# A CASE STUDY
# in
# CLASSROOM EXPERIENTIAL LEARNING
# of
# PROBLEM STRUCTURING METHODS


## Dr. Phokion 'Ion' Georgiou
### Associate Professor (de carreira)
### FGV-EAESP/IMQ


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- Georgiou I (2006) Managerial effectiveness from a system theoretical point of view. *Systemic Practice and Action Research* **19**(5): 441-459
- Georgiou I, Zahn C, Meira BJ (2008) A systemic framework for case-based classroom experiential learning. *Systems Research and Behavioral Science* **25**(6): 807-819
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## *About the Author*

Ion Georgiou has taught and undertaken research at the London School of Economics, Kingston University (UK), the Russian Academy of National Economy in Moscow, Zaragoza University in Spain, the Universidade Estadual do Sudoeste da Bahia, and the Faculdade de Tecnologia e Ciências, Bahia. In January 2005, he joined the São Paulo School of Business Administration of the Getulio Vargas Foundation as Associate Professor. He holds a PhD (Behaviour in Organisations) from Lancaster University, England, a Master of Science (Operational Research) from the London School of Economics, and a Bachelor degree (Business Administration) from the University of Missouri. Proficient in five languages, his professional research interest is focused upon holistic approaches to problems and knowledge. It is founded upon an interdisciplinary theoretical base which spans the history and development of General System Theory and Systems Thinking, the Problem Structuring Methods of operational research, and Husserlian and Sartrean phenomenology. He has published a number of articles on these areas in primary international academic journals and conferences. Forthcoming publications include his book on systemic epistemology, to be published by Routledge in England.

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## *Abstract*

The effective combination of disseminating theoretical knowledge and practical application of problem structuring methods (PSMs) in a classroom setting is a problem about which the relevant literature is silent. In this report, a case study classroom experiential learning pedagogical approach is described which not only guides PSM pedagogy but simultaneously addresses a contemporary pedagogical problem in management education. The report also provides a refined pedagogical framework which can guide the classroom learning process.



Key Words:
Pedagogy, Experiential Learning, Case Method, Problem Structuring Methods, Soft Systems Methodology, Decision Making

# *Introduction*

Problem structuring methods (PSMs) are a distinct and acknowledged part of operational research (OR). Their future, however, is rendered insecure by the lack of published pedagogic guidance for effectively teaching and learning them. In June 2005, the author submitted to GVPesquisa a report entitled *Classroom Experiential Learning of Problem Structuring Methods: the Need, the Possibilities, and a General Framework.* That document largely set the theoretical basis for future research on effective teaching of PSMs in the classroom.

The June 2005 report achieved three things:

1. When consulting the literature on PSM theory and practice, the deduction of any number of classroom pedagogic frameworks was demonstrated as not necessarily being a difficult task. This literature, however, provided no pointers as to how a classroom *experiential* learning exercise can be designed to promote the teaching of PSMs. As such, the teaching of PSMs, based singularly on their current literature, was identified as largely a theoretical exercise. The weakness and consequences of maintaining this *status quo* were discussed.
2. By sampling the reported use of classroom experiential learning in the general management literature, a preliminary listing and categorization of the extensive possibilities for classroom experiential learning of PSMs were identified.
3. In developing a general pedagogic framework for classroom experiential learning, case studies were identified as a primary tool for the furtherance of such learning. The report noted, however, that, given the manner in which the 'alternative paradigm' of PSMs defies the norm of operational research, the type of case study for the experiential learning in question might also be one which defies the norm.

The report submitted to GVPesquisa in June 2005 was converted into a paper and submitted to the *Journal of the Operational Research Society.* The submission was returned with a detailed and very useful referee report. Based on this feedback, part of the paper was re-written and submitted to the journal *Systems Research and Behavioral Science.* At the time of this writing, the journal has confirmed that the submission is currently under peer review.

The present document builds upon the June 2005 report. It provides a case study of the type identified in item (3) above, and discusses what has been learnt through its application in classroom experiential learning environments which fit the general pedagogic framework identified in the June 2005 report. The case study in question has been applied, by the author, during the first and second semesters of 2005 at FGV-EAESP. It has previously been applied by the author at Kingston University[1] (UK), the Academy of National Economy[2] (AHX, Moscow, Russia), and the Faculdade de Tecnologia e Ciências[3] (Bahia). This international undergraduate and postgraduate experience constitutes a rich data set whose analysis can not only generate rich insights into the practicality of the pedagogic framework detailed in the June 2005 report, but also into the general practice of PSMs.

A number of conceptual foci guided the manner in which the available research material was analyzed:

- To begin with, it had to be shown how and why the case study in question invited PSMs in order to resolve it;
- Second, learners'/students' experiences had to be analyzed in order to provide insights of their learning progress in applying PSMs to the case;
- Third, it was deemed relevant to report on general issues of the application in the classroom environment, if only to provide a feel for what happened or can happen, and to thus promote confidence that the possibilities are transformable to effective reality;
- Fourth, any new theoretical, conceptual or practical insights into PSMs were sought as a major product of the research; and,
- Finally, given the new research findings, it was deemed relevant to develop and refine the pedagogical framework discussed in the June 2005 report.

In addition, although the objective was not to write a teaching manual on PSM classroom applications, provision had to be made for pedagogical insights which could guide instructors especially in terms of pedagogical process. Incorporating results from concentrating on these foci constituted a formidable task. The working material

[1] Diploma in Management students – CEAG equivalent.

[2] Executive MBA students.

[3] Undergraduate students.

exceeded 300 pages requiring qualitative and quantitative analysis. In the main, the qualitative analysis yielded insights at almost every turn. This led to versions of the final report exceeding reasonable length. A discipline of condensing results without losing valuable insights was, therefore, adopted – in essence, the practice required of all good report writing and journal publications.

The result is a two-part report accompanied by a series of tables, figures and boxes[4]. The first four items in the above list are tackled in Part One. Further developments and refinements of the original pedagogic framework (the final item in the above list) are discussed in Part Two. It is fair to note that the results reported in Part One exceeded initial expectations. Not only do the results reflect the conceptual foci above; a distinct and workable answer is provided to a general pedagogical problem posed by highly respected American academics in a 2005 issue of the *Harvard Business Review.* As such, the report has been able to furnish valuable results on classroom experiential learning of PSMs, and simultaneously address one of the main pedagogical challenges to contemporary management education.

[4] After experimenting with a number of presentation formats, it was deemed more presentable to group the tables, figures and boxes in an Annex at the end of the document. The first reference to each of these items is highlighted in **bold** within the body of the text.

# *PART ONE: Making Decisions in the Absence of Clear Facts*

The effectiveness of a decision maker is not demonstrated through access to better or more information. Effectiveness is demonstrated in an ability to use, more resourcefully, whatever limited information is available, and to portray its implications more usefully. Part One demonstrates how decision makers can make systemic decisions in situations characterized by extremely limited information and, furthermore, what form such decisions take.

> *In the post-modern world*
> *hard-systems problems are the central issues of the past*
> *and soft-systems situations are the key concerns of the future.*
> *(Kay and Foster, 1999)*

## The Contemporary Challenge

In his classic work on system dynamics, Jay Forrester (1961:117) writes:

> The power of system dynamics models does not come from access to better information than the manager has. Their power lies in their ability to use more of the same information and to portray more usefully its implications.

This is a claim concerning the effectiveness of system dynamics models as decision support systems. Forrester contends that system dynamics models enable the decision maker to use, with greater effectiveness, whatever limited information is available in a problematic situation, and in addition they help portray the implications of this limited information more usefully. Given that this minimizes the costly need to gather additional information, system dynamics models are implicitly presented as efficient decision support systems.

Also implicit in this claim is that the effectiveness of a decision maker is not demonstrated through access to better or more information: the effectiveness of a decision maker is demonstrated in an ability to use, more resourcefully, whatever limited information is available, and to portray its implications more usefully. In Forrester's case, system dynamics is offered as an approach which can assist a decision maker to realize such effectiveness.

Consider, however, a decision maker who can demonstrate effectiveness irrespective of whether system dynamics is used or not. Since the acquisition of more information can be costly, such a decision maker may well be in high demand. Furthermore, information procurement is time-consuming, and the delay is compounded by the time required to complete the meta-level decision process which addresses procurement in the first place (Grünig and Kühn, 2005: 181-195). In a world where 'the ability to learn *faster* than competitors may be the only sustainable competitive advantage' (de Geus, 1988), the decision maker in question may likely be the key to the survival of any organized entity (corporate or otherwise). In this respect, Bennis and O'Toole (2005) point out what is required:

> Executive decision makers are not fact collectors; they are fact users and integrators. Thus, what they need from educators is help in understanding how to interpret facts and guidance from experienced teachers in *making decisions in the absence of clear facts.* (italics added)

What is at issue here is the versatile use and portrayal of limited data, or information, with a view to construct knowledge, enable learning, and inform action. Knowledge management, concerned with practicable 'ways of disseminating and leveraging knowledge in order to enhance organizational performance' (Easterby-Smith and Lyles, 2003: 3), is the field which should address this challenge. An effective decision maker, in other words, should be one who can *do* knowledge management resourcefully in the absence of complete information. The field of knowledge management, however, appears insufficiently prepared to tackle the challenge, as evidenced by Kawalek's (2004) disturbing conclusion:

> [W]hen investigating the conceptual literature on knowledge management it seems that it is burgeoning with viewpoints that overlap, and commonly contradict each other… the literature has not provided *methodological* guidance for *doing* knowledge management (i.e. managing knowledge), without which knowledge management is fated to remain ill-defined, open to misinterpretation and sometimes abuse by unscrupulous practitioners… there are quite significant differences between the writers on knowledge management, and following each will lead to quite different approaches to knowledge management practice… While the knowledge management literature presents many insightful points, definitions and analyses, none inspire confidence that successful management of knowledge will result (or is even possible) as a result of a process of selecting from these insights.

Moreover, the challenge is compounded by the growing demand for decisions to address the holistic or *systemic* nature of problem situations. Consider a few examples of this emerging demand. In his 2002 annual review Nick Land, Chairman of Ernst & Young, concluded that:

> The root cause of corporate collapse and scandals in companies like Enron and WorldCom was not audit failure. They came about because of *systemic* failure in the US around corporate governance and transparency, accounting standards and regulation, and, perhaps most importantly, as a result of greed.[5]

On 18 October 2005, New York Federal Reserve President Timothy Geithner expressed his concern over a developing paradox: whilst increased complexity of financial systems reduces the individual vulnerability of firms, it compounds uncertainty as to

[5] Ernst & Young's chairman's review of the year 2002, as reported on the firm's internet website at the following URL: http://www.ey.com/global/content.nsf/UK/UK_Annual_Review_2002_-_Chairmans_review (accessed 23 October 2005)

how the financial system as a whole might function in the context of a *systemic* shock from hedge funds and other unregulated institutions.[6]

The Inquiry into the 1997 Southall rail disaster in the United Kingdom found that 'it would be wrong to concentrate on the failings of the driver when there is compelling evidence of serious *systemic* failings within Great Western [Trains]'[7] – failings further attributed to the rail industry as a whole by one of the companies recently prosecuted for the October 2000 Hatfield crash.[8]

Setting up an alert on the Google News Internet site for the keyword *systemic* yields, on average, three to four alerts per week. Addressing systemicity is obviously *dans l'aire du temps.* In the words of general system theorist Ludwig von Bertalanffy (1968: 3),

> if someone were to analyze current notions and fashionable catchwords, he would find 'systems' high on the list.

A decision maker who can simply plan or solve systemically, however, is not enough. For if effectiveness is measured by more resourceful use of *limited* information, what is required is a decision maker who can meet the challenge of the paradoxical demand for useful and practical *systemic* results in the face of *partial* information, or equally, for implementable wholes in the face of informational incompleteness. **Figure 1** summarizes the argument which leads to this demand.

The first part of this report demonstrates how a well-established systemic approach provides a process for extracting knowledge from limited information, enables the construction of a systemic plan based upon such knowledge, and hence realizes effective and efficient *systemic* use of available knowledge. As a result, the paradoxical demand for useful and practical *systemic* results in the face of *partial* information is met. What is thus demonstrated is how decision makers can make systemic decisions in the absence of clear facts and, furthermore, what form such decisions can take.

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[6] As reported by Reuters on 18 October 2005, in an article entitled "Fed's Geithner: Market changes have altered risk" at the following URL:
http://today.reuters.com/investing/financeArticle.aspx?type=bondsNews&storyID=2005-10-18T200837Z_01_N18235770_RTRIDST_0_ECONOMY-FED-GEITHNER-UPDATE-1.XML

[7] As reported on the BBC Internet site on 21 December 1999 in a report entitled *Rail Managers Rebuked Over 'Catalogue of Errors* at the following URL:
http://news.bbc.co.uk/hi/english/uk/newsid_573000/573740.stm

[8] As reported by the British newspaper *The Daily Telegraph* on 8 October 2005 in an article entitled "Companies fined £13.5m for Hatfield crash" at the following URL:
http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2005/10/08/nhatfield08.xml

## Preliminaries

Over thirty years ago, Belasco, Glassman, and Alutto (1973) designed problem cases, for pedagogic use in the classroom, which simulated four simultaneous characteristics that decision makers commonly face:

- the task is ambiguous;
- the structure through which the task might be accomplished is loosely defined;
- the standard against which success is to be measured remains unstable; and,
- knowledge of the organizational and wider environments remains uncertain.

In accordance with the problem-case instructional approach (Böcker, 1987; Cochran, 2000) the instructors, on each occasion, asked the students to identify the critical issues in the case, decide what methods are appropriate and use them, and ultimately interpret the results of analysis and suggest a plan of implementation. The instructors' aim, in other words, was to teach decision making effectiveness in situations characterized by limited information, where time and resources are no longer available to collect more information, yet where a resolution is nevertheless required based upon the information available.

Belasco, Glassman, and Alutto indicated that substantive decisions were possible under such circumstances. They make no mention of *systemic* decisions, however. Furthermore their paper provides few details of how to make decisions under the stipulated circumstances and what form these decisions can take. Cochran (2000) and Bell and von Lanzenauer (2000) provide an answer to the latter question: in a controlled training environment, such as a classroom, the objective with problem cases is not so much to *solve* them but to *plan* for the immediate future. Decisions, therefore, come in the form of plans – what may be termed *planning as decision making*.

In order to get that far, however, the decision maker - and, equally, the instructor attempting to teach decision making in situations lacking clear facts - faces a non-trivial task. First, given sparse knowledge of a problem situation, what is required is a way to extract information from it. Second, if such information can indeed be extracted, a manner of structuring it is required which enables rigorous problem definition. Finally, even if a rigorous problem definition can indeed emerge from the situational ambiguity, looseness, instability and uncertainty exemplified by Belasco, Glassman and Alutto,

some process, or method, is required which can use the definition to inform a systemic approach toward resolution. It may be added that the development of an implementable systemic plan itself requires a method for its realization. For the instructor, meeting these requirements would enable the stipulation of those conceptual tools which can be taught for making systemic decisions in the absence of clear facts. For the decision maker facing the aforementioned challenge, knowledge of these tools would provide significant empowerment.

Consider, therefore, a problem case which exhibits all four of the characteristics set by Belasco, Glassman, and Alutto. Such a case is given in **Box 1**. It is clearly, and purposely so, a situation lacking in clear facts. Indeed, the sparseness of the case may be viewed as too extreme to result in any observable decision making effectiveness, let alone serve for any pedagogic value. In this respect, it serves the present purposes very well. For if it is possible to demonstrate, through this rather extreme example, that valuable information can indeed be extracted, structured, and also lead to resourceful systemic planning, guidance will have been provided as to how to make decisions in the absence of clear facts.

Prior to the demonstration, it is only fair to note that this problem case has been used (by the author) to teach decision making in information poor contexts. Five such uses have been made between the years 1999 and 2005, in three very different geographical and cultural regions (Britain, Russia and Brazil) and across three degree levels (undergraduate, postgraduate, and executive MBA). What follows is a summary of the major theoretical insights accompanied by some highlights of practical results stemming from these applications. What they indicate is that it is possible to make systemic and significantly informed decisions in the absence of clear facts. Ultimately, a particular outcome has been realized: the design of useful, practical and perceptibly implementable *systemic* plans in the face of *partial* information.

## Extracting and Structuring Information

A first sweep through the case yields more or less the following. The operations manager clearly visualizes that any solution to his dilemma must not sacrifice certain key variables in favor of others. *Quality*, for example, cannot be traded-off against *customer care* or *capacity*, and *operational strategy* seems not to enjoy any privileged, governing position high above the other ‘relevant concepts’. There is, in other words, no

single objective but multiple and simultaneous objectives measurable on respectively separate dimensions. The case is also constituted by multiple stakeholders, not necessarily hierarchically related and not necessarily in consensus with one another, whose respective decisions impact, in varying degrees, upon the situation: for example the *manager* himself, the *team* he manages, his organization's *customers* who are explicitly identified as having businesses, his organization's *clients* who are explicitly identified as having expectations, and the *external specialist organizations* (ESOs) which seem to have a say in staff role allocation and target markets. The fact that some 'negotiation' (with the ESOs) has been deemed as required also signifies that qualitative or social judgments are of some importance to the situation, calling for their integration with any quantitatively based decisions.

What have been underlined in this brief, still limited, understanding are situational characteristics for which Rosenhead's (1989) 'alternative paradigm', and the *problem structuring methods* (PSMs) it underpins, was designed. PSMs are approaches designed to deal with irreducible levels of uncertainty, complexity, and conflict and with risks which such variables imply. In line with the aforementioned *planning as decision making* objective, the essential practice of PSMs is to enable structured exploration of solution spaces in order to help actors draw up equally structured plans for future action (Rosenhead, 1996). Planning is an essential methodological part of PSMs, as can be appreciated by consulting a recent review of the methods (Mingers and Rosenhead, 2004) where the term appears no less than fifty times. In addition, PSMs are also beginning to be explicitly appreciated as support systems for organizational learning and knowledge management (Rosenhead and Mingers, 2001a: 315-334).

Still, demonstrating the relevance of PSMs to the case resolution would at least require, in accordance with their mission (Rosenhead, 1989), the demonstration that they (or any one of them) can identify and structure whatever uncertainty, complexity and conflict there is in the case. Furthermore, even if this is possible from the case as given, one would still need to decide, and justify, which of the PSMs address more directly than others decision making effectiveness in conditions of (extremely) limited information. Since the situation at least indicates the use of PSMs, it is worth exploring these two issues.

## *Identifying Uncertainty, Complexity, and Conflict*

The uncertainty evident in the case stems, in line with Rosenhead (2001a), from the unavailability, doubtful solidity, or unobtainability *of information.* This may be termed the situation's *inherent uncertainty*. Friend (2001), in explicating his Strategic Choice Approach (SCA), notes that uncertainty also arises in proportion to the level of *intuitive effort* necessarily required of the actors when dealing with limited information. Intuitive understanding, though necessary, should be controlled so that its conjectures do not inadvertently compound the inherent situational uncertainty. Friend proposes a categorization of inherent uncertainty which focuses intuitive effort and thus contributes to more resourceful contextual understanding and sharper use of available information.

The first such categorization – stated as *uncertainties pertaining to the working environment* - is labeled *UE* and refers to that uncertainty which demands more accurate information. Friend provides some examples of the manner in which such information may be sought: through surveys, research investigations, attempts at forecasting, and requests for detailed estimations. He qualifies his examples, however, by noting that the process of information gathering may be as informal as a conversation and as technical and elaborate as an exercise in mathematical programming. In other words, the *process* of information gathering is secondary to the *quality* of the information gathered, although the former *may* influence the latter. This view underpins all three of Friend's uncertainty categorizations. *UE*, is the most general of Friend's three categorizations and therefore is identifiable as the type most prevalent in the case. **Table 1** presents some results in this respect.

The second categorization of uncertainty – stated as *uncertainties pertaining to guiding values* - is labeled *UV*. It refers to that uncertainty which emerges from politically charged contexts, where the term *politics* is understood broadly to include issues of policy, hierarchy, authority, declared objectives or values, strategy, and general orientation as well as guidance. In addition, this type of uncertainty refers to affected interests and the expectations stemming from respective, and possibly conflicting, agendas, calling for the practice of negotiation and perhaps the management of threats. Two areas of the case appear to be marked by *UV*, as can be appreciated from the results of the analysis in Table 1.

The third categorization of uncertainty is labeled *UR* and refers to the structural links between respective decision points or spaces. Friend has alternately titled this categorization as *uncertainties about choices on related agendas* (2001) and as *uncertainties pertaining to related decision fields* (1989). Based upon his descriptions (Friend and Hickling, 2005), however, the categorization itself may more succinctly be expressed as *uncertainties pertaining to structural relations between decision junctures* (or decision events). In essence, *UR* is uncertainty about how decisions in one area may affect decisions in other areas. As such, it is an uncertainty closely related to complexity.

Table 1 provides a summary of the analysis of uncertainty based upon Friend's three categories. It may be appreciated that the results reflect a distinct effort to remain within the boundaries of what is knowable. What begun as a situation lacking information, however, appears to be yielding some degree of useful and relevant understanding.

As to complexity itself, it is basically understood as emerging from densely interconnected networks in which decisions undertaken in one part have wider ramifications within, and perhaps outside, such networks (Rosenhead and Mingers, 2001b). Ackoff (1979) defines it in concise terms: complexity emerges from dynamic situations constituted by interacting systems of changing problems. That is, the degree of complexity is not only proportional to the level of dynamism exhibited in situations, but also to the level of interaction between constitutive systems/elemental arrangements, and, further, to the degree to which system parts themselves change. The greater the number of states or behaviors that a system can exhibit, the greater the evident complexity (Mingers and Rosenhead, 2001b). From a soft systems perspective, moreover, complexity is compounded due to dynamic interacting systems of changing *perceptions* (Checkland, 1999). Thus, on the strategic level, complexity is deemed to arise less from the sheer number of observable options available than from the interactions between different decision makers (Mingers and Rosenhead, 2001a).

**Table 2** presents the results of an analysis of complexity in the case. Interestingly, Segments 11 and 12 now betray a relatively dense interconnected network of elements, in which decisions undertaken in one part have wider ramifications within and outside the organization. The identification of complexity, in other words, has already highlighted an area of the case which will require systemic treatment (its basic

infrastructure is illustrated in **Figure 2**). This adds support to the idea of applying PSMs to the case in attempting to realize *systemic* decision making effectiveness.

It is upon human interactions that conflict, finally, is focused. PSM theory broadly contrasts conflict with cooperation (Rosenhead, 2001b), the underlying expectation being that conflict be addressed in the service of potential cooperation. However, the management of conflict need not singularly aim toward cooperation. Bennett, Bryant, and Howard (2001) note that the management of conflict requires at best knowledge, or at least inferences, of the positions of each of the decision makers, as well as of their respective fallback options. When analyzing positions and fallback options, the authors note that the management of conflict may take different forms such as deterrence, inducement or threat. Deterrence, furthermore, need not refer directly to the opposing party but also to attempts to subjugate existent systemic designs by *redesigning* the system in which the parties have become embroiled. An arms race, for example, need not only exhibit deterrent activities which focus upon the potential defeat of the other country; it may also exhibit activities aimed at deterring the possible continuation of the system which promotes the build-up of arms.

In comparison with uncertainty and complexity, conflict is more directly associated with the distinctly human influence upon situations, for it is understood as arising from pre-existing interpersonal relations, incompatible personal styles, but also from the diversity of interests represented (Mingers and Rosenhead, 2001a). As such, an underlying aim is to promote a degree of dialogue or negotiation which can act as the basis for addressing conflict. Based upon the above understanding, there are two apparent areas in the case where conflict might be an issue, and comments on them are found in Table 2.

Tables 1 and 2, along with Figure 2, offer a basis for the relevance of PSM applicability. Uncertainty, complexity and conflict have been identified, defined, structured and situated within the case. The analysis has generated a rich set of insights which, arguably, seemed impossible upon first contact with the case. Given this first positive result for knowledge management effectiveness, it is worth considering whether any one of the PSMs (or mixture thereof) can facilitate decision making effectiveness given the informational limitations of the case in question.

## *Delineating the Choice of Applicable PSMs*

It is noteworthy that the case allows for relatively few structural assumptions about the situation. No prioritization among seemingly important factors is given, for instance, and key aspects appear to be equally necessary, though treatable on respectively different dimensions. As such, the most relevant of PSMs will be those which reflect the rather open-ended nature of the case as given, allowing for variations of interpretations about what is going on, whilst simultaneously promising to provide guidance for future action based on what is given. If on the one hand, however, an imperfectly known situation opens the doors to wide interpretations, ambiguity, on the other, constrains the degrees of freedom allowed in interpretation. Care should be taken not to introduce assumptions which do not fall within the framework of the situation as given. A certain degree of mental discipline, or interpretative rigor, is called for when conceptually framing the situation, avoiding any suggestions or conclusions which are not clearly within the bounds of what is given. The risks of not adhering to this are tantamount to resolving an irrelevant, imaginary, nonexistent, or wrong problem.

Decision making effectiveness, in other words, will emerge in proportion to the deduction of significant information which respects the degrees of allowable interpretative freedom relevant to the situation. *Significant information*, in turn, may be understood not only as information which is interpretatively sound, but as information which effectively serves the interests of the management of uncertainty inherent in the situation, and thus ultimately renders the decision maker tangibly better informed and better equipped to deal with the situation.

The results thus far indicate that much less is knowable about any inherent conflict in the situation than about uncertainty types and complexity. Decision making in this case, therefore, must focus upon the management of uncertainty and complexity. Of the mainstream PSMs (Rosenhead, 1989; Rosenhead and Mingers, 2001a), four deal with uncertainty *and* complexity in relatively greater depth: Strategic Options Development and Analysis (SODA), Soft Systems Methodology (SSM), Strategic Choice Approach (SCA), and Robustness Analysis. Of the four, SODA and SSM are better equipped to tackle high levels of variability in interpretations.

SODA would require for the case study to be mapped and, additionally, cognitive mapping could be used by the learners on themselves in order to make their

understanding explicit. However, basic situational structural assumptions are required in order to design the layout of cognitive maps (Eden and Ackerman, 2001), and it is not clear whether the limited data of the case allow for such assumptions. Furthermore, and notwithstanding SODA's established relationship to systemic modeling (Williams *et al*, 1995), its literature lacks a clear-cut route to rigorous problem definition as well as a clearly identifiable approach to planning which could stimulate actors to move toward decisions. SCA goes a long way to addressing the latter requirement, through its *commitment package* concept, but it lacks mechanisms for systemic decision making. SSM, on the other hand, provides a clear approach to rigorous problem definition which ultimately leads to systemic decision making.

SSM (Checkland, 1999) begins by requiring decision makers to focus upon certain aspects of a situation: the actors in the situation, their power, and the perceived socio-cultural dynamics of the problematic situation and its organizational context (respectively termed Analysis 1, 3 and 2). In so doing, it is possible to generate and structure a significant amount of information. Consider, for instance, the student results in **Tables 3, 4 and 5**. It is encouraging to find how much information has been gleaned and structured from a seemingly elementary exercise in focused thinking which essentially results in three respective lists. Unhindered by methodological concepts or rules, students go on to produce quite elaborate rich pictures as recommended by SSM (Lewis, 1992; Monk and Howard, 1998). This yields new insights and more profound understanding of the case in question, thus building confidence that some sort of progress is possible.

The evidence, in other words, points to the use of SSM as especially effective in extracting and structuring information from limited data. Indeed, the literature itself indicates that SSM 'can be exploited to produce information superior to that obtained through using conventional methods' (Brocklesby, 1995). Decision making effectiveness is furthermore promoted because SSM *qua* methodology is flexible to use but simultaneously provides a 'rigorous approach to the subjective' (Checkland, 1999: A43; Rose and Haynes, 1999). This seemingly paradoxical mix of rigor-in-flexibility also facilitates systemic planning:

> Soft Systems Methodology offers a rigour and discipline which automatically forces systemic thinking over and above received "textbook" wisdom or entrenched custom and practice. (Bolton and Gold, 1994)

Rigor has already been noted as especially important to maintain in information-poor situations. How SSM promotes such rigor is discussed below. What is also demonstrated is how SSM is able to address the paradoxical demand for useful and practical *systemic* results in the face of *partial* information – an ability which its literature has not investigated.

## Understanding SSM

Teaching SSM as a tool for information-poor contexts has afforded a reconfiguration of the methodology which complements the established configurations delineated, for instance, by Rose (1997) and Checkland (1999, 2000). Some would argue that aspects of this reconfiguration do not reflect the methodology's purpose or design (Holwell, 2000). In particular, critique could be directed to steps 'one' and 'three' of the reconfiguration described below – the former for including an analysis of uncertainty, complexity, and conflict which technically does not belong to SSM, and the latter for not stressing the dialectical use of a modeling technique. Additionally, certain terms used are new to SSM. Given, however, that SSM has always been offered as a methodology and not a method, there is arguably no defense for purists. SSM is available to be used in whole (Checkland, 1985), or in part or in conjunction with other approaches (Ormerod, 1995; Mingers and Gill, 1997, Horlick-Jones *et al*, 2001). Indeed, that SSM can be used so advantageously strengthens its transferability and relevance to decision making. The objective here is not to explain SSM, since detailed explanations are available in the literature (Checkland, 1989, 1999, 2001). The objective is to indicate how it has been, and can be, used to yield systemic understanding and action plans in the face of incomplete information. If, on occasion, the discussion focuses upon methodological points, it is because they are pertinent to this objective.

Essentially, SSM can be reconfigured into a three-step process as illustrated in **Figure 3**. A perspective on decision making is implicit in the figure. Decision makers have three main objectives: to produce knowledge concerning the context of a problematic situation from whatever limited or limiting sources are available, to apply it in the service of problem definition, and ultimately to plan systemically for action. The realization of each of these objectives produces, as a matter of course, respective outputs: contextual knowledge, the problem definition, and the systemic plans. They are housed in respective repositories. The term *database* is adopted in the figure to indicate

such repositories. It is used in the broadest sense as opposed to the limited technological meaning it has come to acquire. In essence, the three-step model serves as a solid conceptual foundation which can inform practice and, as discussed below, provides a systematic process which yields systemic plans.

## *Step One: Building a Knowledge Database*

To begin with, there are tools for extracting contextual information and building what may be termed a *knowledge database* of a situation. This is done through Analyses 1, 2, and 3, and rich pictures. Other tools external to SSM – such as Friend's earlier categorization of uncertainties and the incorporation of sourced understandings of complexity and conflict – provide useful contributions. Tables 1 through 5 are examples of some items constitutive of a knowledge database, as discussed in some detail earlier. The development of this first database provides the basis for defining the problem in specific terms in step two.

## *Step Two: Building an Application Database*

Due to the ambiguity surrounding the term *problem* (Mitchell, 1993: 49-58; Ho and Sculli, 1994), defining a problem more specifically requires particular conceptual tools. Fortunately SSM provides a logic which allows users to stipulate problems in a fairly exact manner. In essence the logic says: (1) a problematic situation implies an undesirable state which needs to be *transformed* into a desirable state; (2) identify, therefore, the transformations evidently required in the problematic situation; (3) taken together, these transformations simultaneously define the problem and the desirable state.

By providing rigorous, yet almost commonsensical, rules for identifying and dealing with transformations (Checkland, 1989), SSM bypasses the difficulty of articulating desirable, but often ambiguously conceptualized, states and, instead, helps to plan relatively clearly conceptualized transformations. The focal reduction from states to transformations, and the clear conceptualization this yields, is crucial for lucid decision making and effective problem solving. The transformation rules are given in **Box 2**.

Dealing with transformations, then, is constitutive of the second step of the three-step SSM reconfiguration. A list of evident transformations is first deduced from a problematic situation. Such a list for the case is provided in **Table 6**. Each

transformation is stated in terms of two parts separated by a hyphen. The left hand side states what is to be transformed. The right hand side stipulates to what the left hand side is to be transformed. As such, a list of transformations simultaneously defines the constitution of the problem (on the left hand side of the hyphen) as well as indicates the desirable state to be realized (on the right hand side).

In accordance with the heuristic principle of subgoal-reduction (Grünig and Kühn, 2005: 78), higher-level and lower-level transformations should be identified, with those on lower levels generally being more amenable to accurate planning. T2 in Table 6, for instance, would in effect be a product of dealing with more concrete transformations such as those evident in S4: deal with the latter transformations and the former emerges as a matter of course (*emerges* being a key word here, since T2 appears as meaningful only in light of a complex of lower-level transformations conceptualized together).

Any transformation does not occur in isolation. It is situated in an environment comprised of numerous factors, including other transformations. This might sound obvious but it is often overlooked. For example, most initial thoughts as to what *poorer quality* (T6 in Table 6) should be transformed are *higher quality* or *better quality* or even *total quality*. Such responses say more about students' educational indoctrination and less about their intellectual capabilities. The social construction of TQM for instance (Zbaracki, 1998), has learners commonly turn to this as *the* unquestioned expected solution to a quality problem. One may also sympathize with the use of terms such as *higher* or *better* which indicate a felt need for improvement, but they remain vague in themselves. Responses such as these, in other words, do not contribute to effective management of the ambiguity already at hand, if only because they do not stipulate acceptable levels of improvement. For, no matter the rhetorical desire toward achieving ever-higher quality, the handling of situations is always governed by levels of effort beyond which it is deemed, for a variety of reasons, unnecessary to venture. In the absence of clear criteria, only rigorous interpretation of the limited information yields a firm idea of what may be deemed acceptable. This is illustrated in the note to T6 in Table 6, whose conclusion fits in well with the *conservative* culture identified in the socio-cultural analysis of Table 4. Given the transformation's stipulated desirable state, attention to context, in this case, has provided for a more specific, and perhaps much more relevant, path toward resolution.

Thus, when dealing with incomplete information, attention to whatever contextual information is available can yield well-founded interpretations toward resolutions which can realize the right hand side of transformations. What is required, therefore, is a conceptual tool for effectively contextualizing transformations. SSM provides this conceptual tool in its mnemonic CATWOE (Smyth and Checkland, 1976; Checkland 1999: 225-227). Essentially, the mnemonic incorporates the identified transformation and subsequently forces five questions, answers to which are deemed necessary if a transformation is to begin to be understood contextually. **Box 3** highlights these questions. They ask for the identification of the various players involved in the transformation, according to their roles. Also asked is a reason which justifies the transformation – termed *Weltanschauung* from the German for (roughly) world-view or perspective. In addition, information is requested regarding environmental restrictions directly impacting upon the transformation – that is to say, proximate restrictions to this particular transformation and not general, overarching ones which might be seen as impacting upon the problematic situation as a whole.

Box 3 also highlights some elements of the *knowledge database* which help inform the CATWOE. It is worth noting that Analysis 2 also helps choose which transformations are more implementable than others by contributing information which helps decide on their operational/systemic desirability and cultural feasibility – two practical issues emphasized by Checkland (1985; 1999: 180-183; Yolles, 1999: 323-324). In effect, step two of the three-step SSM reconfiguration *applies* the knowledge stored in the first database to transformation identification and contextualization, thus the term *application database* for the repository in this step.

It is helpful to appreciate the structure of a CATWOE. At its core lie *transformation* (T) and *Weltanschauung* (W). Once T has been identified, it may usually be considered a constant. W, however, is changeable. Many perspectives can be brought to bear upon any particular T, and any one of them could serve as a justification of T. More significantly, each W will imply a different way of realizing T and, consequently, different results which T could yield. One T, in other words, can be matched with many Ws.

Consider a simple example of a transformation which might be considered by a university professor when contemplating the manner in which he organizes his research materials: *card-index research database – computerized research database*. One

possible *Weltanschauung* here could be that a computerized database speeds up research work, and in general renders it more efficient. Another equally viable *Weltanschauung*, however, could be that a computerized database makes it easier to take on trips to conferences because it can be saved and used in a laptop computer.

In both cases, the transformation is the same. In one case, however, the transformation will be designed especially against criteria of speed and efficiency of use. A transformation designed according to this *Weltanschauung*, in other words, will be considered a success if it surpasses the card-index system on these criteria. The other *Weltanschauung* focuses upon portability. This in no way implies the inclusion of speed and efficiency in the computerized design. It merely asks for the card-index to be translated into a basic computer program which allows for the database to be used on a computer instead of a card-index. Whether this renders the database faster or more efficient is neither here nor there. The fact that any computerized creation of a manual system will require various reconfigurations of the latter when translated into digital form is, also, secondary.

In brief, W is the heart of the CATWOE from which stem decisions as to who will be C, A and O, and what sort of environmental restrictions will actually be acknowledged as relevant (Checkland and Davies, 1983). *Weltanschauung* governs the design, realization and outputs of the eventual system which will undertake the transformation – *show me your Weltanschauung and I'll show you your world,* so to speak.

Addressing the CATWOE yields a list of contextualizing elements corresponding to each letter of the mnemonic. One such list is included in Figure 6 (which figure will be addressed in full shortly). Although lists are useful, it is difficult - especially for third parties - to gain an *integrated* understanding of their elements. Behind the creation of any list, there is some idea of what it means as a whole. SSM, therefore, requires such integral understanding to be made explicit in the form of a logical, tightly-structured statement known as a *root definition*. In essence, the root definition states what is required of the transformation as set within a particular context (constituted by C, A, O and E) and as driven by some intention (W). The utility of the root definition, therefore, lies in its being able to describe what the elements of the CATWOE point toward. As such, the root definition may be seen as a planning statement which provides an overarching description of the system that will realize the respective transformation. SSM provides quite detailed guidelines for the drafting of such statements (Checkland

and Tsouvalis, 1997; Checkland, 1999: 221-228), ensuring as far as possible a description which can guide systemic planning. An example is included in Figure 6.

In summary, there is a variety of information which needs to be stored in the application database. The problem situation is first translated into a series of transformations in order to enable more exact understanding of the problem. The structural manner of stipulating transformations (left hand side, dash, right hand side) serves to define constitutive problems as well as indicate respective desirable states. Taken as a complete list, transformations serve to define the problematic situation as a whole, as well as point to the overall desired state. Transformations must be graded and contextualized if realistic planning is to materialize. A central aspect affecting contextualization is the manner in which any number of *Weltanschauungen* can impact upon a single transformation. Finally, each contextualized transformation is transcribed into a one-sentence description which acts as an overarching planning statement to guide the systemic planning of that transformation.

## *Step Three: Building a Systems Database*

In Steps One and Two, all analysis has been based on what can be gathered about the present situation. By contrast the focus of Step Three is about systemically planning for the future. It thus involves using the knowledge gathered in the two previous databases to make an informed leap into that future. With only incomplete information to begin with, the shorter the leap the more solid the plan. Thus, short-term planning is recommended. As will be shown, however, short-term *systemic* planning minimizes unforeseen systemicity and can thus yield more profound insights than usually expected of a short-term focus.

In the first instance, systemic planning focuses upon planning individual systems for effecting respective transformations. This involves the listing of activities which could reasonably by seen to effectuate each transformation. This list is then translated into what SSM terms *conceptual models*, or better, *human activity systems* - for a conceptual model is a systemic model of human action, comprised of specified interlinked activities, to be taken in order to realize a particular transformation (Checkland and Tsouvalis, 1997). Dependency links and influences are identified between activities and serve to guide the construction of these systems. **Figure 4** provides an abstract

illustration of two such individual systems, each composed of particular activities and associated with respective transformations.

Checkland (2000) stresses that human activity systems should be used to structure debate about change. No doubt this is true. Given, however, that debate is based upon versions of a human activity system, there results, once debate reaches a level of agreement or accommodation, a final human activity system as a plan of what needs to be done. Ultimately, therefore, human activity systems provide in themselves useful systemic action plans.

Initially, then, individual human activity systems are constructed corresponding to each of the contextualized transformations in the application database. The information limitations and inherent complexity of a problematic situation, however, will more than usually render common activities between any number of individual human activity systems – this occurrence is illustrated in Figure 4 whereby the systems planned to realize the transformations include a common activity: Activity 3. For each set of commonalities, all but one are erased. Links are drawn to and from the one remaining, as required. This practice may be termed *analytical linking*. **Figure 5** illustrates the result based upon Figure 4. Analytical linking not only highlights that two transformations are related, but it also helps to identify how they are related. In the illustration, Activities 2 *and* 7 will inform Activity 3, and this latter cannot be undertaken effectively unless *both* of the other two activities are taken into account. It allows for holistic appreciation of multiple transformations and activities by making explicit inter-transformational dependence. In effect, analytical linking adds structural relationships *between* individual human activity systems and changes structural relationships *within* each of them.

Analytical linking automatically renders a systemic plan, or what may be termed a *supersystem*. Supersystems are necessarily constituted by two or more interlinked human activity systems. The design of the supersystem may, however, also invite what may be termed *conceptual links*, that is, those which arise due to interpretation. Since these links have interpretative foundations, however, care must be taken that they fall within the rigorous understanding of the situation which has been maintained thus far. The fact that systemic planning already requires a leap into the future means that this leap must not be needlessly energized through daring interpretations. The more logically argued the conceptual links, the stronger the case to draw them. The temptation to link

everything with everything else must be avoided. Even though the world might indeed be interconnected, its connections are not capricious but specifically routed.

Finally, the stipulation of control criteria is an ever-present issue which must be dealt with throughout the construction of human activity systems (Checkland, 2001). Any system without control criteria cannot be monitored. The pervasiveness of this issue is made evident once individual human activity systems, each with their own control criteria, are linked systemically to form a supersystem requiring its own control criteria. The resulting structural changes and new influences require the revision, or at least reconsideration, of all control criteria. Figure 3, therefore, highlights that the stipulation of control criteria is a continuous task throughout systemic planning. Checkland (1999: A25-A26, A37; Yolles, 1999: 327) subscribes to five key issues which serve to control systems when using SSM for their design. Like in the CATWOE, what is at stake is essentially answering five questions. They are given in **Box 4**, which also highlights an understanding of the organizational focus of each control.

## *From Systematic Process to Systemic Understanding*

Notwithstanding the step-by-step logic of the model, at any point in time, and especially during a particular task within any of the three steps, new insights arise which either require to be added to previous databases or require the revision of current information therein. Information feedback is thus unavoidable in order to ensure resourceful decision making at any particular step.

In essence, the three-step model of SSM offers a systematic series of tasks (or equally, a systematic process), arranged and known in advance for their ability to produce, when followed accordingly, a particular product: a systemic plan. The fact that systematic input thus yields systemic output is of the utmost relevance. For, in the popular mind, systemic thinking is the simultaneous grasping of the whole – a quaint but impossible idea. Systematic thinking, on the other hand, underpins the basic problem solving approach (Mitchell, 1993: 75-86; Grünig and Kühn, 2005). If, therefore, the demand for systemic planning can be met through systematic thinking, this imposes few psychological barriers and simultaneously fulfills a contemporary and growing need. That the three-step SSM model, discussed here, provides this is evidenced by the systemic plans rendered possible by following the process.

Consider briefly, as an example, only one small part of a wider supersystem of the case in question. **Figure 6** provides a human activity system for the transformation *unacceptable time lag in dealing with urgent demand – acceptable time lag;* one possible manner, that is, in which this transformation could be systemically planned. Next, however, when planning for the transformation *uncoordinated approach to service provision – coordinated approach,* it was found that this second human activity system had much in common with the one for *unacceptable time lag.* Linking the two produced the beginnings of a supersystem as in **Figure 7**. There are two immediate insights here.

First, although the planning of a coordinated approach will require (for coordination to be realized) the rates of all three demands, the designers considered the planning of a coordinated approach as secondary to, and furthermore requiring, the resolution of the time lag situation impacting upon urgent demand. Use of the rate of this demand, therefore, can only be made indirectly, that is, once the acceptable time lag for urgent demand has been set. The dotted-line link was used to indicate indirect usage and thus reflect the designers' considerations.

The second insight is the formation of a feedback loop which has been highlighted in thicker arrows in Figure 7 and reconstructed, for clarity, in **Figure 8**. What this feedback indicates is that the time-lag level of acceptance will be incorporated into the coordination planning. The coordinated plan, however, must subsequently be communicated to the organization. This requirement to communicate was interpreted from the hierarchical socio-cultural dynamics of the organization, as identified in Analysis 2 of Table 4. The link, in this case, is therefore conceptual.

Communicating the coordinated plan in this way might, due to the subsequent links already established, influence expectations and lead to changes in the acceptable time lag level and operational strategy. These changes could, in turn, affect coordination planning. The merging of human activity systems, therefore, begins to betray interrelated factors which at first may not have been perceptible.

There results, in other words, systemic information which appeared to be unavailable in the raw data of the case, and yet has been uncovered by following a systematic approach to the situation. Furthermore, this systemic information is conceivably relevant beyond the short-term for it portrays underlying structural dynamics. As such, by focusing only

on the short term, an insight has been provided which can inform any medium-to-long-term plan, decision or action.

The example of the two transformations briefly considered here implies something very powerful in a methodology which can yield such rich insights from very limited information. Far from being invented and going beyond the boundaries of the case given in Box 1, information has been extracted, used and portrayed in a resourceful manner. The result has been knowledge which is interpretatively sound, which effectively serves the interests of the management of uncertainty, and which ultimately renders the decision maker tangibly better informed and better equipped to deal with the situation. Systemic understanding and systemic plans have resulted from applying a systematic process to partial information. The thought processes formalized in the methodology indicate that, where decisions need to be made in information-poor contexts, the decision maker who thinks in terms of SSM might well be the effective decision maker.

## Conclusion

The reality confronted by decision makers can frequently be constituted by ambiguous tasks, loosely defined structures, dynamic standards, and poor information. In having to make decisions in such circumstances, decision makers face a difficult challenge. A slightly reconfigured version of Soft Systems Methodology (SSM) can be exploited to construct knowledge, enable learning, and inform action by resourcefully using whatever limited information is available, and thus portraying its implications for decision making advantage. There results quite elaborate, internally coherent and well-grounded systemic planning. Decision making effectiveness, in this case, is manifested in a plan whose scope is wide enough to render it useful, yet whose footing remains firmly within the limited information available. Under ambiguous circumstances, therefore, decision making is substantiated in planning. The final product itself may additionally be appreciated as a decision map, warning of potential systemic effects, and hence risks, when any one of the activities of the plan is actioned. In this way, uncertainty compounded by complexity is brought under some control and dealing with informational incompleteness becomes manageable.

The reconfiguration of SSM into a three-stage process meets Grünig and Kühn's (2005) criteria for any systematic decision making process. In particular, the reconfiguration can be appreciated as a goal-oriented decision process (the goal being systemic

understanding and systemic action plans), whose deliberations may be evaluated as objectively as possible (due to interpretative rigor, sets of rules and guidelines), and which follows a structured procedure of action using clear methodical rules (manifested in the proposed three-step reconfiguration). The advantage of the SSM reconfiguration presented here, however, is that the systematic decision making process leads to systemically structured action plans. More accurately, the reconfiguration constitutes a systematic problem structuring process which leads to systemic decision making.

SSM's advantage is enhanced, especially in situations lacking clear facts, because it operationalizes 'a rigorous approach to the subjective' (Checkland, 1999: A43). This is exemplified, for instance, in the manner in which (1) certain rules guide the stipulation of transformations; (2) the three Analyses act as an information source for the CATWOE contextualization of transformations; (3) the CATWOE mnemonic itself imposes particular issues upon which to focus, with subjectivity receiving especial attention since different perspectives on the same transformation produce strikingly different models of how the transformation should be dealt with; and (4) conceptual models must have accompanying and specific control criteria.

In the university classroom, three one-hour lectures, corresponding to the three stages of the reconfigured SSM, are all that is required for providing the conceptual material. When applied to a problem case, learning is focused less on *what* to think and more on *how* to think. For what decision makers learn is essentially a thinking methodology, that is, a manner of approaching problematic situations. This runs counter to many management degrees (from Bachelors through to MBA) which trade on substantive factual material and tend to disregard teaching *how to think* in problematic situations (Checkland, 2000; Bennis and O'Toole, 2005). However, under circumstances of limited information compounded by the need to act on it, no amount of factual material can help if the decision maker is not equipped with an equally substantive, yet flexible, methodological approach which enables him to design his resolution on the firmest ground possible given the informational limitations. Indeed, learning how to think provides the solid foundations for effectively absorbing factual subject-matter for what it is: required contextual, as opposed to procedural, knowledge for dealing with complex problems. A teaching model which complements the classroom application discussed here is provided in Part Two of this report.

Tackling complexity and its related uncertainty essentially amounts to effective knowledge management. As a general approach, way of thinking, and process of constructing knowledge, SSM is able to provide such effectiveness. As such, SSM is a major contributor to forging the link between systems thinking and knowledge management/organizational learning. In demonstrating the possibilities for useful and practical systemic results in the face of partial information, the discussion has indicated how instructors can guide decision makers to make decisions in the absence of clear facts and, furthermore, how decision makers may use structured means through which to navigate inherent uncertainty, complexity and risk. In this respect, and in response to Bennis and O'Toole (2005), here is a distinct contribution toward the manner in which business schools might, once again, find their way.

# *PART TWO: A Systemic Framework for Case-Based Classroom Experiential Learning*

In the realm of education, a common thread which unites inquirers, their critics, and academics in general is the concern to minimize the gap between classroom and real world so that students are effectively prepared for the demands of real-life problems. Part Two focuses on what can be done in the classroom in order to thus prepare students - prior, that is, to even an intermediate real-world experience such as an internship. Case-based classroom experiential learning is discussed as one fruitful approach. A systemic framework for such learning is presented that renders the approach relevant for consideration by the systems movement. It is argued that classroom teaching based upon this systemic framework contributes a qualitative improvement to education in general.

*True teaching can be a terribly dangerous enterprise.*
*The living Master takes into his hands that inmost of his students,*
*the fragile and incendiary matter of their possibilities.*
*He lays hands on what we conceive of as the soul and roots of being,*
*a seizure of which erotic seduction is the lesser, though metaphoric, version.*
*To teach without grave apprehension,*
*without troubled reverence for the risks involved,*
*is a frivolity.*
*To do so without regard for what may be*
*individual and social consequences*
*is blindness.*
*To teach greatly is to awaken doubts in the pupil,*
*to train for dissent.*
*It is to school the disciple for departure*
*("Now leave me" commands Zarathustra).*
*A valid Master should, at the close, be alone.*
*(Steiner, 2003: 102)*

# Introduction

Part One discussed a classroom application of Problem Structuring Methods through the example of a case study which attracted the use of Soft Systems Methodology. The discussion concluded by arguing that what was ultimately presented was a distinct contribution to the educational concerns expressed recently by Bennis and O'Toole (2005). In what follows, arguments and the pedagogic framework underpinning the contribution are presented.

The systems movement began the new century with education very much on its mind. It was argued that the higher education system appears ill-equipped for contemporary challenges (Jenlink, 2001). Public committees, charged by government with inquiring into the future of education, were criticized for laying out a vision of this future in questionable, archaic, or simplified terms (Banathy, 2001; Horn, 2004). Their understanding, it was argued, not only does not match, but contradicts the contemporary and foreseeable dynamism inherent in the world for which graduates are supposed to be prepared (Banathy, 1999). What is more, the very idea of the systems approach, and the skills required to develop systems thinking, appeared to be poorly understood by the inquirers (Ison, 1999) – to the extent that the approach appeared to be understood in terms opposite to what system theorists would conventionally agree (Weil, 1999).

A related field, operational research (OR), also began the new century contemplating 'what makes for good OR education' in the face of reality's messes which graduates should supposedly be able to tackle (Williams and Dickson, 2000). Williams and Dickson suggested that classroom exercises, designed 'to combat the problems caused by a lack of experience', could well contribute to enhancing students' learning experiences. They contended that classroom experiential exercises go a long way to furnishing skills useful to a future real experience. They highlighted that such exercises further the development of key process skills such as: group work and live project work; the handling of methodological issues; the development and use of decision support systems - broadly defined in the manner of, say, Eden (1995) for whom the term indicates their ability to handle problems that have not been pre-formulated and that may have quite diverse structures; and, problem structuring skills. For Williams and Dickson, such skills arise because classroom experiential learning exercises allow for combining analytical abilities with simulated interventionist attempts which require the

management of multifarious decisions. Students can thus be introduced to the impact of social dynamics on successful problem resolution (Eden, 1982) in a controlled environment which can prepare them to think and decide more intelligently when they finally confront the socio-political dynamics of real-world decision making. In suggesting classroom experiential exercises, Williams and Dickson referred to David Kolb (1984), one of the most influential of contemporary experiential learning theorists. They indicated that the OR literature had already taken notice of Kolb's 'learning cycle' (Scott, 1990, 2002) and it would appear that Kolb's work can indeed inform pedagogic approaches to decision making.

On the one hand, then, the systems movement is expressing concerns over education in general. On the other, OR is suggesting classroom experiential exercises as a significant pedagogical approach. The question arises: what is there of significance to classroom experiential learning which the systems movement might find useful when addressing improvements in pedagogy? What is provided here is a systemic understanding and framework of classroom experiential learning that highlights the significance of the approach. In doing so, it renders the approach relevant for consideration by the systems movement as a potential contributor toward the improvement of education in general.

## Cases and Pedagogic Approaches

The educational concerns of the systems movement centre upon the inability of the current education systems to train for the reality of the contemporary world. OR's suggestion of classroom experiential learning is aimed toward training students for dealing with this world. A feature of this debate is the desire to minimize the gap between classroom and real world by focusing on what can be done *in the classroom* in order to prepare for the real world. The discussion begins, therefore, with the one tried and tested window to the world which is available in classroom teaching: the case study.

In general, there are two types of cases available for pedagogic use in the classroom: *demonstration* cases and *problem* cases (Böcker, 1987). Demonstration cases, as the term suggests, demonstrate real world practice. In other words, they are illustrative devices of the practical application of concepts, theories and processes. They belong to a teaching approach which oscillates between conceptual focus and practical illustration, an approach known as *deductive* (Böcker, 1987; Corner and Corner, 2003). Though well-established, this approach is not without its critics.

A commonly understood problematique is that the deductive pedagogic approach, with its leanings toward demonstration cases, tends away from providing the student with a personal experience of an application, even if such a possible application remains within the confines of the classroom - which confines are not limited to such an extent as to deny the possibility of offering an experience of value (Kolb, 1976, 1984; Fellers, 1996; Brock and Cameron, 1999; Scott, 2002; Kayes, 2002). Dewey (1938: 19-20) and Kolb (1984: 5) are even more polemical: in fostering a learning *discipline of passive absorption*, the deductive approach is perceptible as one which demands (and all too frequently acquires) a *static classroom context*, in which it *imposes knowledge* through the medium of *static pedagogic materials*, with the aim of *drilling isolated skills and techniques* that can prepare the student for a *possible* experience in some *remote* future.

The approach, in other words, denies the student what Kierkegaard (1992) calls 'subjective appropriation': the opportunity for students to appreciate, through personal experience, the knowledge for themselves (*now*, that is, without having to gamble on the chance that the aforementioned remote future will actually occur). As Kierkegaard (1992: 22) puts it, the denial of subjective appropriation paves the way toward a result which is the very opposite intended by pedagogy itself, for:

> it is assumed that if only the objective truth has been obtained, appropriation is an easy matter; it is automatically included as part of the bargain, and *am Ende* the individual is a matter of indifference. Precisely this is the basis of the scholar's elevated calm and the parroter's comical thoughtlessness.

In system theoretical terms, the deductive approach tends toward trapping students in a closed learning system, whose prefabricated and predefined tendencies in turn prefabricate and predefine students' own abilities to epistemologically engage *with* situations, *with* concepts, and *with* concepts *in* situations. The entropic tendencies of this closed epistemological system give rise to sterile learning whose relevance is minimal to the ever-changing open system known as reality or real world problems.

This critique of the deductive approach, therefore, paints a rather bleak picture for effective teaching. Students, in this approach, remain *passive* recipients and digesters of information: in the first instance of theory and concepts and, in the second, by way of a demonstration case, of theory and concepts in illustrative context. The deductive approach, in other words, does not *actively* engage students in a problematic context. At best, pedagogic and learning possibilities remain largely within the theoretical side of

the didactic spectrum. This being the case, students might well find the concepts interesting on paper. They might even appreciate *in principle* the concepts' practical relevance. Lack of practical and personal *experience* through classroom exercises, however, leaves students hesitant as to themselves potentially attempting to use or apply the concepts in the future. For students-as-would-be-professionals, seeking experts or specialists will be a more attractive, and less risky, option in the future than their actually attempting to apply the concepts based upon largely theoretical learning. As such, the deductive pedagogic approach ultimately seals the fate of an entire field: on the one hand, its application potential rests in the hands of a few specialists/consultants; on the other, the field remains as merely an interesting topic in academia.

Overall, the critique of the deductive approach centers on this approach's inability to provide the student with a *personal experience* of the subject matter at hand. Based on the views of Dewey and Kolb, the critique calls for an approach which facilitates *active absorption* on the part of the student within a *dynamic classroom context* in which knowledge is *discovered* through the medium of *dynamic pedagogic materials* which can *holistically* provide *integrated skills and techniques*. The critique, in other words, seeks an open epistemological system whose structure can allow continual learning in keeping with the ever-changing open system known as reality or real world problems.

It would appear that what is called for is simply to stand the deductive approach on its head. Thus, instead of the aforementioned demonstration cases, *problem* cases become the norm. They do not so much as demonstrate real world practice as offer real world problems to be solved. Such cases are described by Böcker (1987) as 'open ended', placing the burden of analysis and decision making on the student. They allow for the realization of three basic determinants: it is the student who must identify the critical issues in the case, decide what methods are appropriate and use them, and ultimately interpret the results of analysis and suggest a plan of implementation (Cochran, 2000; Bell and Lanzenauer, 2000). The student is introduced to a world which requires his active involvement, and through which activity he is presumed to learn - or even 'infer' (Corner and Corner, 2003) - a number of general problem-solving rules, techniques and/or approaches simultaneously. Instead of absorbing theory, the tendency is for the student to learn from practice. Such a pedagogic approach is referred to as *inductive.* Like the deductive approach, however, it is not without its problems.

Undoubtedly, inductive learning switches the focus from largely theoretical learning to the ever-changing open system known as reality or real world problems. In a quasi-Heideggerian manner (Heidegger, 1962; Introna, 1997), this approach throws Kierkegaard's elevated scholars and the would-be parroters 'into the swamp' - to borrow a term from Rosenhead (1992) – so that they may mess about in the open-system messes which constitute open-system reality (Ackoff, 1979), and thereby avoid getting trapped in some closed epistemological (or learning) system.

Inductive pedagogy, however, does not avoid the entropic trap; for basing student learning on the open-system world does not, of itself, counteract closed-system learning. The driver of knowledge is, of course, replaced: instead of theory, it is now praxis, or engagement with the world. A replacement part of a system, however, even if such part is deemed to be of higher quality, does not necessarily change the essential dynamics of the system. The tendency is for learning to arise due to external causes and, since such externality is appreciated as an open system, it is presumed that learning itself will avoid a closed system fate. Such an assumption is misguided. For if learning is now a function of external conditions, the tendency is for it to be sourced in, and hence largely determined from, them. Based upon this dependence on the phenomenal world, learning tends to lack any contact with itself: learning is rendered a slave of phenomenal determinism, lacking any epistemological self-referentiality. Such determinism spells the same fate as the closed system deductive approach, only this time it is a fate into entropic exhaustion philosophically known as scepticism (Merleau-Ponty, 1964).

Standing the deductive approach on its head, then, does little to alleviate the problem this approach poses. The *nature* of the problem appears to have changed: where deductive pedagogy inhibits practice, inductive pedagogy inhibits theory; or, equally, whilst the former approach inhibits the ability to deal with particulars, the latter inhibits knowledge from taking advantage of generalities. The *essence* of the problem, however, remains the same: neither approach in itself provides an effective learning system and hence is inadequate for the accumulation, development, and use of knowledge. What is missing? Arguably, there is no missing third epistemological piece, at least not at the foundational level – as Smith and Smith (1995: 32) make clear when introducing Husserl's wide-ranging contributions to epistemology:

> Knowledge about objects […] proceeds, Husserl argues, by comparing corresponding intuitive observations and framing more theoretical judgements about

> what is known, and in principle going back and revising the initial observations. This is quite a natural account of human knowledge, weaving together strands of both empiricism (knowledge begins with observations) and rationalism (knowledge is guided by reason) in a quasi-Kantian thesis (knowledge centrally involves putting objects under ideal species via conceptual structures of certain sorts).

In other words, the seed for human intellectual and, hence, overall survival and development lies in an *interaction* between deduction and induction. As such, it is the *relation* between the deductive and inductive pedagogic approaches that is the original and primary foundation upon which learning rests. In the field of pedagogy, nowhere is this better expressed than in the work of David Kolb (1984).

## The Kolbian Experiential Learning Framework

Kolb (1984: 21) favors 'a holistic integrative perspective on learning' which systemically links both instructional approaches. He bases his entire presentation of experiential learning on the aforementioned relation. He identifies *concrete experience* and *abstract conceptualization* as respectively empiricist and rationalist foci of learning. These two learning modes relate to each other, on the one hand, by means of *reflective observation* of the concrete experience resulting in abstract conceptualization and, on the other, by means of *active experimentation* of the abstract conceptualization resulting in concrete experience. In other words, reflective observation of empirically acquired knowledge enables rationalist development of such knowledge. In turn, active experimentation of ideas enables the acquisition of empirical knowledge. The learner is thus involved in a two-way, mutually informative, and complete learning/epistemological process or *system*. This system is illustrated in **Figure 9**.

It is easy to trace Kolb's argument in favor of this understanding. He begins by expressing the inseparability between learning and epistemology for the furtherance of pedagogy:

> [T]o understand knowledge, we must understand the psychology of the learning process, and to understand learning, we must understand epistemology – the origins, nature, methods, and limits of knowledge. (p. 37)

Kolb (p. 18) finds support for this thesis in Piaget, in whose research he sees an inquiry into 'the relationship between the structure of knowledge and how it is learned.' Indeed, Kolb (p. 37) goes so far as to extensively cite from Piaget's (1978) *American Psychologist* article, in which 'it is impossible to dissociate psychology from

epistemology'. Kolb then chooses to conclude the citation with Piaget's division of epistemology into 'empiricism, apriorism, [and] diverse interactionism.' The third term is equivalent to Kolb's (p. 21) calling for 'a holistic integrative perspective on learning' – a reference reflecting the systemic understanding above.

The deductive pedagogical approach with its theoretical focus, therefore, leans toward apriorism, whilst the inductive pedagogical approach, with its practical focus, leans towards empiricism. For Kolb (1984: 20), neither pedagogic approach proves sufficient in itself for the realization of effective learning, yet no third singular alternative is available. In a distinctly systemic turn, therefore, and in line with the understanding above, Kolb (p. 101) opts for their systemic or 'interactionist' momentary conjoining from which arises experiential learning.

The systemic conjoining of empiricism and rationalism is not new in the history of thought, and especially in the history of epistemology. Kant (1929) is widely regarded as the first great synthesist. In the twentieth century, Husserl reinvigorated this systemic approach (Natanson, 1973: 3-41). A more recent systemic development of epistemology in this vein – and one whose particular aim is to inform system theory - is provided by Georgiou (2001, 2004) and Georgiou and Introna (1999). Kolb's 'interactionist' option may thus be appreciated as philosophically acceptable and practically relevant.

Kolb's work serves to highlight that whatever the critique of the deductive approach, it cannot minimize the value of theoretical learning evident therein. As such, instead of standing the deductive approach on its head, the critique serves to complement it with an inductive approach which, alongside deductive learning, can also provide learning through experience. As such, the critique opens the way for the inductive approach to amplify the deductive approach and create a fusion which gives rise to a virtuous learning circle.

## A Systemic Framework for Case-Based Classroom Experiential Learning

In essence, then, Kolb presents a learning system constituted by two moments, deductive and inductive pedagogic methodologies. *Qua* moments, these two approaches enable the realization of an emergent property. That emergent property is known as *experiential learning.* More significantly, however, what Kolb shows is that learning

depends on the praxis of relating these two moments. That is, without active experimentation or reflective observation, the two pedagogical approaches reduce to detachable pieces, independent of each other. As such the heart of experiential learning lies in reflectively observing concrete experience and actively experimenting with abstract conceptualizations. As noted earlier, therefore, the original foundation for learning lies in the relation between deductive and inductive pedagogy.

In the classroom context, the means for such observing and experimenting is provided through problem cases. Mu and Gnyawali (2000) add that students should be allocated to workgroups in order to prepare them to effectively work in cross-functional teams that have become increasingly popular/necessary in organisational reality. Such workgroups, moreover, will enable them to experience the development of synergistic knowledge and its contribution to effective performance in heterogeneously-constituted groups. They highlight three factors which impact upon the development of synergistic knowledge: cognitive conflict, team psychological safety, and social interaction, arguing that students exposed to these factors are better prepared to handle complex problem-solving. In other words, case-based classroom experiential learning can foster skills explicitly required of employers or, more generally, of the world in which the real problems lie. This requirement is continually evidenced in inquiries into higher education such as the 1997 National Committee of Inquiry into Higher Education in the UK (Peters, 1999).

Problem cases, therefore, offer significant educational advantages. Whereas the inclusion of demonstration cases as illustrative devices for deductive learning is not necessary for such learning *per se,* a problem case remains an integral tool for the furtherance of classroom experiential learning. More specifically, the problem case remains closely integrated to the constituent inductive instruction which contributes, along with the deductive approach, to the emergence of such learning. Indeed, given the contextual limitations of the classroom, the problem case is of crucial importance for it provides the experiential catalyst. In this respect, the problem case is the part without which the instructional system could not give rise to the emergent property *classroom experiential learning*.

If problem cases are to be included in Kolb's experiential learning system for the purposes of furthering classroom experiential learning, they must therefore be included as empirical means for attaining some degree of concrete experience and hence

inductive learning. Indeed, inductive learning and problem cases must be intimately related within the wider interrelations of the experiential learning system. One such possible integration is provided in **Figure 10**.

In this systemic framework, deductive instruction provides an initial platform, for example in the form of a lecture explicating certain concepts, which leads to an initial degree of deductive learning. This initial deductive learning serves to inform the tackling of a problem case. Upon setting to work on the problem case, a certain degree of inductive learning takes place. Indeed, there is natural learning feedback between the problem case and inductive learning, thus constituting a sub-system of the wider instructional/learning system. The learning incurred within this sub- system may, and usually will, serve to inform the initial deductive learning – hence the feedback to deductive learning. Such feedback may not only reinforce the initial deductive learning but serve to question it, leading to further deductive and, consequently, inductive understanding. Further conceptual material is introduced through additional deductive instruction and, with each new set of concepts, inductive learning begins to practically appreciate their interrelations and their systemic use. Consequently, after the initial iteration, the parts of the system begin to act less as distinct stops within a learning route and more as systemic interrelations which inform and question each other in the interests of advancing learning and its applications. As such, experiential learning begins to emerge and is strengthened with each opportunity to learn deductively, inductively and through a problem case, simultaneously. When learning can no longer be distinctly recognized as either deductive or inductive, the students may be said to have internalized it or 'thought it in' (Bell and Margolis, 1978). At this point, knowledge forms part of the learner's conceptual apparatus for not only perceiving, but also for dealing with, reality. Hence, the transition from apprentice to expert begins.

The advantage of this systemic instructional framework is that it promotes a learning balance between general/theoretical principles and experiential influence or, in other words, a didactic-experiential blend (Bell and Margolis, 1978). This combats one of the dangers of experiential learning whereby excessive experiential influence could leave learners without reference points from which to derive meaning and relevance from the experience. Indeed, the framework points toward the realization of some key objectives for experiential learning (Certo, 1976; Kayes, 2002): to facilitate learning via theory *and* experience; to *apply* theory (through an experiential exercise) in such a way which can

raise questions about the theory itself and thus serve to clarify or elaborate conceptual (deductive) learning; to enable learner engagement in a dialectical inquiry process; and to provide for a holistic and integrative learning experience.

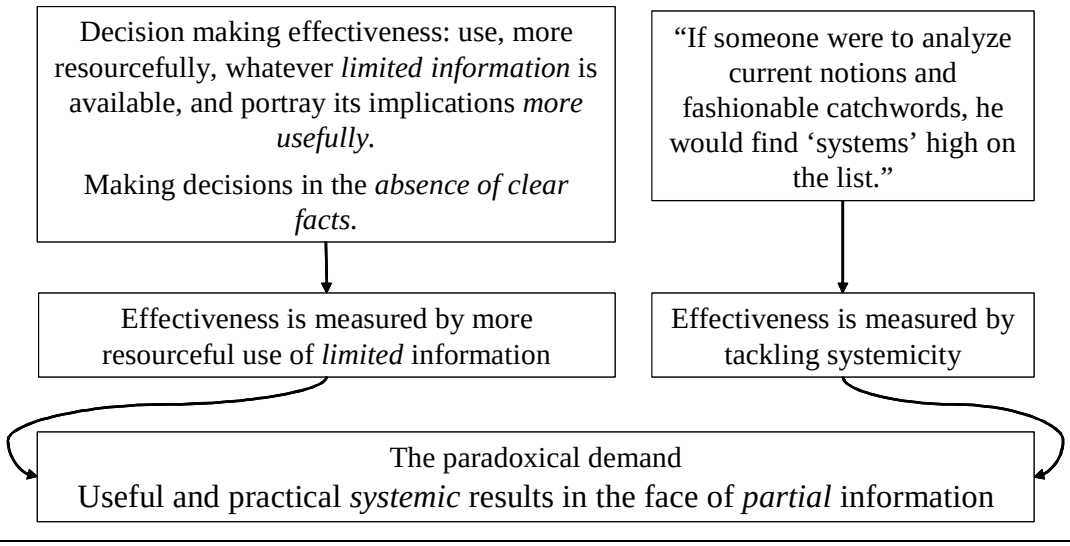
Promoting this balance is recognized as a demanding objective, requiring time, effort, and a high degree of instructional effectiveness (Shuman and Hornaday, 1975; Certo, 1976). Williams and Dickson (2000) also caution that the exercises might not enable students to immediately appreciate the value of dealing with messy problems. This may be because classroom experiential learning is focused more on process than on regurgitating well-defined content (Kayes, 2002), requiring a new learning paradigm of the students. The process includes the gradual fostering, by the instructor, of new conceptual frameworks which can promote students' skills of inquiry, self-esteem and self-directedness, aimed at enhancing their abilities to use and alter knowledge in innovative ways in order to enable insight rather than remain passive absorbers of instruction (Bell and Margolis, 1978). Behind effective case-based classroom experiential learning lies a profound challenge: to develop curricula which balance necessary factual content with equally necessary mental training and development. Arguably, it is the latter that provides the solid foundations for absorbing the former as required contextual knowledge for dealing with complex problems.

## Conclusion

The management sciences are justifiably concerned with developments in education, especially with the results of public inquiries which make recommendations on the future of education. A common thread which unites the inquirers, their critics, and academics in general is the concern to minimize the gap between classroom and real world so that students are effectively prepared for the demands of real-life problems. The discussion has focused on what can be done in the classroom in order to prepare students - prior, that is, to even an intermediate real-world experience such as an internship. Case-based classroom experiential learning has been discussed as one fruitful approach. A systemic framework for such learning has been presented, highlighting the advantage of incorporating equally important deductive and inductive instructional methodologies as moments of one systemic pedagogical approach. The significance of the inductive moment has been especially stressed. Simultaneously, however, the discussion has pointed to the demanding efforts required of instructors and

students alike. It was hinted that, in general, the realization of effective learning lies in developing balanced curricula which provide opportunities for students to learn how to learn and hence think for themselves. For ultimately, as Kierkegaard has argued, any tendency by scholars toward elevated calm, or by students toward parroting thoughtlessness, begins to render both irrelevant to the storms of the real world which demand progressively improved thinking.

# *Annex: Boxes, Figures and Tables*




The two-pronged contemporary challenge and its resulting paradoxical demand.

**Figure 1: The Challenge**

I manage a team of people providing a specific service.

I want to look at improving this specific operation.

We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm.

As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses.

The need to rectify this is particularly significant given the expectations of both, our organization and our clients.

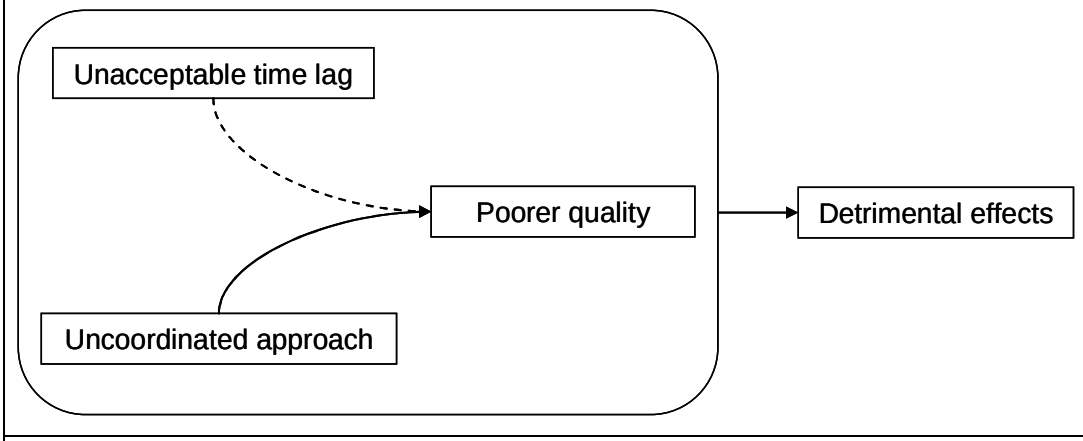
I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with.

Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation.

**Box 1: The Case**

| | Uncertainties | | |
|---|---|---|---|
| **Case Study Segments** | **UE** | **UV** | **UR** |
| S1. I manage a team of people providing a specific service. | | | |
| S2. I want to look at improving this specific operation. | | | |
| S3. We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm. | *Demand* as given in the case can be interpreted as existing in either two or three modes: either as (a) two distinct demands respectively identified as new *and* urgent on the one hand, and urgent local on the other, or as (b) three distinctly different demands respectively identified as *new*, *urgent* and *urgent local*. There is uncertainty due to lack of accurate information and, as given, the interpretations of *demand* will determine the nature of any resolution. | | |
| S4. As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses. | To which of the aforementioned demands does the 'urgent demand' mentioned in this Segment refer: new and urgent demand, or urgent local demand? And how does the interpretation of these latter (as noted in the UE comment above) affect the understanding here?<br>The perceived distinction between *customers* and *clients* is also one which gives rise to uncertainty due to lack of confirmatory information. Customers are identified with having businesses whereas clients are identified as having expectations. Clients, in this case, might not be an immediate group which makes use of the service provided. After all, stockholders are a group which has expectations on a company, might not use its services, but most certainly is the group for whom the company ultimately works and, as such, is the ultimate client. As to customers, their having been identified as having business which are affected by the seeming inability of the current system to meet demand, indicates that the operation in question might be strictly commercial, that is between corporations instead of serving customers off the street. | | |
| S5. The need to rectify this is particularly significant given the expectations of both, our organization and our clients. | | There are affected interests around the (possibly conflicting) expectations of *our company* and *our clients*. Clarification of the convergences and divergences between the respective expectations might be required, serving to clarify the respective authority or importance of each, in order to ultimately provide guidance or orientation. | |
| S6. I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with. | Perhaps the most striking example of *UE* in the case, however, and no less due to the operation already meeting some demand, is the somewhat surprising issue that *who we will provide a service for* remains an open question. This sort of question arguably points to the need for surveys, research investigations and the like which are suggested by Friend as alleviating *UE*. | It appears that an external element – the ESOs – quite directly influence or impact upon traditionally internal decisions such as *roles of staff* and target markets (*who we will provide a service for*). It is not clear whether this influence is welcome or not, or whether it constitutes normal policy. It is clear, however, that the decisions identified constitute policy issues, perhaps define hierarchy in staff roles, require negotiation and affect certain interests. As such, this area of the case exhibits uncertainty of the *UV* type. | *Uncertainty* stemming from complexity, especially from apparent *decision-making complexity*, is particularly evident in the ambiguous manner in which the following four decision areas relate: the establishment of the system, staff roles, target market, and negotiations with ESOs. Any overt *UR* in the case is arguably concentrated here. |
| S7. Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation. | Require more accurate information in order to decide whether uncertainty is even relevant. | | |

**Table 1: Identification of three types of uncertainties**




Cross-sectional, partial systemic infrastructure evident in problematic situation of Box 1

**Figure 2: Cross-section**

| Case Study Segments | Complexity | Conflict |
|---|---|---|
| S1. I manage a team of people providing a specific service. | | |
| S2. I want to look at improving this specific operation. | | |
| S3. We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm. | *Demand,* in the case, appears to be riddled with complexity. On the one hand, the problem of demand is its urgency, rendering it clearly dynamic. On the other hand, the problem of demand as a whole is changing since something *new* has been introduced into it (either a new demand or a demand which is new *and* urgent, both of which interpretations remain within the bounds of what is given). | |
| S4. As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses. | Complexity is evident in the manner in which the non-existence of the desired system gives rise to *an unacceptable time lag* and *an uncoordinated approach* – both or the latter of which lead to *poorer quality*, which leads to external *detrimental effects* (to the customers' businesses). The complexity here is compounded by the role of organisational and client expectations. This area of the case implies a densely interconnected network of elements, in which decisions undertaken in one part have wider ramifications within and outside the organisation. | The fact that customers' businesses suffer from detrimental effects caused by the lack of the desired system signals a point of conflict between these customers and the *specific service* in question. |
| S5. The need to rectify this is particularly significant given the expectations of both, our organization and our clients. | | |
| S6. I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with. | *Complexity* is particularly evident in the ambiguous manner in which the following four decision areas relate: the establishment of the system, staff roles, target market, and negotiations with ESOs. | Any negotiation deemed as *required* arguably hints at potential conflict if the negotiation is not carried through. In which case, it appears that conflict might be an issue wherever the ESOs come into play. |
| S7. Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation. | | |

**Table 2: Identification of complexity and conflict**

| Case Study Segments | Who | What |
|---|---|---|
| S1. I manage a team of people providing a specific service. | I (manager)<br>Team of people | Specific service |
| S2. I want to look at improving this specific operation. | | Specific operation |
| S3. We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm. | We (I + team + organisation?)<br>New and urgent demand<br>Urgent local demand | |
| S4. As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses. | Customers | Time lag<br>Approach to service provision<br>Quality of the service<br>Customers' businesses |
| S5. The need to rectify this is particularly significant given the expectations of both, our organization and our clients. | Organization<br>Clients | Organisational expectations<br>Client expectations |
| S6. I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with. | Staff (individual team members)<br>Who the service is for / target market<br>External specialist organizations (ESOs) | Roles of staff within the team |
| S7. Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation. | | Quality<br>Customer care<br>Capacity<br>Operational strategy |

**Table 3: Results for SSM Analysis 1**

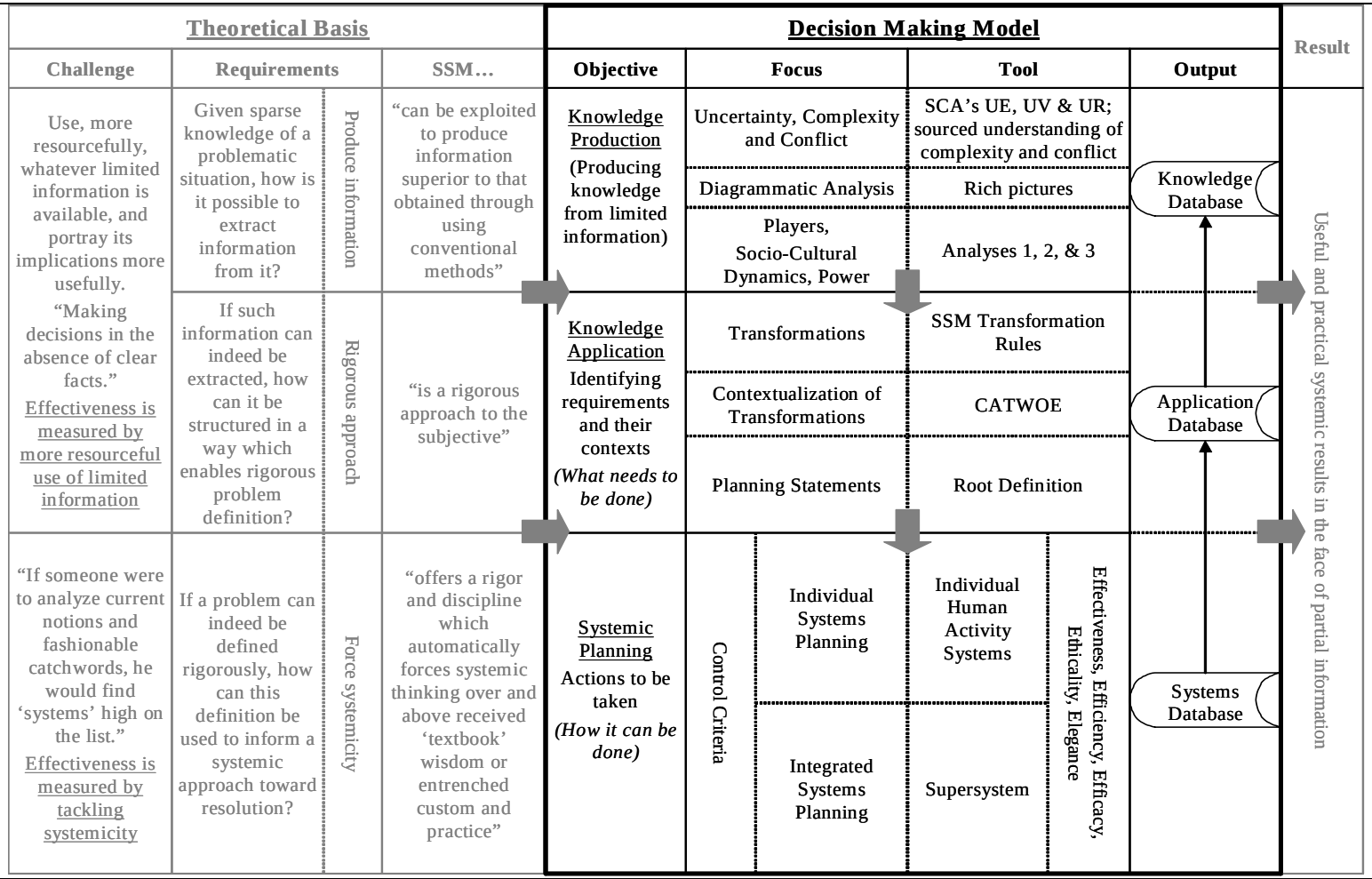
| Case Study Segments | Socio-cultural dynamics | Notes |
|---|---|---|
| S1. I manage a team of people providing a specific service. | Hierarchical | |
| S2. I want to look at improving this specific operation. | Open to ideas (?)<br>Autocratic management style<br>Bureaucracy<br>Low team spirit | Autocratic/bureaucratic/blame culture: these dynamics arise from the language of the case. For example: *I* manage, *I* want to improve, but *we* lack. Positive aspects of the situation are attributed to *I,* whereas negative aspects of the situation are attributed to *we*.<br>Urgency/deadlines/tension: these dynamics arise from the nature of the demand(s) acting upon the situation, as well as the *unacceptable time lag* and *detrimental effects*.<br>Disorganised: this may be a consequence of the urgency/deadlines/tension, but is more explicit in the *uncoordinated approach*.<br>There is no quality limit set and yet quality control requires defined limits if it is to work. Perhaps the limit is defined by the expectations of *our organisation and our clients*. |
| S3. We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm. | Urgency<br>Deadlines<br>Tension<br>Blame culture | |
| S4. As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses. | Disorganised<br>Desire for (previous level of?) quality or quality=expectations | |
| S5. The need to rectify this is particularly significant given the expectations of both, our organization and our clients. | Desire to meet expectations (not go beyond them ?) – conservative<br>Goal-oriented<br>Threatening culture | May be a conservative culture because there is no indication of wanting to go beyond expectations.<br>Threatening culture: there appears to be a horizon of threats from the organisation and the clients. The autocratic style, identified above, may also contribute to this. |
| S6. I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with. | Dependent culture<br>Stuck in their ways | Dependent culture: depend upon ESOs for internal structuring (roles of staff) and market definition (who we will provide a service for).<br>Stuck in their ways: system not established yet, and roles of staff has become an issue. |
| S7. Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation. | Data-driven<br>Technical<br>Computer-literate<br>Optimisation-culture | |

**Table 4: Results for SSM Analysis 2**

| Case Study Segments | Who/ What | Power |
|---|---|---|
| S1. I manage a team of people providing a specific service. | I (manager)<br>Team of people<br>Specific service | Allocated and bureaucratic power – no presence (charisma)<br>Low power stemming from little room to manoeuvre<br>? |
| S2. I want to look at improving this specific operation. | Specific operation | ? |
| S3. We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm. | We (I + team + organisation?)<br>New and urgent demand<br>Urgent local demand | ?<br>Power to force change<br>Power to force change |
| S4. As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses. | Customers<br>Time lag<br>Approach to service provision<br>Quality of the service<br>Customers' businesses | ?<br>?<br>?<br>?<br>? |
| S5. The need to rectify this is particularly significant given the expectations of both, our organization and our clients. | Organization<br>Clients<br>Organisational expectations<br>Client expectations | Power to impose expectations<br>Power to impose expectations<br>Power to regulate time lag, approach to service provision, and quality<br>Power to regulate time lag, approach to service provision, and quality |
| S6. I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with. | Staff (individual team members)<br>Who the service is for/ target market<br>External specialist organizations (ESOs)<br>Roles of staff within the team | Low power stemming from little room to manoeuvre<br>Power to force internal change<br>Power to influence in terms of internal HR and external market definition<br>? |
| S7. Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation. | Quality<br>Customer care<br>Capacity<br>Operational strategy | ?<br>?<br>?<br>? |

**Table 5: Results for SSM Analysis 3.**

A Who/What plays a role in a situation. As such it has some power, if only to play the respective role. Therefore, all Who/What elements should have associated Power descriptions. If these descriptions are marked with question marks, this indicates high uncertainty given the information at hand.




The three-step decision making model, flanked by (a) the theoretical basis which informs its respective parts, and (b) the expected result. Decision making action is taken working down the model, whilst information feedback occurs upward between the three databases. Such feedback is a function of enhanced situational understanding: as new understanding emerges, it requires the review/revision of the content in the databases.

**Figure 3: The Decision Making Model**

| |
|---|
| • Consider only one input and one output |
| • The input must be present in the output, though most probably in a changed state |
| • An abstract/intangible input must yield an abstract/intangible output |
| • A concrete/tangible input must yield a concrete/tangible output |
| The four transformation rules used in SSM.<br>Note the reduction to one-to-one relationships between inputs and outputs might appear to restrictively reduce the richness of any problematic situation. The objective at this stage, however, is not to appreciate such richness, but to grasp the essence of the problem. The reductions undertaken here enable the richness of the situation to emerge later in a structured and systemic manner. |
| **Box 2: Transformation Rules** |

| Case Study Segments | Transformations | Notes |
|---|---|---|
| S1. I manage a team of people providing a specific service. | | |
| S2. I want to look at improving this specific operation. | T1. Specific operation in need of improvements – improvements realised | |
| S3. We are currently lacking an effective system to deal with new and urgent demand including a system to deal with urgent local demand which must be met between 9 and 5pm. | T2. Lack of an effective system to deal with new and urgent demand – lack met<br>T3. Lack of a system to deal with urgent local demand which must be met between 9 and 5pm – lack met | How the lack is 'met' should be addressed by Conceptual Model activities. The abolition of the demands, which would thereby dissolve the respective lacks, does not appear to be an option. Note also that these Ts address the desire 'to look at establishing such a system' in Segment 6. |
| S4. As this system does not exist currently, the result is an unacceptable time lag in dealing with urgent demand, an uncoordinated approach to service provision - leading to poorer quality of the service with consequent detrimental effects to our customers' businesses. | T4. Unacceptable time lag in dealing with urgent demand – acceptable time lag in dealing with urgent demand<br>T5. Uncoordinated approach to service provision – coordinated approach to service provision<br>T6. Poor quality of service – quality level which does not detrimentally affect customers' businesses<br>T7. Consequent detrimental effects to our customers' businesses – detrimental effects minimized | T6 alternative (with reference to Segment 5): Poor quality of service - quality level which meets the expectations of our organization and our clients<br>*Note on T6:* Constitutive part of the problem is poor quality of service. T6 also indicates, however, that action required is to elevate quality to a specific level, one which does not detrimentally affect customers' businesses. This is different from deciding on indefinite improvement or to go for 'total quality'. A specific criterion has been set, (relatively more realistic than the standard 'higher quality' response?). Source of criterion: S4 the consequence of poor quality is detrimental effects to customers' businesses. Quality must, therefore, attain a level which minimizes such effects. Beyond that level, the net benefits might be negative – or, more rigorously: there is nothing in the limited information which could found an interpretation that there is a desire to go beyond that level.<br>T7 (note on causality): The consequent detrimental effects to our customers' businesses are a consequence of poor quality of service. |
| S5. The need to rectify this is particularly significant given the expectations of both, our organization and our clients. | T8. Unclear expectations of our organization – expectations clarified<br>T9. Unclear expectations of our clients – expectations clarified | Note that he does not say that expectations are not being met. There is therefore no T such as: expectations not met – expectations met |
| S6. I would like to look at establishing such a system. This will raise issues about the roles of staff within the team and who we will provide a service for. This will require negotiation with various external specialist organisations we work with. | T10. Unaddressed issues about the roles of staff within the team – issues addressed<br>T11. Unaddressed issues about who we will provide a service for – issues addressed<br>T12. Negotiation required with various external specialist organisations we work with – negotiation realized | |
| S7. Relevant concepts will include quality and customer care, capacity and operational strategy. However, I am somewhat uncertain as to how I would apply forecasting, inventory management or computer simulation. | T13. Uncertainty as to how to apply forecasting, inventory management or computer simulation – uncertainty resolved | |

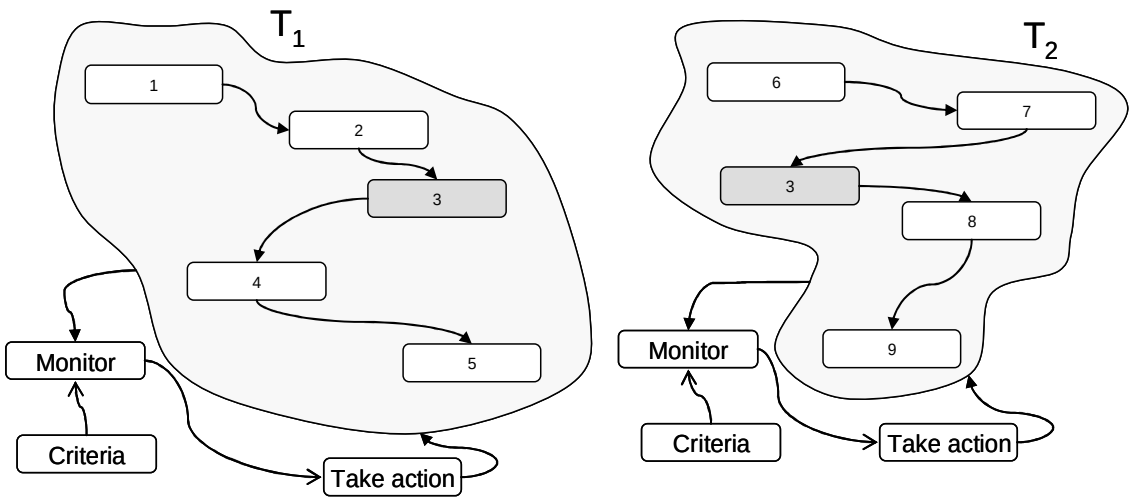
**Table 6: Identification of transformations**

| Mnemonic | Terms | Questions | Informed by |
|---|---|---|---|
| **C** | Customer(s) | Who will benefit and who will lose from this T? | Analyses 1, 3 |
| **A** | Actor(s) | Who will do this T, or make it happen physically? | Analyses 1, 3 |
| **T** | Transformation | The T itself | Methodological rules |
| **W** | Weltanschauung | What reason or perspective justifies doing this T? | Analysis 2 |
| **O** | Owner(s) | Who can stop or change this T? | Analyses 1, 3 |
| **E** | Environmental restriction(s) | What restrictions are there in the immediate surroundings of this T? | Analysis 2 |

Above: The elements of a CATWOE and their basic information sources. Each identified transformation requires a completed CATWOE. All CATWOE terms are technical, with respective questions highlighting exactly how such terms are to be understood. Thus, *customers* is a particular label for those who will gain and/or lose from the transformation. The term used here is not to be confused with *customers* in the case, nor with any other quotidian understanding of the term.

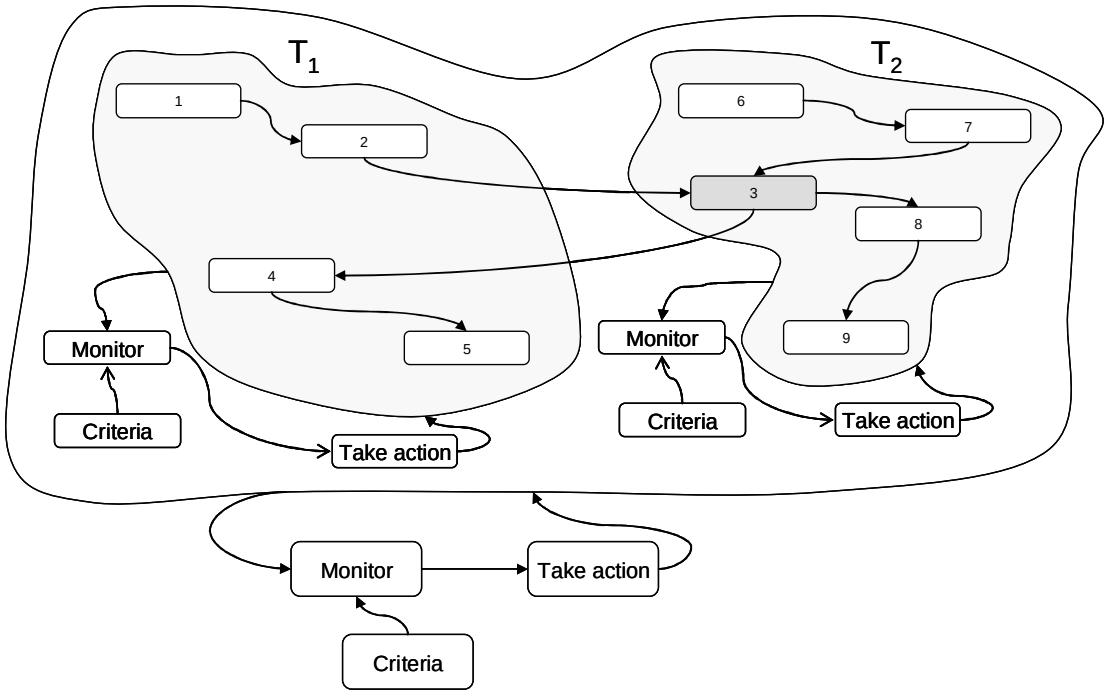
Note In essence, the CATWOE says: give me a transformation, tell me who is involved and how they are involved, tell me why this transformation should be done, and provide immediate restrictions which should be taken into account when thinking about, and planning for, this transformation.

**Box 3: CATWOE Elements**




Abstract illustration of two individual human activity systems respectively associated with transformations $T_1$ and $T_2$. Notice that the planning of each transformation requires respectively distinct and linked activities, as well as respective monitoring subsystems which control output according to certain criteria. The two systems here make use of one activity, Activity 3, which appears in both. This indicates the need for analytical linking, as illustrated in Figure 5.

**Figure 4: Individual Human Activity Systems**




Supersystem that renders Activity 3 dependent on Activities 2 *and* 7 which belong to respectively different transformations. The links create antecedent and posterior relationships between the two transformations. This introduces inter-transformational dependence which, in planning, is made obvious only at the supersystem level.

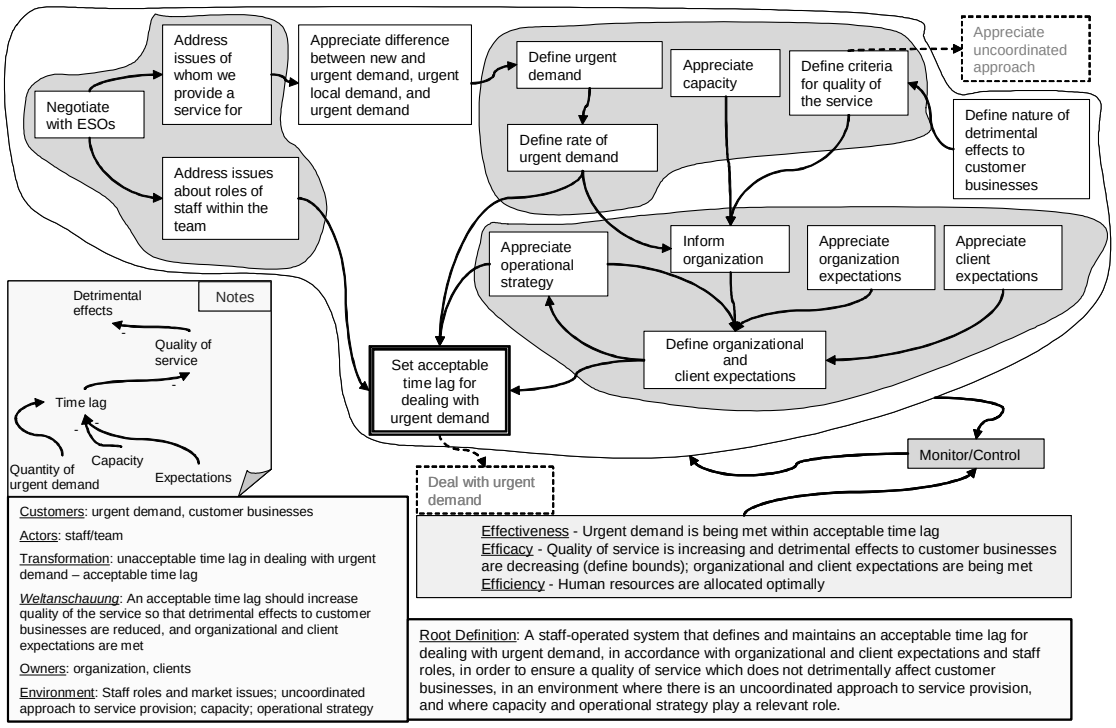
**Figure 5: Abstract Supersystem**

| Control criteria | Questions | Focus |
|---|---|---|
| **Efficacy** | Do the means work? | Processes and their output |
| **Efficiency** | Are the minimum resources used? | Resource usage |
| **Effectiveness** | Does the T contribute to the attainment of owners' (O) goals and expectations | Strategy |
| **Ethicality** | Is T a moral thing to do? | Social responsibility, ethics |
| **Elegance** | Is T aesthetically pleasing? | Socio-cultural sensibility |

Above: five control criteria incorporated in SSM use, the questions they ask, and the organizational focus of each.

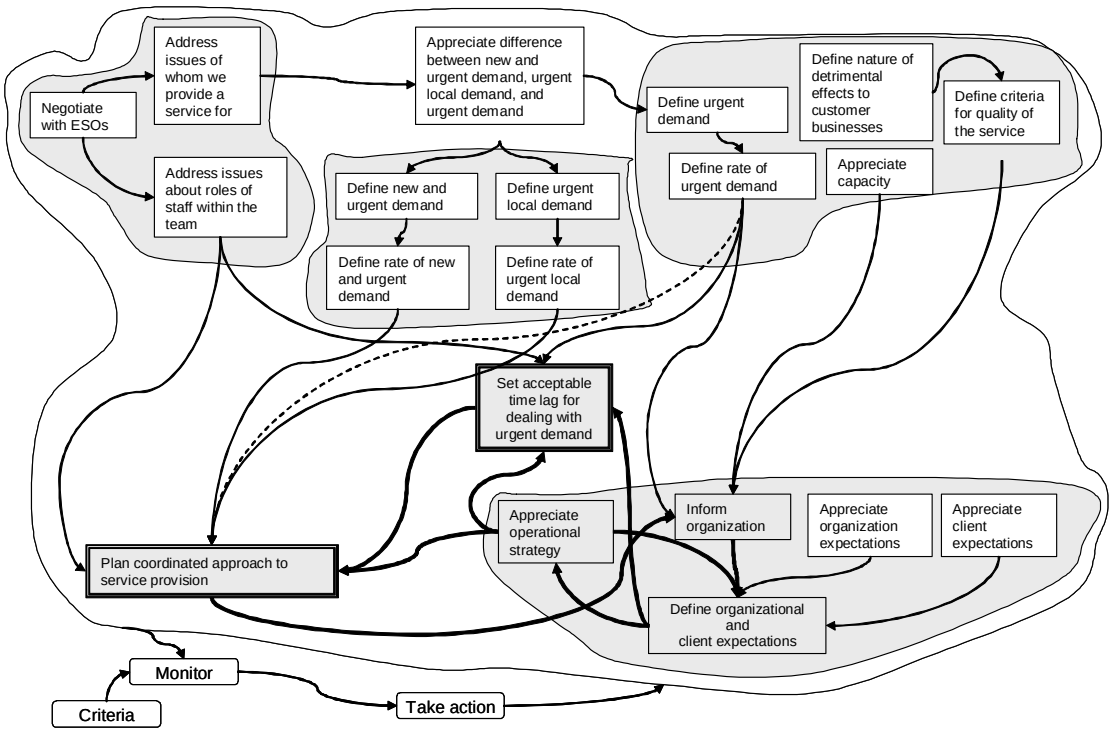
Note Answers to the five criteria will be based on particular perspectives which do not arise independently of the wider environment. To take an extreme example, efficacy might be attained through slavery or through waged labor. The fact that one is chosen over the other is based upon an underlying perspective reinforced by societal moral standards and infrastructure. Consider, also, that efficiency cannot be tackled independently of effectiveness for they are, by nature, inversely related – more weight placed on one causes the other to suffer. As such, the development of control criteria is not a simple task but one which requires a degree of systemic thinking itself.

**Box 4: Control Criteria**



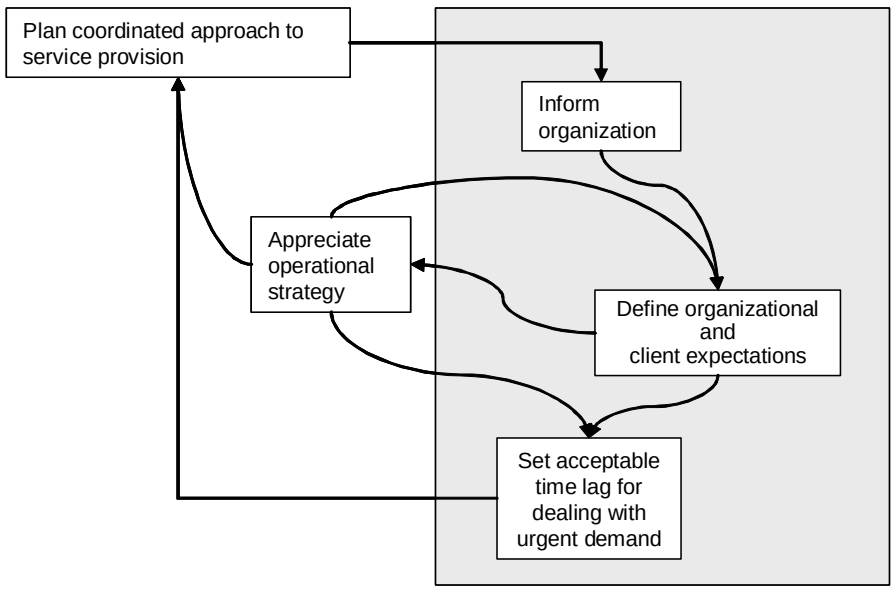

Individual systemic plan (human activity system) for the transformation *unacceptable time lag in dealing with urgent demand - acceptable time lag*. Included are the model's CATWOE, root definition, three control criteria, and an influence diagram of core issues. The designers of this particular model decided that the grouping of individual activities need not represent sub-systems within a larger system. The groupings merely highlight activities which are understood as lying within respective contexts: a context of negotiations with ESOs, a fact-gathering context, and a context of informing the organization. Due to this, the only monitoring and control system required is the one shown for the whole human activity system. Had the groupings been treated as sub-systems, then each one would require its own monitoring sub-system with control criteria.

**Figure 6: Individual Systemic Plan**



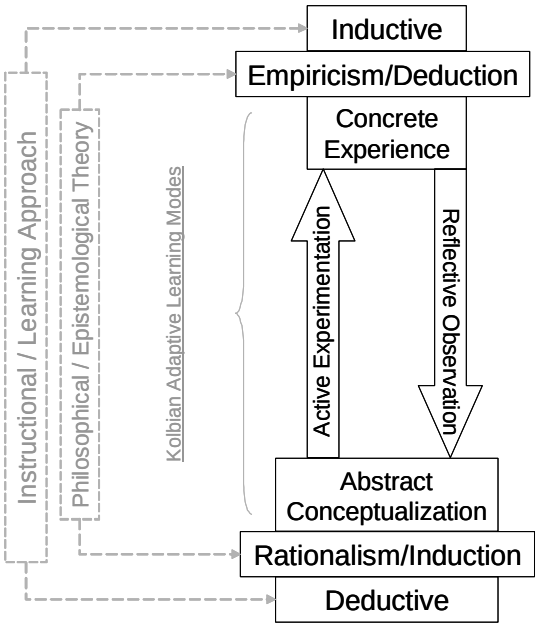

The beginnings of a supersystem constituted, at this stage, by two transformations, (1) *unacceptable time lag in dealing with urgent demand – acceptable time lag*; and (2) *uncoordinated approach to service provision – coordinated approach*. The heavy arrows indicate a feedback system which is reconstructed in Figure 8.

**Figure 7: Beginnings of a Supersystem**



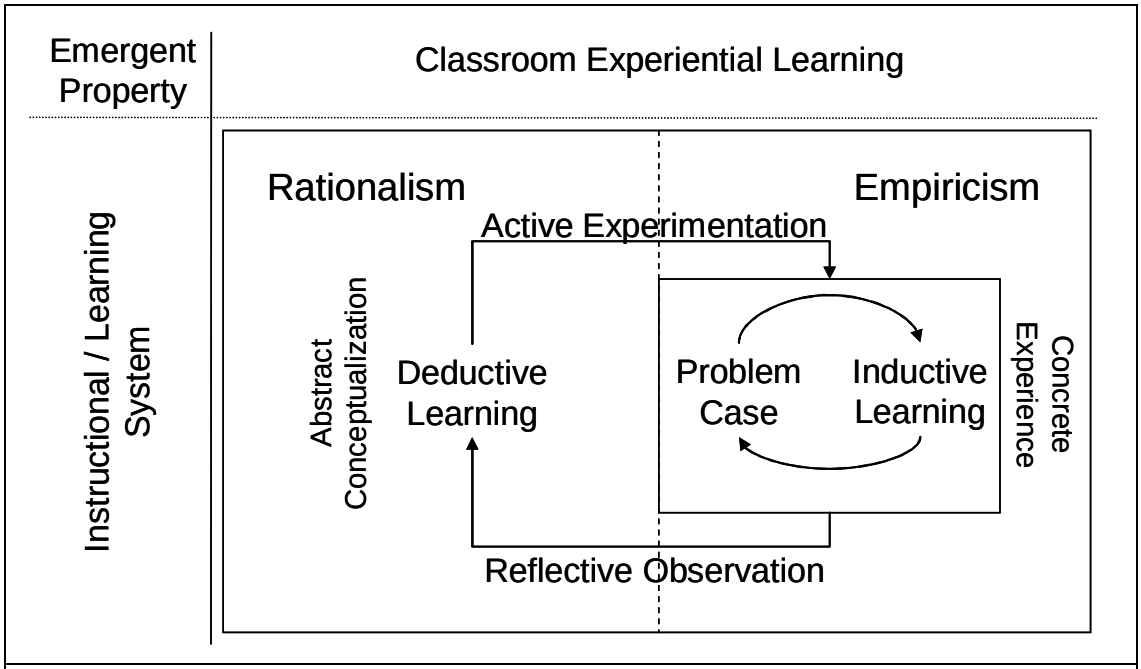

A system of feedback loops evident in the supersystem of Figure 7.

**Figure 8: Feedback Loops**




The Kolbian learning system with respective philosophical/epistemological theories and instructional/learning approaches

**Figure 9: Amplified Kolbian Learning System**




Systemic, case-based classroom experiential learning framework

**Figure 10: Pedagogic Framework**

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