisfaction. That way, management could create an environment in which the means for reaching a goal are continually and routinely evaluated in relation to explicit criteria. Such a management structure ensures that requirements are satisfied as appropriately as possible. It is believed that

this idea could be adopted in a variety of settings to enhance the efficiency and effectiveness of the underlying information systems (IS) support and to motivate the participants involved to reflect on organizational goals. Practically, we have often managed to experiment with the incremental realization of the VU in the form of numerous Web-based information systems (Isakowitz, Bieber, & Vitali, 1998) for different functional requirements including those related to the activities of collaborative learning over the Internet. Specifically, the VU can be characterized by focusing on identifying the requirements needed to realize the IS applications, while at the same time, investigating and specifying the current technological means for satisfying the same requirements. It is often the VU's ability to switch systematically available IS services to requests based on explicit formulation of goals, that allows for a high degree of flexibility and responsiveness in improving resource utilization, achieving better quality products, strengthening managerial control, and providing cost-effective services. Indeed, the VU, being an innovative form of organization, requires a learning framework for exploring requirements, satisfiers, assignment methods and criteria, to assess and improve the organizational performance. In this paper, we attribute such a framework to the learning organization model for electronic transformation, comprising such components as the transformation architecture, and the knowledge architecture.

The Connotations of a Learning Organization

Nowadays, enterprises including educational institutes are challenged to do things faster, better and more cost-effectively in order to remain competitive in an increasingly global economy. There is a strong need to share knowledge in a way that makes it easier for individuals, teams, and enterprises to work together to effectively contribute to an organization's success. This idea of knowledge sharing has been well discussed in the notion of a learning organization (LO) (Garvin, 1993; King, 1996; Levine, 2001; Senge, 1990). Basically, a learning organization could be considered as an organization, which focuses on developing and using its information and knowledge capabilities in order to create higher-value information and knowledge, to modify behaviors to reflect new knowledge and insights, and to improve bottom-line results. Based on this characterization of LO, there are many possible information system (IS) instances that could be incorporated into a learning organization. The acronym "LOIS" (Learning Organization Information System) (Williamson & Lliopoulos, 2001) as applied to an organization is often used as a collective term representing the conglomeration of various information systems, each of which, being a functionally defined subsystem of the enterprise LOIS, is distinguished through the services it renders. For example, if a LOIS could support structured and unstructured dialogue and negotiation among the organizational members, then the LOIS subsystems might need to support reflection and creative synthesis of information and knowledge and thus integrate working and learning. They should also help document information and knowledge as it builds up, say, by electronic journals. Or, they have to make recorded information and knowledge retrievable, and individuals with information and knowledge accessible. Collectively, a LOIS can be considered as a scheme to improve the organization's chances for success and survival by continuously adapting to the external environment. Consequently, we stand a better chance of increasing social participation and shared understanding within the enterprise, and thus foster better learning. Although we believe that this positioning of LOIS represents a

significant vision of a future generation of information systems, there are serious questions to be addressed in connection with knowledge capture and transformation, as well as intellectual asset management within the enterprise. All these have consequences for organization transformation in such areas as strategies, structures, processes, systems and people. More importantly, the philosophy underlying the LOIS design should recognize that our knowledge is the amassed thought and experience of innumerable minds and the LOIS helps capture and reuse those experiences and insights in the enterprise. The notion that emerges resembles strongly the classical history paradigm of learning from past events, necessitating the collection of data and repeated re-interpretation of its meaning, significance and impact for next generations. That is also the idea of organizational learning (Kim, 1995), supported by an organizational memory (Conklin, 1996) – the means by which knowledge from the past is continuously brought to bear on present activities. It should possibly result in higher or lower levels of organizational effectiveness in terms of the decision-making, organizing, leading, designing, controlling, communicating, planning and motivating functions of the management process. The cultivation of a communal knowledge space based on the organizational memory, is fundamental to any enterprises that intend to establish, grow and nurture a digital learning organization (Hackbarth & Grover, 1999), where individuals grow intellectually and expand their knowledge by unlearning inaccurate information and relearning new information. Oftentimes, there is the essential difference between doing it the way we always did it (single-loop learning) and arriving at an innovative solution that establishes new patterns and relationships (double-loop learning) (Argyris, 1992; Kim, 1995). Consequently, the idea of the learning organization, and thus the subsequent LOIS support, has tremendous implications for the development of the virtual learning university.

The Context of Organizational e-Transformation

The electronic transformation (e-Transformation) from a bricks-and-mortar organization to its clicks-and-mortar counterpart, as often required in the Internet environment today (Buffam, 2000; Hoque, 2000), represents an exemplary opportunity when the idea of learning organizations can be realized. However, it requires an objective methodology. And this methodology must be instrumental to creating a productive and efficient organization model, which enables us to follow an iterative development sequence. This means being able to plan and prepare for a launch based on a new idea or lessons learned within a reasonable cycle time. In particular, this model should enable our organization to launch and learn, and then incorporate those lessons and launch again. Actually, this can be accomplished only if we have an agile operation based on a pragmatic philosophy. First, we need to define an electronic vision to bring all of an organization's real-world and virtual-world strengths together in a re-configurable constellation. Second is to define the organization's business architecture (learning architecture, in the case of the VU), which will let us move from vision to reality. Third, we have to entail a corresponding technology architecture that allows an iterative realization of the business architecture. Fourth is to create a repository to keep track of the emerging business and technology artifacts, which should allow us to recycle every piece of learning, time after time, and in as little time as possible. Meanwhile, we accept the proposition of John Kay (1995) that the real world of organization is too complex to be fully modeled. Our efforts in modeling the VU should serve as an organizing framework by which concepts and

goals may be formulated, extended, and synthesized. Essentially, we must recognize that organizations are products of their social and historical growth. We need to identify the context that defines and constrains what is, and what is not, possible to design in an organization. Our modeling approach should also structure its assumptions around such contexts as organizational, business and information systems concerns. Such axles motivate the necessary constructs with which an organization must deal to form its baseline for change. Subsequently, our organization modeling could be made more flexible by introducing some innovative constructs through which each domain of the organization may be analyzed and designed. In practice, we need to involve the concept of alignment among domains of the organization, as well as the idea of composites of aligned domains, thus developing different expressions of the organization model. Indeed, the whole process of organizational e-transformation could be considered as an ongoing project of technology change management, which is not an isolated activity but a process that touches many of the socio-technical activities at work in an organization. Interestingly, learning and technology change management reinforce one another. If we are smart about how we manage change, we will help make our university a learning organization, and that should pay off in many ways.

A New Page of Work for the VU

According to Johnson and Johnson (1989), if the VU is to succeed in the emerging marketplace of the educational industry, we need to be mindful of nurturing some basic conditions throughout the process of providing educational services to our student-clients. Examples include the following: Typically, the VU must have electronic spaces for its organizational members and clients, which provide richer functionality and features than their physical analogs. And it should focus on developing skills and expertise by mass customizing content on demand rather than merely providing terminal degree programs with pre-determined curricula. Also, the VU normally comprises different bodies regarding administration, academic, support, and students affairs, connected electronically with appropriate mechanisms. The VU's electronic infrastructure is generally equipped with a repository for reusable educational components for course development, and a user-centered digital learning environment. Operationally, a VU takes educational material on demand from many sources, including content providers and educators, customizing it to students' needs and interests, thereby providing the benefit of learning customized knowledge and skills minus the opportunity cost of time and other resources incurred by students. Technically, a VU uses Internet surveys to determine demand for various types of content, and then uses search agents to look for content providers. The latter submit their material to the VU's reviewers for evaluation as to accuracy, timeliness, relevance, and match with demand areas. These contents are classified as components and sub-components to be assembled later into a full course. When the material is accepted and processed, the administration assigns instructors to various components. When a potential student makes a request to learn about a certain topic over the Internet, relevant materials can be gathered and one or more instructors assigned to interact with the student. Given the open nature, global scope, and availability, the Internet and the Web are respectively the ideal platform and client application to support the VU's operations. All these imply some renewed mindset for the roles of being the teacher and the student, as well as a renewed perspective of the pedagogical organization.

The VU's Role as a Dual Mode Institution

The dual mode interpretation refers to the institution's operation as both a campus-based university as well as the worldwide provider of distant education typically enabled by today's Internet technologies. The former is the university with a physical campus to serve a local body of on-campus students, whereas the latter is the digital counterpart of the same university, with a virtual campus to serve a global body of both the on- and off-campus students. The VU's role as a dual mode institution implies the provision of an ICT (information and communications technologies) infrastructure that is able to support both the on-campus and the off-campus student bodies. In particular, the preparation of educational materials (course contents) for the VU should take into account both the on-campus and the off-campus students' needs. The critical problem is to set up the proper organization within the institution. The on-campus educational programs are usually structured in years or semesters for organizational reasons. The VU requires that programs should be organized as webs of logically coherent courses for pedagogic reasons, and such courses could also be organized as series of logically complete modules, which in turns are serial sets of sessions. In this fashion, learning materials are component-based and are ready for reuse (Tsichritzis, 1997). Moreover, each program and all its components need be dynamic: programs can change their courses; courses can change their modules, and modules their sessions. More importantly, modules can be used within different courses and courses within different programs. Understandably, it is important to have good coordination, evaluation and evolution of all these instructional units. And these activities require some meticulous preparation in personnel and the management structure. Certainly, universities require insight to decide the areas for which they will become the providers of global educational contents and local learning curricula, according to their judgment that there is a wide demand for that service.

The VU's Renewed Mindset for Education

In realizing the VU model of providing educational services, there must be a major shift from the linear view to a dynamic view of managing education (Bates, 1995; Berreman, 1997). The first challenge for the VU educators is to figure out how to harness the power of the new media to take advantage of its capacity to support flexibility, concurrency, and just-in-time design, instead of merely using the new media to deliver the same old stuff (Vat, 2000; 2002a). In the linear model of education, learning design proceeded in a linear fashion from defining objectives to lesson planning to course delivery. Educators first engaged in a comprehensive learning needs analysis process, often based on assessments done by others about competencies and learning objectives. Comprehensive course syllabi were developed. Finally, the course was delivered as planned. Associated with this linear approach were a set of teaching strategies which matched its linear qualities, characterized by being predominantly one-way, centralized, and broadcast-oriented. When students appeared bored and unengaged in this type of program, the solution was to find ways to use new media to make the one-way broadcast more entertaining. Much early online learning was nothing more than a way to generate a broadcast of an expert and his multi-media slides with good production values. The VU model was praised because of its ability to scale up to reach larger numbers of students at standardized levels of quality. However, an expert lecturing to a group of passive students is

engaging in didactic one-way teaching no matter how that lecture is delivered, say from a stage in an auditorium, or via broadcast television to students sitting in their living rooms. Today, we need a renewed mindset for education. Teaching and learning is currently seen as an ongoing process rather than a program with a fixed starting and ending point and the importance of widespread participation by learners in the design of their own learning has also been widely recognized (Kimball, 1995). ICT are particularly well suited to a more dynamic approach to managing education. Good teachers have always been open to changing their lesson plans based on student input. New media makes it easier. And online environments can provide space for continuing conversation among students and teachers about what is working and what is not working in the course. The idea of participatory course design is not to be neglected. The VU environment provides an opportunity to support collaborative learning in ways we have not been able to do before.

The VU's Challenges for Learning Management

As Peter Senge (1990) says, "The organizations that will truly excel in the future will be the organizations that discover how to tap people's commitment and capacity to learn at all levels in an organization." To harvest the knowledge and experience of people and make it available to the organization (VU) as a whole, ICT technologies need to be managed differently to support dialogue rather than mere databases (Vat, 2002b). In particular, communication technologies are needed to support a learning environment, which could stimulate and nurture the complex network of interpersonal relationships and interactions. Also, people must be allowed to make choices about whom they need to communicate and learn with without regard to traditional organizational boundaries, distance and time. In other words, they need to manage their own learning to form new groups and teams as requirements develop and change. The new framework for managing the VU should be about managing the learning process as well as managing course contents. The kinds of questions we need be asking ourselves are not only about how to plug one type of technology into another, but also about how to use technology to leverage resources and group dynamics in new ways to make fundamental changes in every part of the learning process. It is not surprising to recognize that the easy part of this process might be the technology, and the tough part is to invent and innovate the organizational context to create new models of experiences for knowledge sharing with the technology.

The VU's Techno-Pedagogic Models

As online technologies and information resources rise in salience with the advent of the Internet, we are witnessing the emergence of a multi-faceted techno-pedagogic reality in the development of the VU scenario. It ranges from the simple decentralization of classroom activities to interactive multimedia models that make learning available, whatever the time or the location. We could briefly describe these models in terms of several paradigms: The first is the *enriched classroom* (Paquette, 1998) where technologies are used within a traditional setting in order to do a presentation, a demonstration, or an experiment. It could be a networked classroom allowing access to campus resources and external databases. The second is the *virtual classroom* (Wilson & Mosher, 1994; Hiltz 1990), which mainly uses

video-conferencing to support distant learners and teachers, thereby re-creating a tele-presence type of classroom. Many university campuses today have their own multimedia production studios so they may decentralize training at satellite locations. The third is the *education media* approach (Pea & Gomez, 1992; Bourdeau, et al., 1994; Henri & Rigault, 1994) with emphasis on the learner's workstation. This machine should allow access to prefabricated multimedia course contents either on CD-ROMs or from Web servers. Both media offer instruction and didactic resources in such a way that the learner can individualize his or her own learning process. The Internet-enabled workstation could also serve as a navigation and research instrument to find all kinds of useful educational information. The *electronic learning (e-learning)* approach (Schank, 2002; Rosenberg, 2001) concerns the creation of learning spaces where synchronous and asynchronous communication tools, are made available to encourage individual and group-based learning within the context of team work and collaboration. The first two models have been functioning for long. They rest on the traditional paradigm inherent in live information transmission: The teacher uses computerized and audiovisual equipment to animate a real-time multimedia group presentation, broadcast locally or to several distant locations where learners are gathered. This model requires costly equipment as well as the simultaneous physical presence of both the teacher and the learners. Also, it often reduces the learners' interaction and initiative to a level that is in no way better than that of a traditional course presentation in an auditorium. This approach appears incapable of meeting the growing educational needs in today's socio-economic context where lifelong learning, sought by busy and mobile people, involves cognitive abilities of a much higher level than what was required in the past. The new paradigm, where the learner at the center of his or her learning process calls on many expertise sources, is better represented by the last two models described above.

The VU's New Roles for Teachers and Students

Instead of performing as the sage on the stage transmitting knowledge to a class of innocent students, in the VU's collaborative learning environment, teachers' roles are often defined in terms of mediating learning through dialogue and collaboration where knowledge is created in the community of students rather than being transferred from the individual. More specifically, the idea of mediating could include such aspects of facilitating, modeling, and coaching (Chung, 1991; Whipple, 1987). Facilitating involves creating rich activities for linking new information to prior knowledge, providing opportunities for cooperative work and collective problem solving, and offering students a multiplicity of authentic learning tasks. Modeling serves to share with students not only the perceived content to be learned, but also the important meta-cognitive skills of higher-order thinking, in the process of communication and collaboration. Coaching involves giving hints or cues, providing feedback, redirecting students' efforts, and helping them use a strategy. A major principle of coaching is to provide help only when students need it so that students retain as much responsibility as possible for their own learning. In fact, we need to teach students to rely less on teachers as the source of knowledge. We need to help them learn to learn as self-directed groups of active, autonomous, and responsible individuals. In the VU's learning settings, students are expected to assume their new roles as collaborators and active participants. It may be useful to think how these new roles influence processes and activities before, during, and after learning. For example, before learning, students set goals and plan learning tasks. During learning, they work to accomplish

tasks and monitor their progress. And, after learning, they assess their performance and plan for future learning. In practice, students constantly need help from the teachers to help them fulfill such new roles. Students must learn to become teachers of their own. Indeed, a frequent formula (Dilworth, 1998) that action learning proposes has been quite useful in constantly reminding students of their new role in the VU's learning scenario. Namely, L = P + Q + R, where L (learning) equals P (programmed instruction) plus Q (questioning) plus R (reflection). Here P represents the knowledge coming through textbooks, lectures, case studies, computer-based instructions, and many others. This is an important source of learning but carries with it an embedded caution flag. That is, P is all based in the past. Q means continuously seeking fresh insight into what is not yet known. This Q helps avoid the pitfall of imperfectly constructed past knowledge. By going through the Q step first, we are able to determine whether the information available is relevant and adequate to our needs. It will point to areas that will require the creation of new P. R simply means rethinking, taking apart, putting together, making sense of facts, and attempting to understand the problem. Following the use of this formula, action steps are planned and carried out with constant feedback and reflection as the learning takes place. It can provide for the mature students elevated levels of discernment and understanding through the interweaving of action and reflection.

A Learning Organization Model for e-Transformation

The concept of the learning organization took seed several decades ago and gained major recognition with the incredible success of Peter Senge's 1990 book *The Fifth Discipline*. Senge (1990, p.3) describes a learning organization as a place where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together. At the core of Senge's formulation are five essential learning disciplines: personal mastery, mental models, shared vision, team learning, and systems thinking, that may be briefly described as follows. Personal mastery has to do with individual learning, and can be seen as the basic building block through the actualization of which the learning organization is typically constructed. Mental models are about how individuals reflect on their own knowledge, using such models to improve the internal understanding of the organization's functions, and processes. Shared vision implies a sense of group commitment to a matrix of organizational goals, while team learning describes a sharing and utilization of knowledge involving collective thinking skills. The purpose of systems thinking is to understand relationships and inter-relationships, as well as the context and the forces that affect the behavior of the organization. To the conscious readers, it is not difficult to perceive that the learning organization model represents an organizational context which helps transfer learning from individuals to a group, provide for organizational renewal, keep an open attitude to the outside world, and support a commitment to knowledge. The attempt to define this new spirituality of organization, as the backbone for our architecting efforts, is hereby presented in terms of two specific architectures: the 4-R framework for organization transformation, and the knowledge framework for knowledge synthesis: the former comprises four important architectural components constituting the transformation architecture of our learning organization model for e-Transformation; the latter comprises five essential components, representing the knowledge architecture of the same model for e-Transformation, providing a knowledge vision for the VU.

The Transformation Architecture

The transformation architecture is made up of four important components, whose background ideas are often concurrently examined for operational purpose: Reframing, Restructuring, Revitalizing, and Renewal. They also represent the important organizational contexts where various LOIS (learning organization information systems) supports are to be elaborated.

Reframing

Organizations often get stuck in a certain way of thinking, and lose the ability to develop fresh mental models of what they are and what they could become. Reframing opens the organization's mind and infuses it with new visions and a new resolve. The three important constituents of reframing are conceived to include: achieve mobilization, create a vision, and build a measurement system. Briefly, mobilization is the process of mustering the mental energy needed to feed the transformation program. It involves expanding the realm of motivation and commitment from the level of the individual to the team, and finally to the entire organization. Whereas mobilization prepares an organization to create a better future, vision provides a shared mental framework that gives form to that future. The vision often represents a significant stretch from current reality, becoming the organization's new sense of purpose. Once the organization has been mobilized, and armed with an inspiring vision, leadership must translate the vision into a set of measures and targets, and define the actions needed to reach the targets. Therefore, the measurement system creates a sense of commitment.

Restructuring

Restructuring deals with the body of the organization, and its competitiveness – the need to be lean and fit – is the primary consideration. It is the domain where cultural difficulties are supposed to be greatest. Nonetheless, if the payoffs are invested to fuel longer-term transformation programs, many wounds could be healed. The three major constituents of restructuring are conceived to include: construct an economic model, align the physical infrastructure, and redesign the work architecture. Briefly, constructing an economic model involves the systematic, top-down dis-aggregation of an organization in financial terms, typically from stakeholder value considerations to activity-based and service-level assessment. It gives the organization a detailed view of where and how value is created (or destroyed), and like the human cardiovascular system, is supposed to transport resources to where they are most needed inside the organization. On the other hand, the redesign of an organization's physical infrastructure is one of the most visible and telling measures of the overall health and strategic direction of an organization. The physical infrastructure, like the human skeletal system, is the network of facilities and other assets upon which work processes depend. Some facilities or assets are like the spine of the human body: When they fall out of alignment, they pinch vital nerves, causing pain and partial paralysis. Others may fracture under stress, immobilizing whole sections of the corporate body and requiring mechanical realignment to allow the healing process to occur. More, in an organization, work gets done through a

complex network of processes, the work architecture. Like muscles, such work processes can be considered in isolation, but are in fact so interconnected that a change in one may affect them all. Also, they must continuously adapt to the demands placed on them or fall into atrophy from lack of stimulation. If properly configured and aligned, and if properly orchestrated by an integrated set of goals and measures, they produce a symphony of value creation so fluid that process boundaries seem to disappear.

Revitalizing

Revitalizing is the ignition of growth by linking the organization body to the environment. Every organization wants to grow, but the sources of growth are often elusive, making the process of achieving growth more challenging. Revitalization provides three essential channels of growth including achieve organizational focus, invent new businesses, and change the rules through information technology. Focusing on customers is a good place to start, because providing the benefits customers seek – often new and as yet to-be-discovered benefits – is what leads to business growth. Organizational focus is to the enterprise what the senses are to the human body, connecting the organization's mind and body to its environment. On the other hand, growth also comes by starting new businesses from scratch. This requires the cross-fertilization of capabilities often scattered throughout an organization's business portfolio, and the creative assembling of them to develop new offerings. In many cases, the capabilities of other organizations are required, spawning alliances, partnerships, mergers, or acquisitions. Inventing new businesses also brings new life to the organization; it is the organizational equivalent of the human reproductive system. Often technology can provide the basis of new ways to compete. Information technology, in particular, can redefine the rules of the game in an industry. Technology is the equivalent of the human nervous system, connecting all parts of the body and allowing it to experience sensations produced by the environment.

Renewing

Renewing deals with the people side of the transformation, and with the spirit of the organization. It is about investing individuals with new skills and new purposes, thus allowing the organization to regenerate itself. It involves creating a new kind of metabolism, the rapid dissemination of knowledge inside the organization, and it involves the cultivation of a reflex of adaptation to environmental changes. Renewal is the most subtle and difficult, the least explored, and potentially the most powerful of transformation's dimensions. The three major constituents of renewal are conceived to include: create a reward structure, build individual learning, and develop organizational learning. Briefly, rewards are not the only motivators of people, but they are very powerful ones. When they are misaligned with organizational objectives, they can be equally powerful de-motivators. The organizational compensation system should reward risk-takers, and encourage people to link their own futures to the transformation of the organization. The reward structure builds a sense of gratification among individuals in the organization. Nevertheless, there can be no organizational transformation without the transformation of a large number of individuals. Organizations must commit themselves to the development of their people by encouraging the acquisition of skills and by cultivating mutual learning. Individual learning promotes self-actualization in the individuals

who make up the organization. Further, organizations need to organize themselves for learning, so that they can adapt, constantly, to their changing environments. Developing organizational learning fosters a sense of community among individuals.

The Knowledge Architecture

Following the idea of a learning organization, we suggest the creation of a number of architectural components in the knowledge architecture (Vat, 2001; 2002a), which are intended to facilitate learning, and the creation, acquisition, plus distribution of knowledge, among organizational members.

- *The IS-component.* The field of information systems (IS) (King 1996, 1999) operates on the paradigm of identifying relevant data, acquiring it, and incorporating it into storage devices (databases) that are designed to make it readily available to users in the form of routine reports or responses to inquiries. Principally, IS directly relates to managing data and information rather than to knowledge and learning. But, the IS infrastructure, including application programs which transform data into more valuable information relating to particular decisions, functions or activities in the organization, is of fundamental importance to implementing any of the other knowledge-related architectural components. An organization that chooses to employ an IS-related component in pursuit of a learning organization does so by creating databases, inquiry capabilities, communication capacities and other leading-edge infrastructure elements to enable and facilitate collective learning, information sharing, collaborative problem solving and innovation.

- *The IL-component.* The individual learning (IL) (Kim, 1993) component serves to provide training and education for individuals through the institution of workshops, apprenticeship programs and the establishment of informal mentoring programs. Typically, an IL component provides free use of the organization's IS infrastructure to access unstructured material in order to pursue an explicit educational path, and to access structured learning material purposely designed for online self-learning. The organization that adopts the IL component in pursuit of a learning organization is betting on its people; namely, enhanced individual learning will translate into improved organizational behaviors and performance.

- *The OL-component.* The organizational learning (OL) (Grant, 1996; Probst & Buchel, 1997) component focuses on the use of communities of practice approach, leading to the formation of collaborative groups composed of professionals who share experience, knowledge and best practices for the purposes of collective growth. The conceptual basis is that group-based organizational competencies and capacities, can be developed, refined and enhanced to enable the organization to adapt to changing circumstances and demands, through such ideas as teamwork, empowerment, case management or development-centered career paths.

- *The IPM-component.* This component deals with the issue of intellectual property management (IPM) (Stewart, 1997; Sveiby, 1997; Wiig, 1997) underlying the activities that are involved in leveraging existing codified knowledge assets in the form of patents, brands, copyrights, research reports, and other explicit intellectual properties of the organization. The

organization that pursues the IPM component in support of a learning organization may devise a financial incentive that allows individuals and groups to be rewarded for the creation and leveraging of intellectual properties.

- *The KM-component.* The knowledge management (KM) (O'Leary, 1998) component focuses on the acquisition, explication, and communication of mission-specific professional expertise that is largely tacit in nature to organizational participants in a manner that is focused, relevant and timely (Grant, 1996; King 1999; Wiig, 1993). The conceptual basis is that an organization's tacit knowledge can, in part, be made explicit, and leveraged through the operation of KM-related processes and systems developed for knowledge sharing.

Conclusion

Every organization is a complex organism. At any given moment, the picture an organization presents is only part of the truth about it – there is so much more hidden within its complexities. A given model of an organization clarifies – for a person or a group of people – some aspect of or some perspective on an organization. In practice, we use different models to describe different aspects of an organization, and it is important to determine what aspect a given model is supposed to express. In the learning organization model for e-Transformation we discussed above, we have an overall organization model decomposable into such aspects as the transformation architecture and the knowledge architecture. Each of these two aspects can be represented by its own model, which specifies its areas of interest. The primary purpose of this modeling activity is to clarify an organizational context suitable for e-Transformation in the context of a learning organization. It should be noted that the staff assigned to redesign the organization for e-Transformation must be able to create the necessarily detailed models in support of different organizational objectives. An example is to create various working models to visualize the organization and the world around it through trying out different scenarios to see how organizational processes can be extended. This work in turn must involve the different design alternatives and decision-making at various levels from the comprehensive architecture down to the detailed, dynamic flows of events. In other words, we recognize that extending from a physical organization to its electronic counterpart is not simply a technology issue to be managed by the IS department. Instead, the e-Transformation itself involves business process engineering and re-engineering, and it is a core strategic issue, requiring meticulous planning before construction. In particular, it is about molding selected aspects of the running university into whatever the re-engineered vision of the educational process demands that they be. And it is about setting long-term goals to refocus the business of the organization. Hence, it is about business as much as it is about technology, and as such it must be managed directly by a team of integration specialists (educational executives, organization architects, technologists) who can walk the line between enterprise strategy and the information technology and IS issues. Oftentimes, this requires IS leaders to learn business, and business leaders to learn technology. In today's complex knowledge environment, it is also our belief that the core of the VU is the backbone of intra- and inter-organizational processes and their attendant IS support, which spread both within and without organizational boundaries to include internal and external stakeholders.

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