Application of soft systems methodology to the real world process of teaching and learning

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Soft systems methodology provides a structured and systematic approach for analysing human activity systems such as the institution of education

Introduction

Soft systems approach is a particularly productive methodology for studying any organized human activity existing to pursue a given purpose or purposes. A set of such purposeful human activities can be termed a system, in which the various activities are interrelated. Soft systems methodology (SSM) refers to such a set of activities as a human activity system.

Soft systems approach has been applied to education at the level of secondary schooling, but it was to test the hypothesis that headmasters are more managers of resources than they are head teachers[1, pp. 132-41]. SSM can also be used for self-analysis of teaching and learning methods used by a lecturer in higher education. It can be used to conduct a self-audit of the teaching and learning strategies used to deliver academic subjects to students. Thus, SSM is particularly good, because of the intellectual activity it involves of conceptual modelling, as a tool for self-analysis for the reflective practitioner in higher education. The purpose of this article for the author is to gain a deeper understanding of the process of teaching and learning at undergraduate education, such that appropriate action can be taken to improve that process.

Consequently, this article will analyse the real world process of teaching and learning by applying SSM to this area and to define this process conceptually in terms of a human activity system. The analysis is based purely on the author's academic and experiential knowledge of the process, and is undertaken to gain an insight into the process of teaching and learning with a view to improve it.

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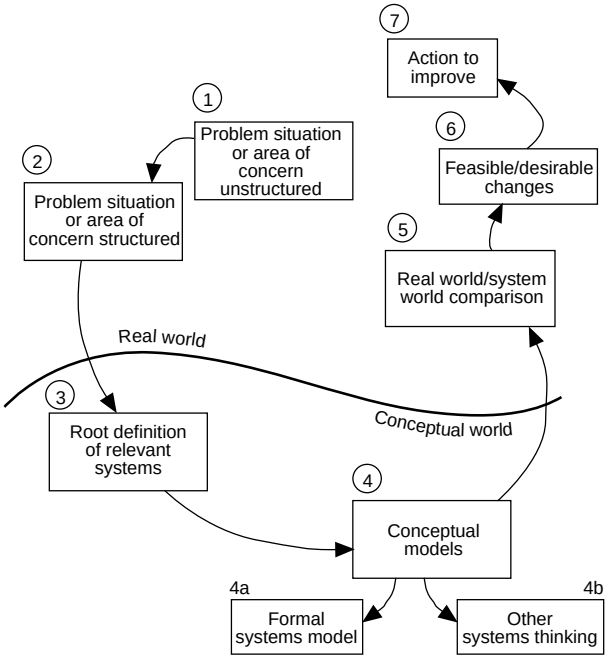
There is more than one soft systems methodology available from which the most suitable can be chosen to conduct a self-analysis or audit[1, pp. 132-41]. The methodology adopted here for analysing the process of teaching and learning is the seven-stage Checkland Methodology[1, p. 68]. This is shown diagrammatically in Figure 1.

A brief statement about SSM

Soft systems methodology had been developed by engineers and technologists at Lancaster University for solving problems concerned with efficiency and effectiveness which involved the use of highly complex modern technologies in human organizations[2]. However, its range of application is not restricted to technologically-based organizations because of its emphasis on human activity systems. SSM is potentially able to address all areas of purposeful human activity. From such organized, purposeful human activity a continuum of problems arises. At one end, the problem can be formulated precisely and a commensureate solution sought. Such problems are known as "hard" problems. At the other end of the continuum, the "problem" cannot be formulated and stated precisely, in fact, often the "problem" is simply an area of concern requiring attention. This type of problem is known as a "soft" problem. Therefore, the methodology is able to focus on "soft" problems which cannot be formulated precisely in the first instance. In addition, the methodology is unique because it enables the analyst to embark on a process of learning about the real world situation being investigated, while simultaneously seeking to improve it by analysing the situation within the paradigm of soft systems thinking and suggesting recommendations for further action to improve the problem situation.

Figure 1. *Checkland's seven-stage soft systems methodology*



A fundamental concept incorporated in SSM is that of wholeness of a system. The concept has been borrowed from the field of biology, where biologists are concerned with studying an organism as a whole entity. SSM views the defined human activity systems under investigation as more than just the sum of its parts, and requires the analyst to take a holistic approach.

A second central concept in SSM is that of hierarchy. A given soft problem, or real world area of concern can be viewed at different levels of resolution, with each level being defined by the emergent property of the system at that particular level. The notions of hierarchy and emergent properties arise in and are fundamental to the logical world of conceptual modelling[3].

Closely related to these notions of hierarchy and emergent properties are those of communication and control. SSM defines a system as a set of entities related to each other and pursuing given purposeful activity or activities. Consequently, communication between the related entities is important in order to ensure they are all working towards the stated purpose or purposes. The achievement of the stated purpose is further regulated explicitly by the inclusion of a controlling activity in the conceptual model. The aim of this activity is to monitor relevant activities and compare them with predetermined performance criteria, and to take appropriate control action when the activities deviate from the required criteria such as to ensure the achievement of the stated purpose or purposes.

Applying SSM to the process of teaching and learning

An area of the real world of immediate importance for the author is that of satisfying the learning needs of undergraduate students. The importance of SSM cannot be overstated for a reflective practitioner. The methodology is simple to use, requiring no elaborate tools except pen and paper, and yet it is quite comprehensive and incisive in its ability to identify problem areas (for instance, lack of information flows) and to generate recommendations for improving the expressed problem area. While it is not unreasonable to suppose that students' major aim is to achieve the highest possible degree classification, it is equally relevant to suppose they also want to be able to enjoy the learning process they have to undertake to achieve their aims. Thus in this broad sense, their learning needs are twofold. One of the many purposes of university activities is to ensure these learning needs are satisfied and, for lecturers, it remains a perennial issue as to how this might be best achieved.

This issue could not be formulated by the practitioner in terms of a definite hard problem leading to a feasible solid solution. The process of teaching and learning is variable from one day to another, depending as it does on the topic being taught, students' attitudes or the lecturers' mood, and teaching methods adopted among many other variables. Rather than stating this real world scenario as a hard problem or even a soft problem, it is permissible in SSM to refer to it as an *area of concern* which requires the reflective analysts' attention. Apart from this license, it seems appropriate to refer to the process of teaching and learning as an area of concern not because it is significantly deficient in some sense, but rather because it allows us to continually focus our attention on improving it.

Therefore, it was thought beneficial to apply the philosophy and thinking of SSM to this area of concern, to determine whether the practitioners' hitherto unrecognized activities to satisfy students' learning needs could be identified and whether the organization of these new activities and existing ones could be improved, resulting in an efficient and effective teaching and learning process.

The process of teaching and learning is a highly complex real world situation[4]. It acquires a new dimension when conducted at undergraduate university level, primarily because the recipients of the learning, the new undergraduates, have to replace their familiar learning paradigm acquired throughout their secondary schooling with a new one, quite different from that, which they had been using. Whereas at secondary level education their learning was conducted within a constricted and tightly regulated environment, at undergraduate level where there is more liberty, they are given more freedom to determine their own learning environment and to interact

freely with their tutors. Furthermore, while the undergraduates are progressing through their course of study subject by subject and year by year, they will be making adjustments to their process of learning as it is influenced by different lecturers' styles of teaching.

Using the SSM notion of hierarchy of systems explained earlier, the relevant system identified within the university for conducting this process is the medium of lecturing. (This includes the corollary of seminars in which discussions are conducted to provide deeper understanding of topics covered in lectures.) The lecture is the first activity encountered by students in their formal process of learning at a university. Therefore it is important that this activity should be completed well and to students' satisfaction.

It is precisely because of this activity, that SSM was selected for application to this area of concern. The analysis will enable us to assess whether the methodology is able to reveal hitherto unrecognized flaws in the existing process of teaching and learning for the reflective practitioner. Moreover, if such flaws are discovered, the methodology enables the reflective analyst to make recommendations and take action to improve the process.

A rich picture

The starting point in SSM for an analysis of a given real world area of concern is the drawing of a rich picture. Usually the non-reflective analyst (in areas other than educational teaching) is divorced from the area of concern being examined and has to use interviews and existing documents to form an impression of the area. The knowledge gained by doing this is used by the non-reflective analyst to draw rich pictures. A rich picture contains both appropriate symbols for real world activities and words, and is an attempt to express the area of concern. The process of teaching and learning in the real world is unstructured from the reflective analysts' point of view, but by drawing a rich picture of it, the area of concern becomes expressed to enable subsequent structuring.

As SSM is being used by the reflective practitioner, there is no scope for interviewing to gain an understanding of the area. The reflective practitioner has to gain this understanding from reflection. There are basically two components of a rich picture. In drawing the rich picture for our area of concern elements of structure in the real world have to be included, thus structure is the first component. Such elements would be the type of activities, the physical layout of the lecture and seminar rooms and boundaries. The second component concerns the processes occurring in the area of concern. Elements to be included here basically answer the question, "What is going on?" Such elements could be teaching and learning, among others, and "the relationship between the structure and process represents the climate of the situation".

A rich picture of the process of teaching and learning in a lecture environment is shown in Figure 2. The picture has a boundary within which the activities pertaining to the process of teaching and learning take place. Use is made of both symbols and words in compiling the picture and arrows show relationships. The purpose of the picture is to provide an easily absorbable summary of the area of concern. In contrast, a prose transcription of the same picture would be voluminous and difficult to absorb.

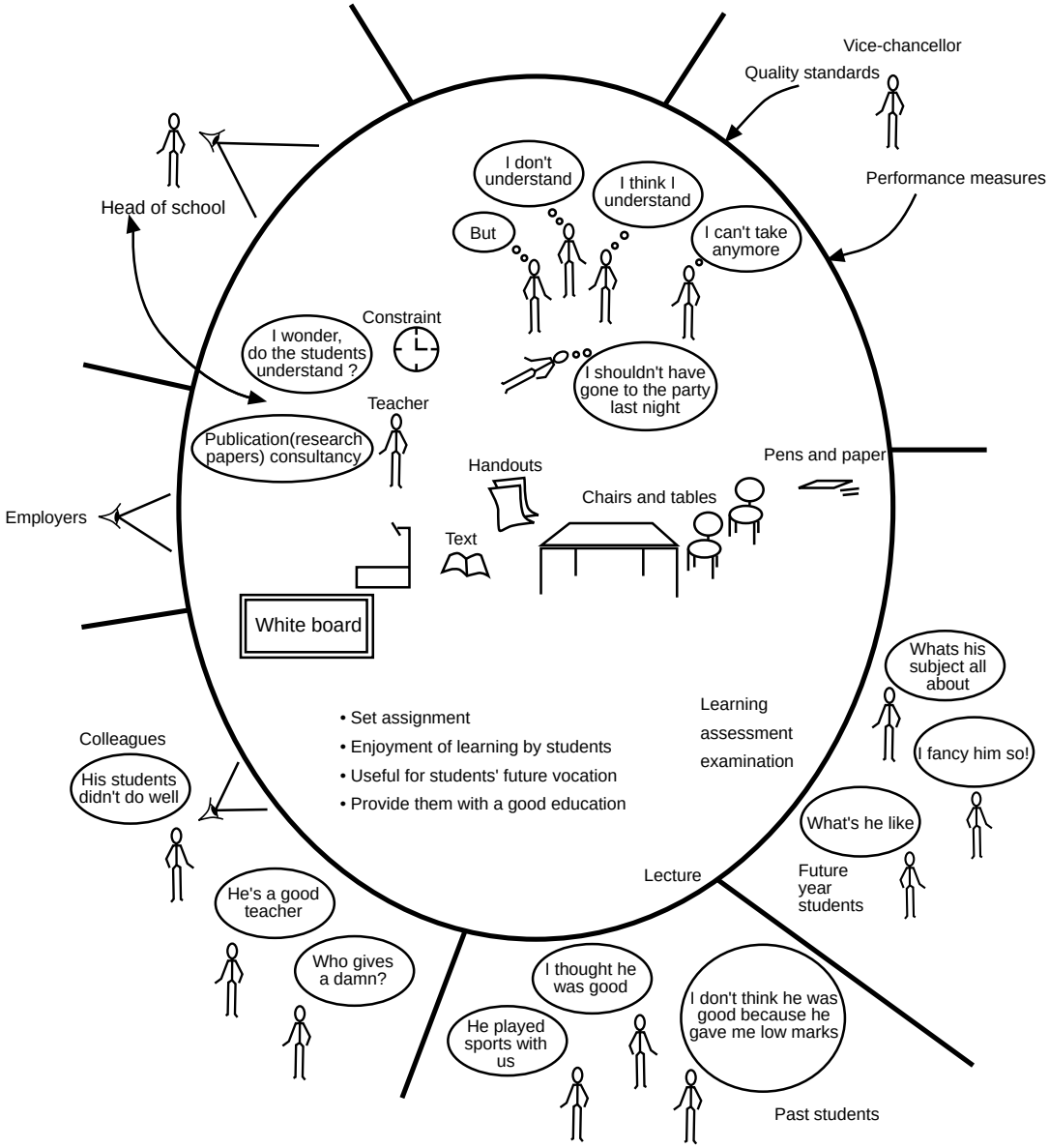
The picture contains a symbol for an eye, indicating that someone is observing the activities in the system. Beside this symbol is a "thinking" stick person and the name of the organizational entity it represents. Another symbol is that of a clock, which indicates that time is important in this process. Some teaching and learning resources are shown too – an overhead projector, handouts and a white board, among others. Students are depicted as stick people expressing their particular concerns.

Root definitions

The next step in the methodology is to derive a root definition from the rich picture drawn. The rich picture provides the basis from which a root definition of a particular system could be derived. A root definition clarifies two aspects of the area of concern for further analysis: first is the identification of the "soft" problem or basically, what requires to be addressed and, second, it identifies the system in which the subsequent analysis will be done – which human activity system is of concern. Although it is not necessary to draw a rich picture to formulate a root definition, in this case it was thought useful to do so, because it enables the analyst to focus the area of concern. The formulation of a root definition indicates that the expressed unstructured area of concern has been structured to enable further systemic analysis. It is the root definition which adds structure to the area of concern.

It is possible to derive more than one root definition for a particular area of concern depending on the particular *weltanshauung* being investigated. A *weltanshauung* is a special perspective an actor or participant in the human activity system has on a given reality. Logically it is possible to derive as many root definitions as there are particular *weltanshauungs* or actors. Two root definitions have been formulated in the case of the process of teaching and learning to demonstrate such derivations. First, the two root definitions will be presented and then their respective components will be analysed with reference to the CATWOE acronym categories.

Figure 2. *Rich picture 1 – an area of concern expressed SSM applied to a lecture situation (classroom interaction)*



Root definition 1 (RD1)

A lecturer owned system, jointly operated by the lecturer and students with the available teaching and learning resources to ensure that students pass or achieve higher marks in assignments and examinations to a realistic ceiling, being the joint aim of the lecturer and students, subject to the requirements and constraints of the University of Luton.

Root definition 2 (RD2)

A lecturer and students' jointly owned and operated system with the available teaching and learning resources to ensure that students learn relevant knowledge which is worth learning for their vocational and educational benefit while enjoying the process of learning by delivering lectures subject to the various constraints of time, learning and absorption rates of students, limitations of the room and other teaching and learning resources, meeting both the required quality standards expected by the University of Luton and the lecturer's performance measurement criteria relevant to the system.

CATWOE

The acronym CATWOE is used in SSM for formulating precise and relevant root definitions. It is used to check that the root definition is well formed. It stands for: customer, actor, transformation, *weltanshauung,* owner and the environment. The checking is aided by the CATWOE in terms of asking: "who is doing what for whom, and to whom are they answerable, what

assumptions are being "made, and in what environment is this happening?"[5]. It is not a requisite in SSM to specify the customers and actors of a system in a root definition, but the remainder of the CATWOE categories have to be specified.

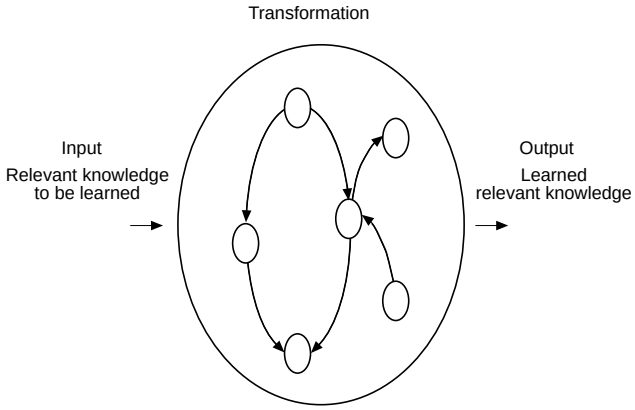
The two root definitions presented can be analysed in terms of CATWOE, in which the two most important components are the transformation and the *weltanshauung*. In RD1 the transformation is: "to ensure that students pass or achieve higher marks in assignments and examinations to a realistic ceiling". A transformation requiring precise input(s) and the precise expected resultant form of the input(s) as an output(s). For the current area of concern, the inputs are not yet passed students, and the outputs are passed students or students with higher marks.

The *weltanshauung* in RD1 is "the joint aim of lecturer and students". The major characteristic which distinguishes one root definition from another is the *weltanshauung* component. The various actors in the real world area of concern have mental constructs which they use to form opinions about the process of teaching and learning. These opinions provide the actors with varying perspectives on the process. The reflective analyst using SSM is able to take as many perspectives as thought necessary to derive root definitions in order to understand and improve the real world area of concern. The customers are students, and the actors are the lecturer and students. The owner of the system is the lecturer, although there is no restriction to having a single owner of the system[6]. The environmental constraints are those imposed by the University of Luton.

Given RD1, it is possible to proceed to develop a conceptual model of the process of teaching and learning. However, that will not be done for this particular root definition. Instead, RD2 will be examined in terms of CATWOE and subsequently its conceptual model will be presented. The transformation in RD2 is "to ensure that students learn relevant knowledge". The input for this transformation is relevant knowledge to be learned and the output is learned relevant knowledge. This is illustrated in Figure 3 in terms of the input and output of the system. The figure shows the bounded system containing the various interrelated human activities described in oblong shapes. These activities transform the input into this system, that is, relevant knowledge to be learned, and produce an output, which is, learned relevant knowledge.

The *weltanshauung* in RD2 is "knowledge worth learning will be of vocational and educational benefit for students and will be enjoyable to learn". This *weltanshauung* is quite different from the one in RD1. Whereas RD1 emphasizes the level of achievement by students, in RD2 the *weltanshauung* is concerned with providing

Figure 3. *Rich picture 2 – the transformation element of the defined process of teaching and learning system*



worthwhile knowledge which will give students a good education and be of practical use in their vocations. In addition, the *weltanshauung* in RD2 stresses the importance of enjoyment of the process of teaching and learning by the students.

The customers have been specified as students, and the actors in the system and the owners of it are the lecturer and students. There is a more detailed specification of the constraints in this root definition. These are: time available for delivering the lectures; the learning and absorption rates of students; the physical environment in which the teaching and learning will take place; the limitations on the teaching and learning resources available; meeting the required standards of quality set by the University of Luton and finally, meeting the lecturer's performance criteria relevant to this system.

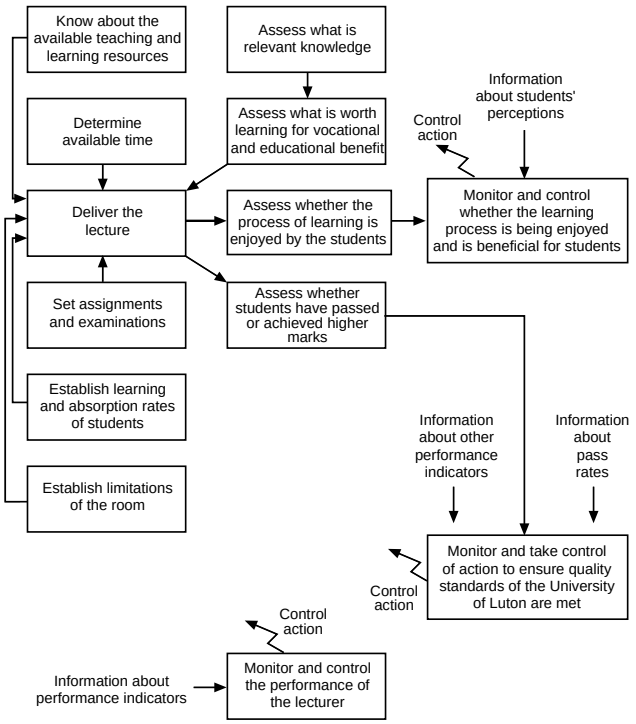
RD2 will now be used to present a conceptual model of the real world process of teaching and learning.

Modelling

The process of modelling in SSM requires the analyst to step away from the real world area of concern. The analyst is required to focus on the root definition and derive the minimum necessary activities which will achieve the purpose(s) of the defined system. At this stage in SSM, the intellectual activity of logical argument is used to derive relevant activities in the human activity system, which are known as a conceptual model. These activities will take place within the bounds of the defined system.

A conceptual model derived from RD2 is presented in Figure 4. The model contains 13 activities. These activities are at their top most level, that is, in terms of hierarchy in SSM these activities reveal the most general

Figure 4. *CM2 level 2 – a conceptual model of the process of teaching and learning based on RD2*



resolution of the area of concern. They are the minimum necessary activities at this level to achieve the stated aim of the system defined in RD2. The arrow emanating from one activity and pointing to another, indicates that the second activity is logically dependent on the first activity having been completed.

The various activities in the system are not discrete events, on the contrary they are being continually performed. Knowing about the available teaching and learning resources is not done once in an academic year, rather it is a continual ongoing activity. Similarly, assessing what constitutes relevant knowledge is an ongoing process. However, both of these activities can only be performed if they are recognized and included in the system as formal requirements.

Controlling the system

The activity of controlling the system's performance has been included in three places. This controlling activity is required to ensure that the stated aims of the defined system will be adhered to. A prerequisite of controlling is monitoring. In order for the system to meet the quality standards of the University of Luton, it must monitor the relevant activities to provide information to assess the situation and, if required, take appropriate control action. This control action is shown as a crooked arrow, which means the control action (CA) can apply to any of the activities in the system. The gathering of information relevant to the monitoring and controlling action is shown as a broad arrow pointing to the activity and detailing the type of information flowing into the controlling sub-system.

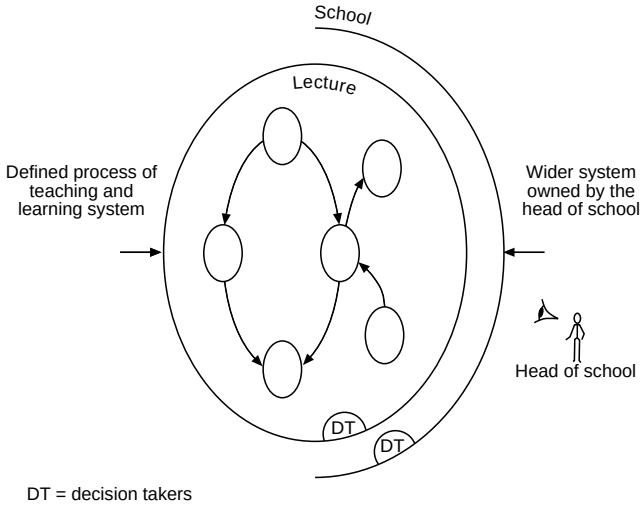
The second monitoring and controlling activity in the system is concerned with measuring the performance of the lecturer. The broad arrow coming into this sub-system indicates that there is information flowing in about the lecturer's performance in the system. If the performance of the lecturer is less than required, as measured against some predetermined standard, then appropriate control action can be taken.

The third controlling sub-system is concerned with ensuring that students learn relevant knowledge, enjoy the process of teaching and learning and that it is beneficial for them. Information regarding students perceptions is required to complete this activity. This is shown as a broad arrow coming into the sub-system from relevant activities in the defined system. In particular, from the activity which assesses students' enjoyment of the process, which is shown as an arrow from the assessing activity to the monitoring and controlling activity, making the latter logically dependent on the former.

The decision makers

The appropriate control action in the controlling activity is taken by the decision taker responsible for the system, who is usually the owner of the system. In the case of the process of teaching and learning system, there is joint ownership, comprising of the lecturer and students. In the wider system, the decision taker is different, for the ownership in this wider system is not the same. The ownership of this wider system belongs to the head of school. This is illustrated in Figure 5.

Figure 5. *Rich picture 3 – control action by appropriate decision takers in the defined and wider systems*



Increasing the resolution of the conceptual model

The human activity system stated in the conceptual model (CM2) for the process of teaching and learning can be enhanced to provide more detail. This has been done in Figure 6. Each of the activities in CM2, known as level 0, can be expanded. The expansion will be a sub-system at level 1 resolution. For instance, the activity concerned with knowing about the available teaching and learning resources at level 0 has been expanded into five new activities at level 1 in CM2a. These activities form a sub-system in the defined system.

This conceptual model at level 1 resolution details 27 activities compared with the 13 at level 0. These are the minimum necessary activities in their detailed form which must be undertaken to ensure the defined system achieves its stated purpose(s).

The activity in CM2, "know about the available teaching and learning resources", as stated, has been expanded to include new emergent properties of the system. This activity entails five activities to be completed. Knowing about the available teaching and learning resources therefore requires determining what are the available reprographics services and knowing about the resources available from the computer services. Once these are known, a selection has to be made and those resources selected need to be used.

The decision-taking function in a given system can be allocated to a single person or a group. Given the *weltanshauung* adopted in RD2 and the consequent conceptual model of the defined process of teaching and learning system, the decision-taking responsibility is allocated to a group. The group in this system consists of the lecturer and students.

Comparison with the real world

Once the conceptual model has been completed, it can be compared with the real world process of teaching and learning. This comparison is between the real world, where the area of concern exists, and the systems world, where the root definitions and conceptual models have been built. The comparison is done activity by activity and is usually well presented in a tabular form. Table I shows the comparison for the process of teaching and learning system.

Table I contains six columns. The first column lists the activities logically arrived at in the conceptual model which determines which activities are thought to be necessary for completing the process of teaching and learning. The sixth column contains comments arising from comparing each activity with the real world process of learning and teaching. The comments may state how a present activity is being done; what the potential benefits of the stated change or recommendation will be; how significant it is to link activities. The second column answers whether the listed activity is currently being done in the real world, and if so, how it is being done is

Figure 6. *CM2a level 2*

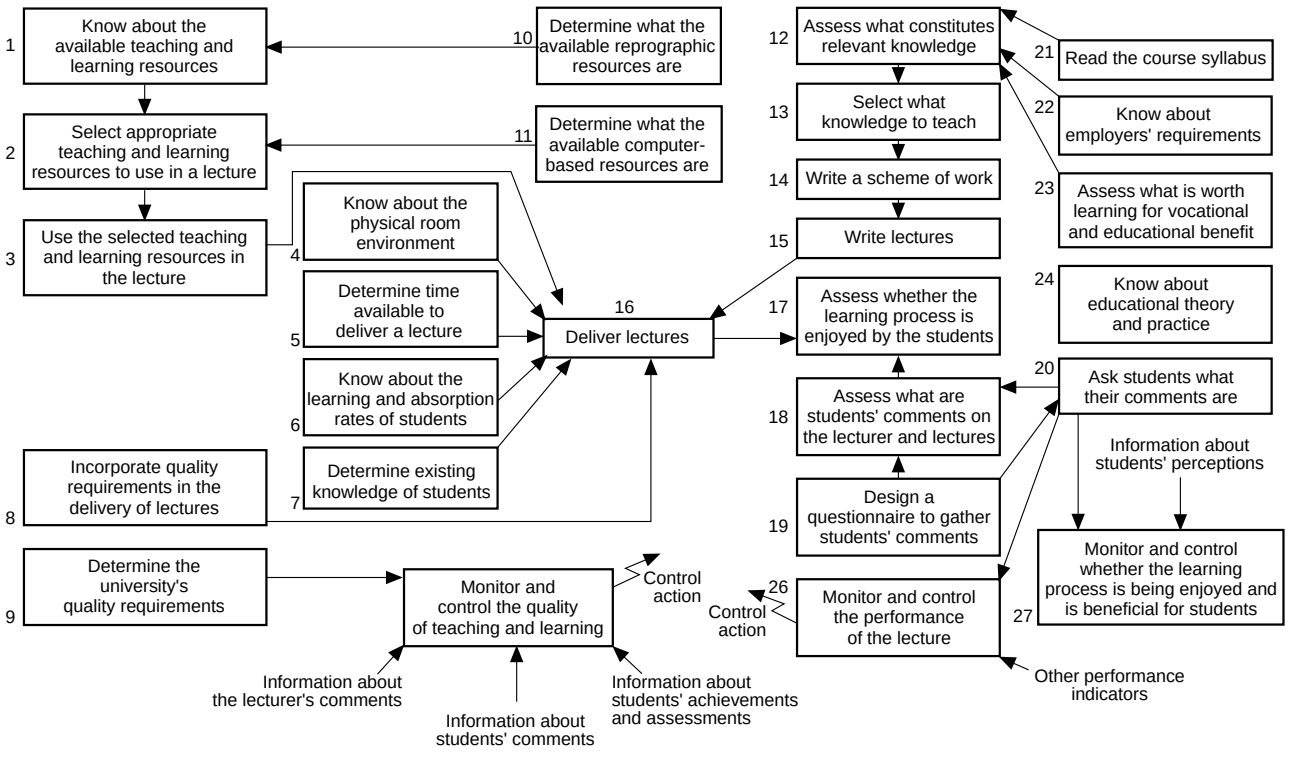


Table I. *Comparing the activities in systems world model with the conceptual activities in the real world*

Activity	Exist or not	Present mechanism	Measure of performances	Recommendations	Comments
1. Know about the available teaching and learning resources	In part	Existing knowledge, but there is no constant flow of information regarding resources	State a variety of teaching and learning resources used	Establish procedures for gathering information about the available teaching and learning resources	I have some knowledge but there is no constant flow of information regarding resources
2. Select appropriate teaching and learning resources to use in a lecture	Yes	Individual choice from known resources	The effectiveness of teaching and learning resource used	Devise a mechanism for picking the appropriate teaching and learning resources	Use is made of those teaching and learning resources with which I am familiar
3. Use the selected teaching and learning resources in the lecture	Yes	Appropriate use of selected resources	Are resources used?	Do not prepare more material than would be required for the session	Efficient use is not made of the material prepared – some is not used, some is half used
4. Know about the physical room environment	Sometimes	This is done by asking colleagues and now from experience of those rooms I have used	None	None	None
5. Determine available time to deliver a lecture	Yes	Determined from timetable	Was the time used effectively?	None	No problem here
6. Know about the learning and absorption rates of students	No	None	None	Do this activity explicitly by, for instance, compiling and asking students to complete a questionnaire regarding their learning styles	This is done implicitly
7. Determine students' existing knowledge level	Partially	Rough questioning of students prior to lecture series	Assess what effort has been made to determine students' knowledge	Do this activity explicitly by compiling a questionnaire, regarding students existing knowledge, and asking students to complete it	This is done cursorily at the beginning of the course
8. Incorporate the university's quality requirements in the delivery of lecturers	Subjectively	None	Peer reviews	None	Not done with reference to any published and known requirements
9. Determine what are the university's quality requirements	No	None	Is quality teaching and learning being delivered?	Learn whether quality requirements exist at present	Not done at present, as quality requirements are at present unknown
10. Determine what are available reprographics resources	Yes	Through the college's induction programme for new staff	None	Write a memo to the head of rep. requesting a listing of the services offered (quarterly)	This was done during the induction week and subsequently by reading circulars from the rep. dept
11. Determine what are available computer-based resources	Partially	Done informally by asking colleagues	None	Request a listing from RW and Jo Reynolds	This has not been done systematically
12. Assess what constitutes relevant knowledge	No	None	Are employers considered? Is there appropriate rigour?	Obtain employers assessments	This is done with reference to the syllabus, one's own work experience and knowledge of employers' requirements
13. Select what knowledge to teach	Yes	Individual choice from available knowledge	Is the selected knowledge being taught?	It might be useful to cover some topics in more depth to provide students with a deeper understanding	This is presently done to provide a comprehensive coverage of the subject

(Continued)

Table I.

Activity	Exist or not	Present mechanism	Measure of performance	Recommendations	Comments
14. Write a scheme of work	Yes	A weekly listening of subjects to be taught	Is the scheme logical?	Involve students in understanding this scheme	This is done at present
15. Write a lecture	Yes	Writing of bullet points based on readings	Aims, objectives learning outcomes	Plan the writing of lectures to avoid wasting time	This is done at present, but consumes much time
16. Deliver lectures	Yes	Stand, talk and question	Students' feedback	None	This is done at present
17. Assess whether the process of learning is being enjoyed by students	Yes	End of semester or course questionnaire and personal impressions of students disposition	Students' comments	Explore the possibility of making this assessment formal. Other possible methods: clinic, informal chats	This has been done on the basis on my W with reference to the questionnaire completed by students
18. Assess what are the students comments of the lecturer and the lectures	Yes	Ibid	Is effort being made to gather students' views?	None	This has been done
19. Design a questionnaire to gather students' comments	No	None	Ibid	Revise the questionnaire to accurately reflect my W	This was not done, a predesigned questionnaire was used
20. Ask students what their comments regarding the lectures are	Yes	Informal	None	Clinics	This was also done using predesigned questionnaire
21. Read the course syllabus	Yes	Obtain syllabus and read	None	None	This was done
22. Know about employers' requirements	No	Gathered from personal contacts and general observation	Is the material taught relevant for business use? Are employers and colleagues consulted?	Instate a more formal requirements statement	This was done on the basis of lecturer's own work of experience and other readings
23. Assess what is worth learning for vocational and educational benefit	No	Ibid and notes gathered from educational theory	How much of the material meets vocational and educational needs?	A more formal assessment procedure is needed	This has been done implicitly, subjectively
24. Know about educational theory and practice	Yes	Use of existing knowledge	Examine the taught material and delivery methods used	A procedure for gaining updated knowledge in this area is required	This has been done by attending a formal course
25. Monitor and control the quality of teaching and learning	Partially	Informally	Peers' comments	Use peer review	No official standards have yet been specified to compare practice against
26. Monitor and control performance of the lecturer	Yes	Informally, based on students' questionnaire	Peers' comments	Determine what information could be required for monitoring and controlling. Use peer review?	This is done on an individual basis
27. Monitor and control whether the learning process is being enjoyed and beneficial for students	Yes	Students' questionnaire	Students' comments	Design a specific questionnaire to assess "enjoyment" and "benefit". Explore students' perceptions of these first	A non-specific students questionnaire was used

stated in the third column. The fourth column seeks to gather information on how the activity is currently measured to determine whether it meets certain performance criteria. The fifth column lists incremental changes thought by the analyst to be necessary to improve the present and new activities in the area of concern.

Intervening in the real world

Soft systems methodology permits the analyst to examine the real world area of concern through the relative safety of intellectualizing in the systems world. However, if that is all it did, the methodology would not gain much credibility. It permits the analyst to compare the conceptual model with real world activities, and on the basis of this comparison to make recommendations to improve the area of concern. Hence the fifth column in Table I is concerned with the intervention in the real world process of teaching and learning which is thought to be necessary to improve it. Such recommended intervention is not absolute, rather it is regarded as incremental because the area of concern cannot be improved instantly.

The comparison of the conceptual model with the real world area of concern has revealed an hitherto unrecognized issue concerning the activity of knowing about the available teaching and learning resources. (This is shown in row one of Table I.) When this activity was compared with the real world, it was found that no formal procedures existed to provide such information which is reflected in the comments column of Table I. Given that information about the available teaching and learning resources is haphazard and informally gathered, the comparison of the conceptual model with the real world permits the analyst to make a recommendation to involve an appropriate activity which will improve the area of concern. This is done in the fifth column of Table I, where it is recommended that formal procedures should be established which will provide a consistent flow of relevant information. The remaining 15 recommendations were similarly obtained. All the activities in the conceptual model CM2a were thus analysed and are presented in Table I.

Consequently, to improve the process of teaching and learning for the particular system defined in RD2, there are 15 recommendations which require intervening in the actual process in the real world. It is now incumbent on the system decision takers to take appropriate action to improve the area of concern.

Discussion

It was indeed informative to examine the process of teaching and learning using soft systems approach. As a result of this analysis, not only were 15 recommendations forthcoming for improving the existing process, but it was worthwhile doing, because of the learning about the real world area of concern obtained. Unlike other methodologies for conducting systems analysis, soft systems actually leads the reflective practitioner analyst on a learning process.

The construction of the rich picture was instructive because it gathered all the relevant entities together in one area. Moreover, it is easier to absorb information in the form of a picture than it is in prose form. If the same information were presented in prose, apart from it being voluminous, it would be difficult to assimilate and retain. The picture also provided an overview of the area of concern.

The flexibility SSM provides in deriving various root definitions is advantageous for gaining an understanding of the area of concern, as it permits an examination of the various perspectives people have. A feature of SSM related to that, is that various conceptual models can also be built and compared with the real world area of concern. By developing various root definitions and conceptual models, the perspectives of lecturers, students, managers or service providers can be examined to gain a deeper understanding of the process of teaching and learning. The process of conceptual modelling is easy to do and not very time consuming. Therefore, despite there being limitations of time on the reflective analyst, it is possible to gain a deeper understanding of the real world by compiling more than one root definition and conceptual model. If many conceptual models are not required then root definitions can be formulated but not their consequent conceptual models to provide an understanding of actors' *weltanshauungs*.

The stage of conceptual modelling is a valuable intellectual exercise. It enables clarification to take place of what needs to be done to achieve certain objectives (purposes), which is not always possible in other forms of problem resolution because of their emphasis on determining "how" to achieve the results. Indeed, in the pressurized environment of the real world situation, often getting the thing done is more important than stopping to think exactly "what" is being done and why.

Another critical aspect of this exercise concerns sequencing of activities. Not only does SSM enable the identification of what activities are relevant for achieving a purpose, it also enables these activities to be sequenced in logistical order. Quite often in the real world some critical activities are neglected and done in retrospect. It is only later that the logical connections between these activities are realized, but this is of no use then. In SSM, the sequencing of activities in the conceptual model is based on their logical dependencies. It is worth knowing what these logical dependencies are to help in improving the real world area of concern.

Conclusion

The soft system approach to the analysis of a real world situation is certainly relevant in the field of educational practice. The exercise has revealed to the author hitherto unrecognized issues which were not practised in the conduct of the process of teaching and learning. The recommendations arising from this analysis will be examined closely and where feasible will be implemented. Thus this article has demonstrated that the process of teaching and learning can be improved using the soft systems methodology for analysing real world areas of concern.

It is worth considering other areas of research in educational practice where SSM may be applied. This application can be on an individual basis as demonstrated in this article, or it can be institutionally supported if it is felt that certain areas of the educational process require analysing and improving. It can be applied to the management of education[1]. Our current understanding of the role of lecturers as administrators can be enhanced using SSM, and the often informally heard hypothesis that administrative duties reduce the performance of lecturers as teachers or researchers can be tested. If all the analysis was done from the educators' perspective alone, the resulting understanding would be partial. Therefore, the soft systems approach can be applied to examine students' *weltanshauungs* of the educational process. These, then, are potential areas for further research work using SSM.

Notes and references

1. Wilson, B., *Systems: Concepts, Methodologies and Applications*, 2nd ed., Wiley, London, 1992.
2. Checkland, P., *Systems Thinking Systems Practice*, Wiley, London, 1981.
3. The conceptual model consists of a set of verbs which describes activities that need to be completed to enable the system to achieve its purpose.
4. The term "real world" is used as the opposite of the "conceptual world", where the intellectual activity of conceptualizing occurs.
5. Wilson, B., *Systems: Concepts, Methodologies and Applications*, 2nd ed., Wiley, London, 1992, p. 171.
6. Patching, D., *Practical Soft Systems Analysis*, Pitman, London, 1990.

Further reading

Avison, D.E., *Information Systems Development*, 2nd ed., Blackwell Scientific, London, 1992.

Checkland, P., "Towards a systems-based methodology for real world problem solving", *Journal of Systems Engineering*, Vol. 2, 1972, pp. 9-38.

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