SYSTEMS INNOVATION AND EDUCATION MANAGEMENT SYSTEMS (EMS)

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ABSTRACT

Many researchers and practitioners contend that all institutions respond to changing market need and can create competitive advantage through innovation and creativity. Each year, institutions expend significant resources developing new products and processes and yet research shows that more than half these initiatives fail. Successful institutions are not innovative by accident; they deliberately manage their innovation process. In order to effectively manage the innovation process, institutions must utilise proven approaches to "lever" innovation within the institutions. This article proposes a new approach to managing systems innovation that centres on the process of institutional innovation and good management practice. This approach aims to provide a more integrated approach to systems innovation that will make it more systemic and improve its likelihood of success. This article main objective is to present systems innovation and education management systems (EMS)

Key Words: Systems Innovation, Levers, Education Management Systems

INTRODUCTION

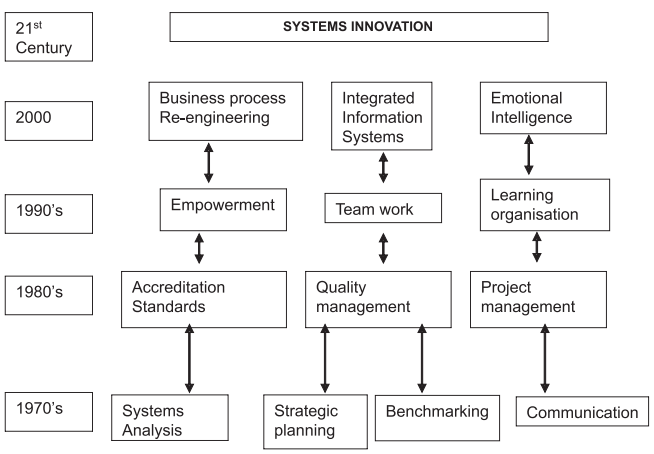
In the modern global environment of integrated markets and intense competition, institutions constantly face the need to reinvent themselves in response to external forces. Managing institutions in turbulent environments often results in one change initiative being implemented after another. It has become a necessary part of the institutions's life that management must strive to create a periodic "sense of urgency" (Kotter, 1990) to reinvigorate the institutions's operational methods. To achieve this, many institutions aspire towards one or more management paradigms, such as Total Quality Management and Business Process Reengineering. Even institutions that set the standards and remain world leaders adopt very different and practical approaches to process change.

When observed closely the actual approaches, which institutions use, have much in common. They are practical, individually complex, and surprisingly effective in helping institutions achieve their objectives. In contrast, none of the current paradigms satisfy the total requirements for change management, since they all fail to provide a holistic and practical approach. The unsuitability of the current change paradigms is reflected by the fact that anywhere between 50% to 70% of change projects fail to achieve their targets (Hammer *et al*., 1995; Burnes, 1996; Tidd *et al*., 1997). These paradigms do however offer a tremendous amount of knowledge to institutions,- knowledge that can be adopted and used contingent upon an institutions own needs and routines. Due to the increased need for institutions to change, the process and management of change becomes critical important to an institutions's overall success. This research presents a new approach (called Systems Innovation Management) that reflects the increased emphasis on the management of innovation process within modern environment.. A set of five supporting levers, distilled from the rich reservoir of knowledge which existing approaches possess, are presented as part of this approach. A Systems Innovation tool that allows progress regarding Systems Innovation

Management and where scope for improvement exists.

Convergence towards Systems Innovation

During the last century, a number of approaches that relate to the domain of institutional change appeared. These range from Scientific Management and Socio- Technical Design to Business Process Reengineering (BPR) . The core elements of this myriad of approaches, when combine produce a wealth of knowledge relating to the best practices concerning institutional innovation management. This vast array of knowledge has converged over time, for improved management of institutional change within the current turbulent environment. The "new" approach to systems innovation comprises a synthesis of the best elements of past approaches, together with a systems perspective that interrelates these elements effectively. The paradigm adopts a contingency approach to innovation by promoting generic elements of past approaches rather than emphasising one best way of operating



(Figure 1).

An approach to manufacturing innovation management which incorporates a synthesis of current and past approaches, contingent upon the multi-disciplinary needs of the specific institutions, is a perspective which in recent years is gathering support (Tyson (1997),

"New" approaches that appear in modern literature, highlights the risk of fanatically supporting"new" approaches and as a result misunderstanding and neglecting the lessons available from past approaches. Burke (1987) emphasises the value of a contingency based approach to institutional innovation and stresses that "there is no one single, all encompassing theory… What we have are a number of mini-theories that help us understand certain aspects of institutional behaviour. Taken together and comparatively, they become useful". This "new" approach is based on addressing the holistic requirements for managing of innovation. The approach is developed upon five broad enablers, which act as "catchalls" to incorporate the vast array of positive elements, distilled from the existing approaches. These five pillars not only provide a firm foundation on which the new aproach is founded, but also support the development of the innovation process within institutions. These are :

Institutions & Leadership;

Strategy & Performance;

Empowerment & Groups;

Reengineering and Improvement

Learning and Communications.

Identifying the Levers of Systems Innovation

As stated above, a number of common traits or enablers are grouped into five system innovation levers.

These levers facilitate the innovation process and ensure an institutional environment in which systems innovation can flourish.

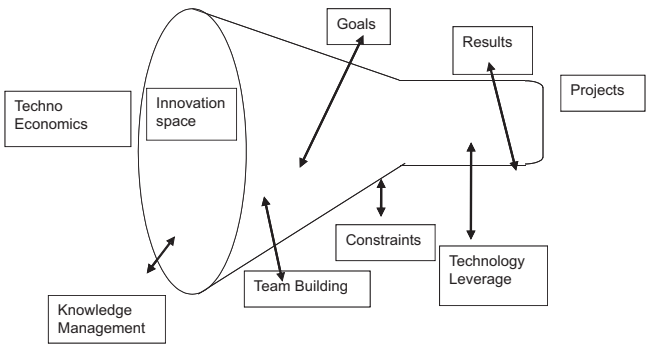


Figure : 2-1.1

Institutions & Leadership

The first lever encompasses 'institutions and leadership' theory; elements that have proven instrumental in the success or failure of numerous institutional change efforts in the past. The importance of leadership with respect to innovation is highlighted across a spectrum of change approaches such as BPR and WCM. Senior management must be committed and willing to champion change initiative in order to emphasise its importance and reduce employee resistance (Bashein *et al*. (1994), Belmonte *et al*. (1993)). Hammeret al. (1995) state that "if your leadership is nominal rather than serious and isn't prepared to make the required commitment, then your [BPR] effort is doomed to failure".

Quinn *et al*. (1997) view leadership as "the most critical single role stimulating innovation.". Kotter (1990) notes that leadership is a process, whose purpose is to "help direct and mobilise people and/or their ideas". Thus the leadership style must provide direction for the institutions and allow the employees to feel that they contribute to the development of the future institutions.

Rothwell (1992), when discussing the critical factors for success, emphasises the importance of the "presence of key individuals… [such as] product champions and technological gatekeepers" and "the top-management commitment to and visible support for innovation". Through operating as a management team, a consensus based approach to determining the direction of the institutions can be obtained. A group leadership approach allows the adoption of a more holistic perspective of the effects of change. In addition, the senior management team can develop a consensus reaching management style that reduces resistance both internal within the management team and also between the institutions' different layers. A consensus-based approach helps avoid differing signals passing down the chain of command by different managers. The management layer operating as a team must be highly visible in the innovation process in order to "lead by example" and encourage participation and group working by an institutions's lower layers.

This lever also incorporates the issue of the institutional structure. The choice of structure adopted has a large impact on an institutions's ability to innovate internally. A flat, networked structure that facilitates communication and encourages cross functional group operations represents the most advantageous style. Burke (1987), following a synthesis of three leading authors in institutionsal development states that the optimum structure for modern institutions is "less hierarchical… and networked more". Burns *et al*. (1961) promote an "open, horizontal management style" to be adopted in institutions and West *et al*. (1990) supported the belief that a "democratic, collaborative style" is most suitable for encouraging innovation. While it is beneficial for ultimate responsibility to rest with one individual since this avoids "buck-passing", such an individualistic approach does not avail of teamwork advantages (Katzenbach *et al*., 1993).

Champy *et al* (1996), when discussing the advantages of "adaptive networks" state that labour is "not divided but

rather shared among knowledge workers, who may either act as individual contributors or as part of a team". Thus, it is important that management demonstrate leadership and to encourage personnel to operate effectively as teams.

Strategy and Performance

Strategy and performance is the second lever identified for facilitating systems innovation.

Pascale et al. (1981) include 'strategy' and 'super-ordinate goals' as two of their "seven- S's" approach to innovation. The presence of an effective strategic plan can "act like a beacon to guide the institutions during the turmoil of the change process" (Dooley, 1997). An effective strategic plan is a concise document that clearly defines the strategies pursued by the institutions and the desired vision. This plan should be readily accessible to all the institutions employees so that they can correlate their idea generation and problem solving activities to the current goals. Such transparency obtains a better correlation between goals and systemic efforts to develop the institutions. A key aspect in identifying future goals is understanding the institutions's requirements. This research defines four broad categories of requirements: customer, conformance, corporate and critical internal factors. In the context of an operations company, customer requirements articulate what the customer wants in terms of timeliness, quality and cost. Corporate requirements identify specific critical success factors at a business level that the company must maintained or improved. Conformance requirements identify what standards or regulations the company must implement as a matter of necessity rather than strategy. Finally, the critical internal factors are specific factors for the company at a operations unit level that must be maintained or improved, and framework that allows the translation of business goals into a set of operational level performance measures. The identification of these measures provides a means of aligning ongoing actions with the goals. Bradley (1996) identifies five main macro measures of performance within the manufacturing model. These are time, cost, quality, flexibility and the environment. The identification of supporting measures allows for a continual monitoring of the institutions' efforts to achieve its goals.

Neely *et al*. (1995) emphasise the need for an institutions seeking advancement to have "a set of metrics used to quantify both the efficiency and effectiveness of actions". While the strategies and performance measures define the path for institutional development, projects and incremental improvements/ quickwins are the modes by which they achieve. Thus a strong correlation must be maintained between a company's current goals and the actions underway to achieve these ends.

Empowerment and Groups

Empowerment and groups is the third lever of Systems Innovation. This lever strives to involve all the institutional layers in the innovation process and is rooted in developments such as human resources movement, socio-technical design (Pava, 1983) and the psychology and operation of groups (Lewin, 1958). In order to facilitate the spread of systems innovation throughout the entire institutions, it must expand from the sole domain of senior management. While it is necessary for management to decide on the strategic path and to lead by example, they must also engage their employees in activities that positively contribute to the development of innovations. Pascale *et al*. (1981)

Highlight the importance of this when they include 'Staff' as one of the "seven-S's" approach to innovation. One of the core concepts of systems innovation is that innovation would be systemic in nature; this is that everyone in the institutions continuously contributes to the innovation effort

rather than a chosen few designers. This allows the institutions to generate as many ideas for potential improvements as document that clearly defines the strategies pursued by the institutions and the desired vision. This plan should be readily accessible to all the institutions employees so that they can correlate their idea generation and problem solving activities to the current goals. Such transparency obtains a better correlation between goals and systemic efforts to develop the institutions.

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Reengineering and Improvement

The fourth lever identified is reengineering and improvement. It addresses two distinct types of change in an institution; radical \step change and incremental \ quick win change. The lever recognises that institutions' efforts to innovate will include periods of radical change and incremental change on a more continuous basis and that both occur in parallel. The competing paradigms of WCM and BPR sometimes create the impression that both types of change are mutually exclusive. (Schonberger (1982), Juran (1993), Parker (1993), Ould (1995)). Hammer (1990) believes that change effort "should strive to break away from old rules.. the notion of discontinuous thinking", while Keegan (1997) states that through "continuous improvement… and by amassing a large number of them [will] achieve significant improvements in overall performance". Hall (1997) supports this need for dual rates of change as a necessary means of avoiding the institution "cooling down" and loss of momentum with respect to innovation. Parker (1993), when discussing reengineering, describes it as "an explosive mix to make dramatic change…. Which builds of existing change processing mechanisms (which are incremental in nature)". awaiting approval. Innovative actions arise from the problems and ideas that are harvested from the various institutional stakeholders. The senior management team constantly motivate stakeholders to develop the processes. This can occur through customer complaints, corrective action systems, suggestion boxes and brainstorming sessions. As

with any change, there is a need to understand the design and operation of the existing systems, prior to modifying them. To this end, the use of high level modelling techniques helps communicate how processes currently are and to present a picture of how these processes will operate in the future. A common problem faced by institutions is that they become confined by the internal ways of thinking and as a result produce 'standardised' ideas and solutions. The use of techniques such as benchmarking and external consultants offer a means of 'thinking outside the box' (Andersen, 1995) and ensures the development of both radical and incremental action. The transition process from an initial idea or problem definition to the eventual implementation of the action must be clearly understood within the institution. This often occurs through the defining of the 'stage-gates' (Cooper, 1988) that the actions must pass to be approved and implemented. The use of minimal critical specifications (Pava, 1983) for compiling and monitoring the essential details of actions is effective to this end. Institutional resources for process innovation are limited, so only a proportion of actions that are developed will be implemented. In order to maximise the benefit to the institution, a system of ranking should be undertaken to align approved actions with the institution's goals and constraints.

Learning and Communications

The final lever identified is learning and communication. This lever is strongly interrelated to all other levers, but is essential to the support of empowerment and groups. Learning and education are essential elements to ensure human resource development and company success (Senge, 1990). Rothwell (1992) includes the "use of effective communication to gain a consensus for change" as part of his "ten-C's". The opportunity to learn can be used as a motivation reward for an employee accepting increased responsibility. Such an approach to employee reward is mutually beneficial, since the employees' future value is increased through knowledge and experience. The institutions gains through employees applying this newly acquired knowledge in their daily operations. It is important that institutional recruitment focuses on developing a learning environment. Through continuous education and effective training plans, the institutional skills base grows and fills gaps that exist in the versatility chart (Amabile, 1996). In institutions that are at the leading edge of systems innovation, both management and employee level undertake training courses to improve effectiveness. Weisbord (1987) emphasises the importance that "everybody has a chance to learn, grow and achieve" to develop a greater degree of self-control and innovation within the institutions. The second part of this lever is that of communication; this aspect is an integral part of each of the other levers discussed previously. Communication is highlighted as an important tool in overcoming resistance to change. The institutions reduces resistance through the development of a culture where people know that they are viewed as 'stakeholders' and have their input into the decision making process. Davenport (1993) includes communication as one of the key enablers for process change. An atmosphere of trust and empowerment can be developed through communication and open access to information regarding the innovation process. Such transparency encourages people to continuously engage in the process, as the necessary information is accessible to track their proposals. Communication is also essential for institutional goals to be more than mere documents. The institutional goals must be disseminated through the institutions's layers, so that it becomes a 'living document that impacts on everything that the company does'

(Dooley, 1997). Thus employees can refine their ideas to better align with the institutional goals prior to submitting them to the innovation process. Kotter (1995) states that "in the more successful transformation efforts, executives use all existing communication channels to broadcast their vision… [and] that communication comes in both words and deeds, and the latter are often the most powerful form".

From the above, it becomes clear that these levers, not only support the Systems Innovation Management process, but are mutually supportive also. This interrelationship strengthens the entire approach since it presents a consistent approach towards systems innovation management. The levers discussed above are a synthesis of institutions and process development best practice and embody the traits that support management of the innovation process.

The Process of Systems Innovation

As mentioned earlier, the success or failure of individual institutions to innovate itself depends on institutions' own processes that the particular firm learns through the experience of time. While popularist approaches such as BPR or TQM can generate ideas and motivation and the levers can support the operation of the process, it is the process itself that determines the institutions' ultimate success or failure to effect change. The pattern for success is increasingly favoring institutions who develop innovation processes that adequately manage the knowledge and technological skills available within institutions and the external environment. One representation of such a process for the management and co-ordination of manufacturing innovation is the "Development Funnel" (Hayes *et al*. (1988), O'Sullivan *et al*. (1998)). This approach used the metaphor of a funnel to represent institutions attempts "to reconcile and integrate competing projects" generated by their ongoing efforts to improve and develop(Price Waterhouse, 1996). Tidd *et al* (1997) also use the metaphor of a funnel as part of the "routines underlying the process of innovation management". The Systems Development Funnel presents a more detailed picture of how the interrelationship of the innovation process is managed and co-ordinated.

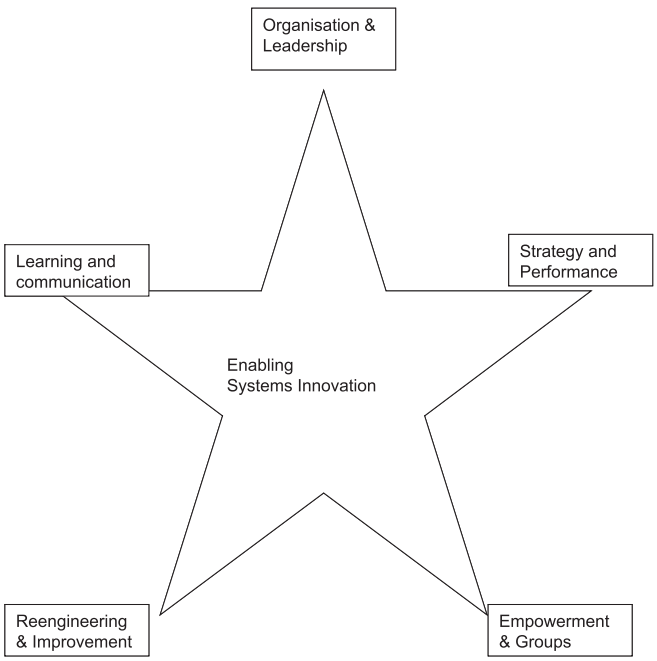

Figure 3

The Systems Development Funnel views the innovation process operating as follows. Prospective innovation projects are generated from various sources and enter the development funnel through the mouth. As they progress into the funnel's mouth, factors such as 'strategy', 'resources' and 'corporate objectives' constrict them. The effect of these goals and constraints results in a number of activities occurring to prospective innovations. They are rejected, merged together, altered in some manner, allowed to continue on through the funnel unchanged or assigned to incremental change for immediate implementation. The decision as to whether a prospective

innovation is assigned to incremental innovation or is allowed to continue on through the systems development funnel to be further developed is decided by the management team. The funnel's converging walls represent how the systems innovation process correlates the institutions's strategic direction and the development portfolio of actions it has underway at any one time. Any action that passes through the funnel is "tempered" relative to these goals and constraints. Actions that pass through the funnel become part of the Systems Innovation Plan. The current absence of such a process in many institutions is highlighted by Price-Waterhouse (1996) who state that "many managers are faced with an undisciplined collection of change projects that together make little sense and … don't reveal a rational pattern or integration of objectives" Innovation projects that progress to the systems innovation plan are correlated and refined in accordance with the institutions's goals and constraints. Each action is defined to its "minimum critical specification", which provides management with adequate information to make their decision as whether to approve the project or not. If the action is approved, then it can be specified in fuller detail if the Project Manager deems it necessary. Each of the actions in the Systems Innovation plan are ranked in order of preference and submitted for allocation of the annual budget. Actions that receive approval from the annual budget, are implemented in accordance with the project management routines of the institutions. This involves the implementation and ongoing evaluation of individual actions relative to specific targets. The final step in the systems Innovation process is a feedback loop that enables an institution to learn from the experience that it has gained undertaking the action. This compiling of the institutions "traumas and triumphs as a sort of corporate consciousness" assists in the future development of the institutions since it enables learning from their mistakes Tyson, 1997). While this model of the innovation process is but one representation, it addresses the interrelationship of the different factors that impact an institutions's ability to manage its innovation process. The benefit of this approach to the innovation process is that it helps align actions pursued by the institutions with existing goals and constraints.

Project-based Learning

Project Based Learning is a teaching and learning model (curriculum development and instructional approach) that shifts away from traditional teacher-centered teaching and emphasizes student-centered instruction by assigning projects. It allows students to work autonomously to construct their own learning, and culminates in realistic, student-generated products.

More specifically, project-based learning can be defined as (Synteta 2001:13) :

Engaging learning experiences that involve students in complex, real-world projects through which they develop and apply skills and knowledge

Learning that requires students to draw from many information sources and disciplines in order to solve problems

Learning in which curricular outcomes can be identified up-front, but in which the outcomes of the student's learning process are neither predetermined nor fully predictable Experiences through which students learn to manage and allocate resources such as time and materials.

Projects are complex tasks involving many different complex activities like the scenarios described above. And therefore support for project may involve several scenarios,

which are further decomposed in smaller phases. In particular students need scaffolding for

(a) initiating inquiry, formulate coherent research questions;

(b) define a research project;

(c) direct investigations and find resources,

(d) manage time; keep deadlines, estimate time needed to do a task,

(e) collaborate and give feedback; articulate work of others and give regular feedback,

(f) follow-up the project; revise products, (Synteta & Schneider 2002). For all these situations we can imagine that computational support and certain stages of the collective research project can be scenarized to profit from the relate-create-donate principle of engagement theory (Shneiderman 1988).

Collaboration and content management systems

Simple Internet technologies (web pages, forums, e-mail, FTP etc.) have been successful in education because they answered basic needs for information exchange, communication and collaboration needed for constructivist scenarios. In addition to being simple, yet powerful, Internet lets the user (teachers) have control. While simple web technology does enable creative scenarios it has 4 drawbacks: (1) Maintaining static web-sites (including the student's pages) is time-consuming, (2) simple discussion systems like forums or mailing-lists do not do very good knowledge management. (3) More sophisticated scenarios (like co-authoring or work-flow) are badly supported and (4) there is no glue for putting all these together.

Community web-sites actually face quite similar problems and seem to have found at least a partial answer. Within the last two years an impressive number of what the authors coin C3MS (Community, Content and Collaboration Management Systems) have sprung into existence. Inspired by personal weblogs (also called blogs, which are increasingly popular journaling systems), slashdot-like weblog/news systems, simple content management systems and various popular groupware applications, they offer a modular system for configuring interactive community web-sites. In addition, most of these systems provide documented extension mechanisms allowing third party persons to contribute modules with additional functionalities. C3MS systems are a form of Web portals. A portal gathers a variety of useful information and communication resources into a single, 'one-stop' web page (Looney and Lyman, 2000). A portal therefore is a collection of objects (information bricks) and services (operation on these bricks) that can be accessed from the portal (web) page.Portals can be adapted for specific communities and sometimes users can tailor them to their needs. Pedagogical interest Interact by providing new information (to start a story, a project, an activity), comment information of others, asynchronous debate, present an expert's view on a theme While managing contents is not central to the argument of this article, it is an issue for teachers. Portals can be particularly useful to manage informally generated knowledge, e.g. the result of educational activities. Good knowledge management (KM) will be instrumental for open e learning and community of practice building since it promotes just-in-time open learning, i.e. helping people to find information from it in order to get some job done. Portals usually have incorporated search engines, some have functionalities for rating information, so that good information "floats" to the

top. For more structured information, e.g. web links, hypertexts etc. there exist special applications that allow users to make quick updates (instead of going through the process of editing HTML files and uploading them).

SUMMARY

Due to the increased need for SYSTEMS INNOVATION AND EDUCATION MANAGEMENT SYSTEMS (EMS) the process and management of change becomes critical important to institutions's overall success. This presents a new approach (called Systems Innovation Management) that reflects the increased emphasis on the management of innovation process within modern challenging environment Teachers should have control over their environment and this fits the philosophy. Finally, we may have a chance to maintain the Internet Spirit in education, which is threatened by the philosophy of so-called educational platforms, e-learning systems or whatever are called today's main stream systems sold to education.

As formulated by e-learning practitioner Gilroy (2001) "E-learning should be first and foremost about creating a social space that must be managed for the teaching and learning needs of the particular group of people inhabiting that space". Or from an other perspective: "In order for individuals to learn how to construct knowledge, it is necessary that the process be modeled and supported in the surrounding community. This is what occurs in a learning community" (Bielaczyc & Collins 1999: 272). While a large part of our knowledge comes indeed from formally planned learning scenarios, people learn a lot from informal exchange with fellow learners, with professors, experts, i.e. from exchange within tightly or loosely defined communities. We can define communities as networks, made up of individuals as well as public and private institutions. They share a certain amount of practices, common goals and common language. They do have a social organization including formal or informal hierarchies and some idea of "social service" (members helping each other). Beyond this abstract definition, "community" is quite an ambiguous concept that encompasses, for example, communities of practice (e.g. teachers from the same school or teaching similar things), local communities (people living in the same area) and virtual communities (people sharing some information over the internet). Communities can be constituted or at least enhanced with the help of collaboration and information. We also should point out that community portals are becoming popular in other contexts. Increasing familiarity with this tool and perception of its general usefulness for "real life" will help introducing it to education (like the successful use of word processors for creative writing).

Success stories of new technologies in education are often related to the teachers' ability to insert it into existing knowledge. In other words, it is easier to promote change when teachers can relate to "models" they know, even if they are not necessarily related to teaching. Teachers able to understand the meaning of simple bricks might be more willing to use them for building more complex scenarios, i.e. teachers must have an operational awareness (vonGlasersfeld) in addition to operational control. In addition, there exist sporadic initiatives for building school or campus portals that are actually useful to the community and not just a presentation/information tool designed by some central service as window to the outside world. Such portals could add support to teaching activities by giving each teacher his own system innovation space.

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Kotter, J. P. (1990) *'A force for change: How leadership differs from management'. New York: The Free Press.For diverse imperatives, such as technological mandates, public dissatisfaction with Educational Management Systems (EMSs), influence of responsible online communication workers, and the usefulness of evaluation results through a critical approach is being performed not only with increasing frequency, but also with growing quality in empowering online communications. Besides, any EMSs are made a good deal of evaluation process in sophistication of meticulous analyses before they are broadly adopted. Not only must EMSs address practical and technical issues, but also they must concentrate on the philosophy of interactive online communications by critically revising ultimate goals and also objects of online programs. Needless to say, the evaluation of EMSs is a complex process, and can be effort-wasting and time-consuming business easily. In this context, online communication workers are capable of clearly understanding that "...curriculum is what we teach; education is how we teach it; and evaluation guides the process... (Howell, Fox and Morehead, 1993, p.1)".*

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