Systems Approach for Virtual Learning Development

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ABSTRACT:

This paper synthesises various aspects of Education and Systems research (through literature survey and a limited case study and taxonomical method) with the view to a method for investigation and development of actions for problematic environments such as instructional technologies. And, to operationalise research outcomes as an on going real-world scenario.

Virtual Lectures and Learning Materials (resource-based learning and Web-sites) have been extant at Swinburne University of Technology, Lilydale (SUTL) Information Systems & Computing Discipline for some years, however, such material and developments currently fail to account for systemic events like a learner centric perspective of learning .

While many systems theories would account for current instructional technology development as a content driven approach to learning, what theory or theories deal with problematic scenarios caused through critical situations (radical transformation events)?

Keywords: Systems Theory, Learning Technologies, Conference.

INTRODUCTION

What started as an ad-hoc redevelopment of the services provided by the Information Systems and Computing Discipline, Swinburne University of Technology, Lilydale campus (Discipline), (including - curriculum development, course/degree definition, etc), progressed very rapidly to a more formal action research oriented development and a desire to operationalise research within a turbulent environment.

An Action Research based approach (ie. The Learning Edge project – described below) has been employed as an interim development framework between 1998 and 2000. However the development must move from a 'problem at a time' cycle to an operational basis where a problematic environment can be dealt with holistically while maintaining a strong research focus for any developments. One seemingly significant issue revealed during the research associated with virtual learning developments was the discovery that scenarios that are now presenting as problematic emanate from institutional decisions that pre-exist the current developments. While such decisions may have been valid at a point in time, the decisions were not tracked nor were the impacts tracked or predicted. This observation opens the possibility or need to record/analyse both the extant spatial relationships and the temporal critical event relationships with any problematic analysis.

All is not known about the Discipline nor is it possible to predict all problems or situations that will offer for a resolution. This being the case:

> *What, if any, approach or approaches will account for an operational and investigative methodology for the Discipline as described?*

While seeking such an approach, the selection must be capable of accounting for elements such as new technology, virtual lectures and learning materials that are extant in the Discipline. Also, the deficiency or dichotomy of failing to account for a learner centric or constructivist perspective of learning vis traditional models of learning. It could be likened to finding an approach capable of 'herding cats', not impossible, however, neither is it trivial.

Therefore this paper records the analysis and synthesis, for this question, to date, for various aspects of the education and systems research (through literature survey and a limited taxonomical review) with the view to a generalised approach to answering the above situational needs.

LEARNING EDGE PROJECT BACKGROUND

The researcher has generalised the scenario in terms of an operational methodology for the entirety of the Information Systems and Computing Discipline. However, it is the need to operationalise the research outcomes from the Learning Edge project (this project being a subset of the Discipline) that has driven the inquiry documented in this paper. This section of the paper briefly backgrounds the Learning Edge project to assist in informing the reader.

Globalised markets, virtual learning and teaching technology developments using multimedia are driving educators in higher education to rethink development and delivery of learning and teaching materials in particular. These drivers offer many global, cultural, ethical, technological, knowledge and intellectual property issues that will require resolution. The Learning Edge project research has taken as a case study new curriculum that is an innovation of several extant bodies of knowledge which are being delivered using traditional delivery and virtual learning approaches.

Whatever methodological approach or approaches are chosen to achieve these broad goals, there must be an encapsulation of the prospect of continual investigation of the tensions extant in the Discipline and a way of accounting for *radical transformation events* or critical situations as Giddens (Giddens, 1993, 1995) suggests, imposed from both internal and external sources, on the Discipline. Central to the philosophy of the Discipline is a deontological and quality construct where this means:

- Obligation based development } deontology
- Continuous improvement } quality
- Fitness for purpose } quality
- Change management control } quality

Rather than think of individual objective parts the Discipline Leader desires a holistic equilibrium based on an understanding of the tensions extant within the Discipline, tensions or competing elements like budgets, student learning styles, academic styles, infrastructure, etc. The Discipline could be considered as a natural environment or open system significantly influenced by internal and external actions.

As with any natural environment that is interacting/acting in holistic equilibrium it is not always, if at all, possible to name and detail everything in that environment. In fact the concept of *Holonicity* (viz. Koestler, 1967) would seem to encapsulate what is being observed or desired in the Discipline and as such will form the basis of investigation and operational management.

Therefore the environment under investigation is that of the Information Systems and Computing Discipline where there are many competing objects creating equilibrium through tension. When any tension is interfered with equilibrium is also disturbed - this typifies a *problematic environment*.

The research framework for the Learning Edge project required an approach that accounted for multiple research methods while maintaining the integrity of the developer (researcher) and the participants of the project (academics, students). There are two specific components in mind due to the fact that the developer of the project conducts the research and that the project is concentrated upon a single Discipline as a learning technology and instructional design implementation. The research methods appropriated to date are *Action Research* (for the instructional developments) and *Case Study Research* (for an holistic analysis of the Discipline) (cf. Cornford and Smithson 1996, Mertens 1997, Yin.1994).

The Learning Edge project must be supported by theories that account for the human aspects of the project. The Discipline Leader, as researcher, sought a theory/ies that would be inclusive of all stakeholders and, as human participants were involved, provide a framework for all experimentation and technological implementations.

The Learning Edge project takes the theories that pertain to a deontological approach, ie. where the individual is obliged to account for their actions relative to other stakeholders (cf.. Spinello 1997, Wood-Harper et al. 1999). In principle, deontology is considered appropriate because the Discipline, being an educational and real-world environment, was not able to be examined by conducting empirical experiments as a means of investigation. Stakeholders (learners in particular) may well be put at risk in another framework, a risk not worth taking. Learning systems – it could be argued- are ostensibly human activity systems, and as such have been subjected to many theoretical and applied research.

Therefore this research paper is not aimed at new theories generalised through empirical measurement. Rather, the focus is on extant theories with application to the specific Learning Edge case and then operationally as part of the Discipline. Axiomatic to the Learning Edge project is a diagnostic and therapeutic based approach to continuous improvement and a systemic view of the discipline in which of the project resides.

OPTIONS ANALYSIS

Many taxonomies of systemicity exist in literature and are available for review by the reader (cf. Galliers 1992, Wood-Harper & Fitzgerald 1982). However, the review for this paper was constrained and bounded by the requirements alluded to earlier. This section therefore begins with a macro analysis of approaches that the researcher considered relevant. However, the researcher acknowledges that this analysis is not exhaustive.

Endemic to the environment under study is the observation that the designation of specific or objective development approaches is itself problematic, for example common to human activity of virtual learning is a constructivist paradigm.

Therefore, could the environment (Discipline and Learning Edge project) under study be considered systemic by nature or not? To answer this the researcher would constrain the analysis at this time to the following theoretical views:

- Post-modernism - "…largely a reaction to the assumed certainty of scientific, or objective, efforts to explain reality. In essence, it stems from a recognition that reality is not simply mirrored in human understanding of it, but rather, is constructed as the mind tries to understand its own particular and personal reality." And "As the philosopher Richard Tarnas states, post-modernism 'cannot on its own principles ultimately justify itself any more than can the various metaphysical overviews against which the post-modern mind has defined itself'." (http://www.counterbalance.org/gengloss/postm-body.html)
- Systems theory - model building for the interpretation of complex and diverse systems, and that 'the whole is more than the sum of its parts'. (Wood-Harper & Fitzgerald 1982:12)

Ancillary concepts that also need consideration include:

- Human activity - "… the results of complex psychological factors rather than simple environmental factors." (http://www.coe.ilstu.edu/malorber/Ppoint/learning/tsld009.htm)
- Participative - Emphasis upon the importance of the user in or to actually do the analysis and design of the system. (Mumford, Land and Hawgood 1978)

The Discipline could be considered dynamic and by definition ill-structured and problematic. Also, the assumption is that a problem, as a result of a radical transformation event or critical situation, creates an imbalance in the environmental tensions and therefore requires resolution. As both the environmental and human activity metaphors are envisaged, many of the tensions will be disrupted by external as well as internal influences. And while each influence could, and most likely should, be identified with remedial activity consequentially proceeding, in fact no action may well be the appropriate action as a problematic event may be beyond remedial activity.

Having identified the environment (the Discipline) and one research facet within that environment (the Learning Edge, Virtual Learning Development), it is important to state the goals for any selection of an approach or methodology and the operational requirements that seek to account for continual environmental event observation.

Therefore, significant to this stage of the research and development is that any approach chosen must be able to deal with:

- Problematic dichotomies ie. On the one hand learner centricity, constructivist learning theories, instructional design theories and instructional technology. Whereas on the other, teacher centricity, traditional and behavioural learning theories, classroom teaching, etc.;
- a participative approach capable of a deontological development regime;

- a holistic organisation that enables the construction of very complex systems that are efficient, resilient to destructive disturbances, and adaptable to changes in the environment under study;
- not reductionist but cognisant of social and human subjectivity;
- an enabling approach capable of embedding relevant tools and methods drawn from extant methodologies, research approaches, etc.; and
- quality oriented testing of fitness for purpose, change management control, and continuous improvement.

As the Discipline is described (above) there is a notion of systemicity. Therefore, is the environment best investigated and operationalised through Systems Theory, or Post-modernism, or Human Activity or some combination of each?

Wood-Harper & Fitzgerald (1982) summarise one such combined approach ie. Human Activity Systems Approach proposed by Peter Checkland ie. Soft Systems Methodology (SSM). Checkland himself states that "…SSM is an ideal type process that the user suitably adapts on each occasion, to use:

-the fact that SSM's systemicity lies primarily in the process of inquiry;
-the fact that its focus is the interaction between theory and practice;
-the implicit belief behind SSM that learning is axiomatically good; and
-the belief that SSM is best used participatively." (Checkland and Haynes 1994:189)

Checkland has developed this methodology based on the concepts of Systems Theory and has extended the notion of real-world problematic analysis to unstructured and complex situations. This methodology was labelled Soft Systems Methodology due to its focus on the complexities of human affairs and the fact that the whole entity may adapt and survive in a changing environment. (Checkland and Haynes 1994)

Checkland and Haynes (1994:192) argue that "… the systems engineering approach assumes that the system of concern can be named unequivocally and that its objectives can be defined with precision, allowing it to be engineered to achieve the objectives, using a range of well tested techniques." And "… problem situations were, more often than not, ones in which the crucial need was to find a accommodation between (permanently) conflicting viewpoints and interests rather than consensus on goal seeking." The four steps employed in this thinking are:

- All problematical human situations can be thought of as situations in which people are trying to define and take useful purposeful actions, ie. human activity systems as abstract Holons;
- A coherent model of this type could be built only if the worldview with respect to the transformation process embodied in the model were unequivocally stated;
- That Soft Systems Methodology is itself a learning system, a process for acquiring knowledge about and taking action in a human situation thought of as problematic;
- The realisation that models of human activity systems can be used to work out what information support was appropriate to purposeful activity.

RICH PICTURES OF THE PROBLEM SPACE

The Learning Edge virtual Learning Development documented in this paper, deals in part with an evaluation of an instructional technology strategy for the Information Systems and Computing Discipline. The researcher intuitively applied understanding of teaching and learning, and particularly of the human aspects of the situation:

- The Discipline was imploding and demanded immediate remedial action;
- Actions were constructed. However, a more worthwhile outcome was envisaged which resulted in the Learning Edge project initiation; and
- This work also provided an ideal opportunity to investigate the theoretical constructs of instructional technologies, learning theories, etc, and to conduct some Action Research.

Learning Edge is an on going project with no guaranteed results, however, the problems are real and the use of the SSM framework offers guidelines to help make sense of any action that may be perceived.

SSM assumes there is some form of perceived real world situation and that it is problematic to something or someone. The first analysis, therefore, dealt with the roles of problem owner, solver, and decision-maker. At

the outset the researcher assumed full ownership, but that came to be challenged when constrained in the decisions that could be made. However, there is no doubt that the researcher, is the problem owner, responsible for the academics, learning material development, student support, etc.

The next stage was to contextualise the culture of the problem situation. There was, and remains, no single problem, instead there were a number of immediately identifiable problems and others that are still being identified. One identifiable problem was that the researcher had not used SSM before in projects this large and in a discipline (education) which was unfamiliar.

The researcher knew that being the problem owner and the researcher would influence what is perceived as problem situations. However, the researcher trusts that as other stakeholders are involved, as participants, then the plurality of views should supersede any bias on the part of the researcher.

Resourcing is highly prejudicial and in accord with cultural values of teaching taking priority over learning, academics for the most part see their role as deliverers of content and not facilitators and deliverers of instructional technology. This was born out by comments of unsustainable workloads in preparing materials and marking of assessment. The researcher is a participant and observer so the realities were not able to be hidden.

When asked, the academics were desirous of enriching the learners learning not just providing content. This situation alone allows for therapeutic action through the provision of instructional technology that allows for ease of materials replication and virtual delivery. It is at this point that the researcher can see the relevance or otherwise of using a SSM approach. Having identified and contextualised a problem situation the analysis moves to a definitional and modelling phase. Much of this process and the process of definition seems to restrict systems to naive structures though. Within an environment or human activity there will be many transformations occurring with internal and/or external events. One aspect that seems to be missing from the approaches under review is the ability to represent a *temporality and spatiality simultaneously*. Radical transformation events or critical situations may occur at any time and at any point in an environment, and while these events may be traumatic, they may equally provide significant windows for opportunistic transformation.

Therefore, as an example, we were creating a rich picture, using the Soft Systems Methodology approach, of the environment under study and it could be argued that any radical transformation event, historical, present or continuing, should also be able to be represented in that picture. Such an approach moves the investigation from a single objective real-world snapshot to a more holistic, temporal representation of event data encapsulated in the snapshot. Many of the needs for problem analysis emanate from radical events that force a change.

Such an event in the Information Systems and Computing Discipline was the globalisation of education and the focus on instructional technology via the Internet and Intranet. If we were to take a rich picture at this time, then these changes would figure as an extant part of the activity and while this is valid, it would be more informationally rich to include the events that have lead to this scenario. This richness enables observation of the transformation that has resulted in the recorded real-world picture. If one were to use rich pictures then perhaps a second transformation arrow, to represent a radical transformation event, would allow such events to be included in the picture and therefore, visualise the impact over times of such events.

However, to date, the research using SSM has not matured sufficiently to suggest that the methodology can assist longer term operational issues other than through persistent review snapshots taken at agreed intervals.

CONCLUSION:

The research reported in this paper is in the early stages but already there seems to be issues arising with the systems approach that will require resolution. Issues such as a methodology that can account for an operational approach and a problematic approach at the same time need to be resolved. SSM in a synthesised form as described above accounts for a snapshot problem-at-a-time but has so far not met the operational needs of the Discipline. Also, while Action Research as an approach enables a researcher, as part of the environment (in this case the Information Systems and Computing Discipline projects), to act diagnostically and therapeutically, Action Research is not of itself appropriate in an operational sense, again because it deals with a problem at-a-time.

Checkland's Soft Systems Methodology does however, seem to encapsulate the essence of a cyclical approach of diagnosis and therapy from an operational and developmental perspective. Significant to the environment under discussion is the desire to embed methods within the selected systems paradigm as envisaged by Miles (Miles 1988). This point being an important element of the Learning Edge project research, where there is a desire to use 'hard' methodological tools and rational management tools (viz. Kepner and Tregoe 1981) as an embedded approach.

It is important to the Discipline to have a systems thinking ideal type rather than a prescriptive whole capable of embedding prescriptive procedures, a way of making sense of and thinking about real-world situations that are by nature problematical. It is also important that the methodology be expendable to include duality, the richness necessary for capturing transformation events (radical and operational) in rich picture definitions as outlined earlier in the paper.

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