« Are we ensuring an effective IWLP? » — *A Systemic Approach*

Key Words

Systems Theory, Soft Systems Methodology (SSM), Human Activity System (HAS), Data Flow Diagram (DFD), Institution-wide Language Programme (IWLP).

Abstract

As course designers and coordinators wrestle with a forever changing educational framework, we cannot escape the growing realisation that issues concerning the effectiveness of course design are now of primary importance. Is the Institution-wide Language Programme (IWLP) an effective programme? This paper introduces the concept of Systems Thinking and demonstrates how the discipline may be applied to the question.

Introduction

> The Liverpool John Moores Student Charter states: « Our main corporate aim is to provide quality courses geared to the needs of our students. »[1][1] It is no longer appropriate to remain entrenched in « ivory tower academia », divorced from society at large. Course designers must adapt to change and develop courses relevant to our contemporary society's needs. As linguists, we cannot ignore the growing needs of British industry to instil within its workforce at least a certain level of linguistic competence/cultural awareness.
>
> > « We have become more dependent than ever on international trade: British exports have reached some 33% of GDP compared with 20% 20 years ago. »[2]

The 1992 single market watershed may well have identified a leading problem for Great Britain vis-à-vis our more linguistically aware foreign competitors — namely a general lack of « preparedness ». A complacent attitude towards foreign language learning, deepened by the absence of a threat to English as the « lingua franca », has, until now, prevailed throughout the business world and indeed in our approach to language learning/teaching in general. HRH the Prince of Wales:

> « Although English is the lingua franca of international trade — the business environment is increasingly multi-lingual. »[3]

Linguists are becoming increasingly aware of a need not only to provide foreign language tuition, but also to integrate the availability of second language

[1] *Editor's note*: Numbers in square brackets refer to the list of *References* at the end of the article.

learning with British business needs and contemporary European developments. The concept of the Institution-wide Language Programme (IWLP) is one of several nationally respected responses to our current language dilemma.

An introduction to the Institution-wide Language Programme (*IWLP*)

> Derrik Ferney, a pioneer of the IWLP concept, heralds this initiative as being part of a « pan-European policy of educational, cultural, commercial and technical cooperation ».[4]
>
> > « Institution-wide Language Programmes (IWLPS) can be seen as one way of addressing both the commercial and humanistic need to ensure that a growing number of people will be able to operate in the multi-lingual and cross-cultural environment of the single market and the people's Europe. »[5]

The IWLP seeks to provide non-specialist language learning facilities/language tuition university-wide. Operating on the fringes of mainstream degree courses, as a separate entity in its own right, the ethos of the IWLP is to broaden the spectrum of language tuition, offering the widest choice of language to the widest choice of student.

Original objectives as prescribed by the founders of the IWLP ethos can be summarised as follows [6]:

i) To enable course designers across the university to include an accredited language component in their course specifications;
ii) To give all students university-wide the opportunity to study a foreign language and gain credit for that study on their own degree programmes;
iii) To equip prospective foreign placement students with essential language knowledge;
iv) To allow overseas students to obtain credit for studying English as a Foreign Language (EFL);
v) To promote language learning facilities for the benefit of staff, i.e. staff participation in mobility programmes;
vi) To enable franchising institutions/associate students within the region to benefit from the language provision.

Since its creation the IWLP has found itself subject to scrutiny both from budget holders and traditionalist language teaching providers. It is not surprising that owing to high demand for the provision of non-specialist language learning facilities, a lack of adequate funding and a tendency to employ more innovative pedagogical approaches, an appeal for some sort of consideration as to the effectiveness of the programme is prevalent. What is the reason for this

unprecedented growth of IWLPS? — The answer: DEMAND. There is no shortage of demand for language training,

> « Linguists are in the happy position of being able to deliver a service which the market very definitely wants: there is no recession in modern language teaching. »[7]

Yet however inviting the market niche or however carefully course designers plan to provide that niche with what it thinks it needs, there is still a lack of acceptance of the IWLP ethos, visible in the lack of pump priming/funding in general, which is at best perfunctory.

Ferney outlines the fact that « the lack of foreign language proficiency is at present the Achilles' heel of European cooperation ».[8] The relative absence of language skills within the British workforce may seriously undermine the country's competitiveness in a business environment which is becoming more and more « European ». This view is substantiated by Embleton and Hagen, editors of a recent book, *Languages in International Business*.

> « Every company that wants to remain competitive has to develop a [proactive] human resource development strategy which is responsive to today's world trends in an increasingly global market place...the sharper our gift of tongues the sharper our competitive edge. »[9]

Embleton and Hagen go on, however, to demonstrate that « quick fix » language solutions are not the answer to their specialist translation/communication problems. More long term investment in developing a language training strategy is the key. This « Integrated Strategy » simply implies that,

> « those language services and activities which provide a vital support to the well-being and overall effectiveness of the organisation are structured and function in an interactive way. »[10]

Businesses in general are coming to the realisation that in searching for a quick « buyable » solution they are confusing reaction with proaction. This is good news for the promoter of the IWLP ethos; language training evidently needs to occur « at source ». Demand for language tuition has never faltered, but it is slowly becoming evident that a greater percentage of the workforce requires basic foreign

language skills in addition to the relatively few specialist linguists (trained on mainstream degree programmes) who are employed in the business sector for their specialist translation/interpretation skills.

Consequently the growth of the IWLP is a direct result of the increase in students' awareness that foreign language proficiency equates to better career prospects. Furthermore, the IWLP exists to address both a commercial and a humanistic need. Businesses have to address (hopefully) only a short-term language deficiency in their existing workforce and the education sector must ensure that such a deficiency does not re-occur.[11]

Due to the fact that pump-priming has been more the exception than the rule, IWLPs have had to rely on money generated as revenue from the programme in operation and have had little help with initial resourcing. This problem has been compounded by an emphasis on more student-oriented learning, developing listening and speaking skills and the use of expensive language learning equipment. Such an overt departure from traditional language teaching environments has evoked a wave of concern vis à vis the effectiveness of the programme. Furthermore, operating on the fringes of main stream degree programmes, Course Leaders and Directors of School regard their own programmes as priority and view the IWLP component as a desirable « extra ». Financing a student to gain language credits equates to « lost » money in universities where the « Income-led Model » is in operation.

The Languages Lead Body has recently published a set of National Language Standards and Qualifications; they provide,

> « a statement of what a person should be able to do using a foreign language at five different levels of ability...criteria for assessment upon which a qualification can be awarded ».[12]

This is one example of how a national framework may affect language standards of the IWLP. The extent of the impact of the National Curriculum on the IWLP has yet to be established and it is an important aspect of this research project and one that will be investigated. Suffice it to say that the introduction of the Language Lead Body standards together with a desire to promote the credibility of the IWLP has encouraged programme coordinators to define exactly which competencies should be gained at each language level. Criteria of success are very specific and levels are validated by the same process as routine courses. It is

intended that students should be able to maximise « value-added" learning, that staff and external examiners should be able to identify clearly the criteria by which students realise course objectives at each level and that future employers should reap the benefits from a more culturally aware workforce.

The project rationale

As is often the case with innovative course design, the IWLP is subject to scrutiny from « powers that be » and viewed with suspicion from the traditionalist camp. Questions concerning the credibility of the programme, standards, pedagogy and above all effectiveness come to the fore. The following key questions pose as a rationale for the research project introduced in this paper:

i What are the critical factors for designers/co-ordinators of IWLPS?
ii How well do these programmes operate? i.e. is the IWLP really effective?

In short, the problem may be defined by this question:

ARE WE ENSURING AN EFFECTIVE PROGRAMME?

Within the *Oxford English Dictionary*, *effective* is defined as: « 1. having an effect; 2. powerful in effect, striking; 3. fit for work or service ». It is the intention not only to investigate to what extent the IWLP is an effective programme, but also, to question what **constitutes** an effective IWLP. In so doing the analysis itself should establish what criteria concerning « effectiveness » exist, or should exist, in order to answer this question.

Initial discussion with interested parties, namely: the Director of School, IWLP coordinators, other IWLP practitioners, students, founders of the IWLP ethos, theorists, budget holders and course validators, has highlighted a concern (in varying degrees and with emphasis on varying issues) as to how effective the programme really is. By bringing together all these issues under one statement, as above, the analyst is able to focus « systemically », i.e. this one question encapsulates the essence and entirety of the problem. Ownership of the problem belongs to all those interested parties who participate in providing viewpoints relating to this issue. Consequently, the « we » referred to above are all those who have any contact at all with the programme and who express opinion related to it.

The extent of this contact is irrelevant and opinion is sought from those who participate in the programme and from those who have some influence over the operation of the programme from the outside.

The rationale for the « systemic » approach will become clear as the reader is introduced to the concepts of systems theory below. However, by undertaking an analysis such as this, the intention is to broaden knowledge vis à vis the IWLP in order to establish either a clearer definition of problem areas or provide recommendations for suggested improvement. The beneficiaries of this investigation are all those parties who have initially expressed concern.

By considering how effective the programme is, analysis is concentrating essentially on whether the programme works and whether all parties associated with it are content with its operation. The original scope of this project was to consider whether the IWLP was a « quality » programme. However, bearing in mind the wealth of discussion relating to the concept of « quality » and how it relates to course design, it is perhaps better to consider this question as an aspect of the research project, rather than using the term within a statement which encapsulates the scope of the investigation. As we shall see, a viewpoint put forward by the director of School, « How can I maintain quality with reduced resources », invites particular analysis, within the project, of the « quality » issue. It is essential that the problem statement itself is relatively non-contentious and well defined. It is believed that « effective » is a far better choice!

An introduction to Systems Theory and methodology

> « "Systems thinking"... makes conscious use of a particular concept of wholeness captured in the word "system", to order our thoughts. "Systems practice" implies using the product of this thinking to initiate and guide actions we take in the world. »[13]

The way that we view the world around us and what we think about the world underpins whatever action we take and accounts for subsequent thought processes. Systems thinking therefore, involves using a set of ideas to understand complexities in the world. These « ideas » can be framed by introducing two key concepts — « system » and « holism »:

> « A system is an organised, unitary whole composed of two or more inter-dependent parts, components or subsystems and delineated by identifiable boundaries from its environmental supra system. »[14]
> « [A system] is an intellectual construct, not something given in nature, but defined by intelligence. »[15]
> « The whole is greater than the sum of its parts; the parts cannot be understood in isolation from the whole; the parts are dynamically interrelated and interdependent »[2]

Anything at all may be viewed as a system. By considering the IWLP as such we are able to envisage a « whole », separated from its environment by a set of defined boundaries. It is the analyst who decides what is to be considered as a system and where to draw the boundaries. Within that whole there are subsystems which interact; i.e. IWLP teaching staff as one component interact with IWLP administration staff, the latter, a further, separate component. The IWLP system also interacts with its environment; i.e. the programme has a partial/periodic association with financial providers, employers, language learning/teaching theorists, course valuators, government policy makers etc. By viewing the IWLP « systemically » we are able to investigate aspects of the programme in context. The concept of Holism relates to the belief that there is some unique quality (termed in « systems speak » as an « emergent property ») associated with the whole; i.e. a plane, as a whole, flies. Flight is an emergent property which is present only at the level of the whole. Each individual component is denied the property when considered in isolation. Thus the essence of the discipline lies in analysing constituent parts in interaction and the whole in interaction with its environment. The analyst is at liberty to choose what is regarded as the system, i.e. a particular sub-system or the environment can be analysed as a system itself. However, analysis must still take place in context and must include all interactions with the system's (as defined) environment and between its individual components. It is not

[2] This term *holism* and its related theory has been attributed to Wilheim Friedrich Hegel, 1770-1831.

sufficient to analyse either one part of the whole or one aspect of the IWLP environment as a separate entity in isolation. What is the use of perfecting one aspect of the IWLP if it is not then able to operate in context?

As systems theorists we are required to « view » our problem domain « systemically ». Systems theory, like other philosophical « stances », allows us to frame certain perspectives on social reality which underpin the essence of the discipline. Peter Checkland refers to the « status of systems ideas as a language by means of which reality may be described...that there is outside ourselves a reality which does actually exist ».[16]

So much for the introduction to systems theory. Why do we need it? It is evident that the world around us is a complex place; people are complex. The way that people think within organisations characterises their actions. Actions are then modified by the individuals' perception of how others react to those actions. People act according to their perception, interpretation and evaluation of events. The notion of the Human Activity System (HAS), which can be determined as a « notional purposive system which expresses some purposeful human activity », embraces the belief that thought and perspectives inherent to the HAS are the key to understanding organisations and more importantly how complexity, (i.e. uncertainties/contradictions, etc.), in the real world, can be manipulated.[3]

« Are we ensuring an effective programme? » This is the ultimate question; the one which the use of Systems Theory and a « methodology » will help us investigate. What then is meant by the term methodology? A methodology is « a collection of procedures, techniques, tools and documentation aids »[17], which will help systems analysts investigate a problem situation and guide them in their implementation of a solution, whether that solution be automated or not. What differentiates a methodology from a method is the fact that a methodology can be said to be based on some sort of « philosophical » view, i.e. that a particular methodology has some inherent quality which distinguishes it from other methodologies in its approach. Some are concerned primarily with investigative procedures and tend to concentrate more on the humanistic aspects of systems analysis. This category of methodologies is deemed to be « soft » in approach, i.e. techniques used within them are primarily investigatory and useful where the

[3] Contentions associated with the real world are those which are considered as being opposed to the type of problems which the scientist can define for him/herself in the laboratory.

problem situation is ill-defined or research sensitive. A typical example of such a methodology would be the Soft Systems Methodology (SSM) developed at the University of Lancaster by Peter Checkland. In direct contrast, « hard » methodologies such as Structured Systems Analysis and Design Method *[sic]* (SSADM) encompass tools, techniques and documentation aids which allow the system developer to produce a coherent and timely system design. SSADM is the government standard and was developed originally by UK consultants Learmonth and Burchett Management Systems (LBMS), in collaboration with the Central Computing and Telecommunications Agency (CCTA), which is itself responsible for computer training and some procurement for the UK Civil Service. Used in government applications since 1981, SSADM is applied to a well-defined « need », which usually either considers the possibility of or supports the development of a technical/automated enhancement.

> « In "hard" systems analysis the concept is that there is a system to be engineered and that this occupies an unequivocal place in a manifest hierarchy of systems. In "soft" systems... there will be many possible versions of the system to be engineered or improved and system boundaries and objectives may well be impossible to define. »[18]

Methodologies are often « mixed and matched ». SSM is often applied as a « soft front end » to « harder » methodologies especially when a technical solution is proposed as a result of extensive SSM investigation. However, the development and enhancement of methodologies continues. Exponents from within both the « hard » and « soft » camps seek to perfect « their » methodology in an on-going attempt to defy criticism from the opposing « team ». It is quite evident that SSM, by its very philosophical stance, lacks design tools and that SSADM offers little to help the confused investigator tackle an ill-defined problem area. Engaging ourselves in the use of one or other of these approaches, we enter into a kind of methodological tennis match. The stage is set, the ball thrashes its way from the hard to the soft court and everyone waits with bated breath for the outcome. In this somewhat fluid environment it is not surprising that theorists are constantly seeking an « answer ». Should hard and soft methodologies be combined? Should one or other be extended? Should we develop an all-embracing new one? The debate continues *ad infinitum*.

How will systems theory relate to this project?

> By bringing to our object of study (through the use of a methodology) concepts such as « system » and « holism », we are embracing systems thinking, employing an analytical systems approach (systems analysis) and using a methodology to effect that analysis. The use of Systems Theory enables us to « view » a problem situation in a particular way — there are other ways! The objective of this study is: « Are we ensuring an effective programme? » This « remit statement »[4] will provide the focus for a Soft Systems Methodology project with the primary goal of eliciting an « answer to the question ». The IWLP will pose as the analyst's client.

SSM « in action »

> Nimal Jayaratna refers to SSM as « a methodology which recognises the role of individuals' "world images" and the influence of historical background on the interpretation of "reality" ».[19] He also quotes Oliga:
>
> > « The interpretive paradigm and its hermeneutic methodology underwrite the soft systems methodologies. »[20]

Within SSM, the Human Activity System (HAS) is of paramount importance. It is the views and subjective interpretations of those active within a particular environment which « colour » any interpersonal interaction. Similarly, making sense of our surroundings necessitates attributing meaning to what we see or hear; a process influenced by ideas, opinions and attitudes personal to the individual. SSM is an abstract and conceptually oriented methodology which allows for an investigation of a problem domain. « Players » within a given situation are encouraged to explore their own « world images » in order to broaden knowledge vis-à-vis a particular problem area. SSM may also be used to address, hypothetically, the path of action needed to support a particular « improvement ».

The methodology, as developed by Checkland, is divided into seven stages and distinguishes between what Checkland terms the real world and the systems thinking world. Figure 1 *(next page)* is a duplication of Checkland's original representation of SSM. However, the nature of this refinement is intricate and is beyond the remit of this paper. It is within this systems world or by using our propensity to think hypothetically that we can map out the implications of taking a particular course of action and consider different ways of viewing a situation.

[4] A « remit statement » is an SSM term used to encapsulate a definition of the problem domain.

The following section aims to provide an example of SSM in operation. This is a much simplified example purely to demonstrate how SSM operates.

Phase 1 — Problem situation unstructured

> « Are we ensuring an effective programme? » is our remit statement. Once formulated it encapsulates the problem domain and SSM can begin. In order to facilitate gaining a « richer » understanding of the problem area, the initial stage of SSM prescribes the use of a methodological tool. A Rich Picture (RP) [21] is an SSM model which enables the analyst to construct a pictorial representation of the problem domain. When dealing with complex interactions between large numbers of elements, it is useful to be able to express our understanding in some external fashion. The author feels, however, that this technique requires some artistic talent and consequently has opted for a simpler choice of model! Although not an SSM model as such, the Multiview Diagram (MVD) [22] maps the views of any person who may directly or indirectly have any influence upon in this case, the IWLP. As previously discussed, the analyst is not forced to follow any one methodology « to the letter », but is at liberty to « mix and match ». Not aspiring to be a budding Picasso, the author has included Figure 2 *(previous page)* to show an MVD associated with the IWLP. This is a simple example to demonstrate the use of SSM within this context. It is by no means the complete version. The IWLP and everyone associated with it is considered as the analyst's « client ». The analyst, through interviewing, questionnaires, action research and traditional research, will seek to broaden the problem domain, represent this on the MVD and then « follow up » the contentious issues raised using SSM. Each problem as defined will be investigated in turn.

So how was the MVD constructed? Even from this limited MVD it is possible to see that much research is needed to investigate views of all those associated with the IWLP; that association being both of an internal and external nature. Not only must we investigate the interaction of components within the IWLP system, but we must also consider how the IWLP interacts with its environment. By thinking systemically, we can imagine that to survive the IWLP accepts input and produces output. Consequently, it is essential to investigate all connections with the IWLP. What affects the IWLP from the outside? Who or what does it interact with? What information does it receive/export? Internally, key IWLP personnel were interviewed and a questionnaire was devised for students. Externally, investigation included considering the nature of financial support, the position of course validators, the rationale of course designers and theorists concerned with

language learning/teaching and methodology and the essence of the environment within which the IWLP operates.

Techniques such as **interviewing**, **questionnaires**, **action research** and **literature searches** broaden the problem domain and help the analyst construct a clear MVD or RP of contentious issues. These techniques are continued to be used at all stages of SSM, either for further research or for clarification. Other models from other methodologies may also be used. The process is one of continual learning which SSM helps structure. The following sections detail how the IWLP problem domain has been broadened using techniques at the analyst's disposal.

They are included within this first section pertaining to Phase 1 of SSM, as this is where the analyst first makes use of these techniques.

Interviewing

> Initial investigation involved interviewing key personnel who had some jurisdiction over the operation of the IWLP, i.e. the Director of School, the IWLP co-ordinator. Examples of their opinions are present on the MVD, Figure 2.

Interviewing the IWLP co-ordinator also revealed that the IWLP « exports » information in the form of reports. The Divisional Academic Review Committee (DARC) report encompasses some form of quality control, but what happens to the quality control once it disappears into the realms of the university hierarchy? At this stage analysis did not focus on the issue of « quality control » as such, but rather to investigate what would happen to the report once it went to DARC and if there would be any feedback as a result; i.e. comments being made at the root level, from the IWLP itself, ought to be tracked through the system. Would there ever be any feedback? It is essential to investigate those systems that interface with the system under scrutiny as this may highlight contentions which may be having a detrimental effect on the IWLP itself.

In order to trace information flow it is useful to employ a « hard » SSADM technique called Data Flow Modelling (using Data Flow Diagrams, DFDS). Figure 3 depicts the passage of the DARC report through the university hierarchy. Information to build the diagram is obtained through interviewing and studying reports and input/output data to each procedure. Any anomalies raised by this technique may be further investigated using SSM. As far as this particular DARC report is concerned, by the time information reaches the ultimate « powers that be

», feedback is reduced to blasé statements such as « the IWLP needs to improve library provision ». Feedback may filter back through, but could take more than a year and is at best perfunctory. For a new initiative such as the IWLP, operating in such a volatile economic framework, such support is little more than useless.

Questionnaires

The questionnaire is a very important tool for gathering information and highlighting contentious issues. Within this investigation it has been used to broaden the problem domain as part of the first stage of SSM. A copy of the questionnaire and a subsequent short report written for DARC can be obtained by contacting the writer of this paper at the address given. The questionnaire demonstrated that the IWLP had been favourably received. However, one outstanding comment which came to light through the distribution of the questionnaire, « We need more student centred learning facilities », has been included on the MVD to show how this point could be further investigated under the remit of this SSM analysis. For example, would the students really make use of more Open Learning facilities, given they have often more immediate demands on their personal study time? Furthermore, the provision of more Open Learning facilities not only necessitates a greater financial outlay, but also presupposes that there is sufficient staff available to support the use of those facilities. A questionnaire is invaluable to obtain student opinion, but course designers/providers are constantly striving to find a happy medium between the « utopic » and the « bare essential » in terms of Open Learning provision.

This initial pilot questionnaire was circulated at LJMU during class time before students sat examinations at the end of the spring term. Respondents amounted to about 1/4 of total students registered, i.e. about 200. Results were obtained in May 1994. It is hoped that this pilot questionnaire will act as the basis for further investigation of this nature. The need for this is evident if we consider student feedback concerning the Open Learning Unit. Response indicated that a very low percentage of respondents had visited our Open Learning facility during the 1993-94 academic year. It is hoped that this is due to the fact that this facility was in disarray whilst the Resources Centre was being built rather than it being the case that the students had insufficient time to use it. It is important therefore, to monitor use and success of the new centre during 1994-95.

Action research

Action research refers to on-the-spot investigation. It is useful to involve all members of staff teaching on the IWLP in monitoring how effectively the programme operates. As yet, staff have only been involved in questionnaire distribution and a staff development day, discussing issues of quality control. It is hoped that action research can be exploited to the

full as the investigation develops. It is envisaged that all staff could be involved to some extent (as yet to be determined) in the SSM analysis; i.e. by monitoring the students' reception and development of varying language skills at varying levels of non-specialist language acquisition. The question of ability and skills acquired at each level was a key concern of valuators at the time of the keyskill validation.[5] It is hoped that engaging in directed action research will provide valuable feedback for the project as a whole.

Literature searches

As has been previously stated, it is necessary to investigate the environment within which the IWLP operates. An initial literature search gave rise to various contentions associated with the IWLP and demonstrated how crucial it is to be aware of market changes and alterations to language learning/teaching trends. In short, whilst businesses require a workforce with language awareness to enable them to remain competitive within Europe and students recognise the career prospects involved, there is still a lack of funding and a concern about what is pedagogically sound. The LLB has initiated the first attempt at establishing a set of language learning standards, but how can the IWLP address what is required, in terms of ensuring an effective programme, if there is still a certain amount of reluctance to provide finance and accept a less traditionalist language learning strategy? Furthermore, how might this « fluid » environment affect the original objectives of the IWLP and to what extent does it prohibit the attainment of these objectives and the maintenance of an effective programme? There is a great deal of benefit to be gained from further research of this nature.

Once a clear picture of the problem domain is established, either with the help of an MVD or an RP, stage 2 can begin.

Phase 2 — Problem situation structured

This is where each contentious issue as highlighted on the RP (or MVD if preferred) is formulated into a problem statement. Each statement then provides the basis for ssm investigation. i.e. an opinion raised by one or more IWLP practitioners (IWLP teaching staff) and taken directly from the MVD was, « classes are too large to ensure effective learning ». It is appropriate to investigate this statement further using SSM in anticipation that this will address one aspect of the « effectiveness » question encapsulated in the remit statement, « Are we ensuring an effective programme? ». It is intended that this example is used throughout the following stages of SSM to demonstrate the benefit of the methodology in a coherent fashion.

Phase 3 — Root definition of Relevant Systems

[5] Prior language knowledge is matched with a keyskill level in order to maximise value-added learning for each individual, i.e. a student doing keyskill « B » would have a poor GCSE grade or a « forgotten » O Level.

> The root definition is a term used to refer to the explanatory paragraph we apply to each « world image » associated with a problem statement, (i.e. as mentioned above it is important that problem « owners » try to view a problem situation in different ways in order to encourage increased understanding of that problem). The way a certain situation is perceived encompasses a certain « world view » and is termed a Relevant System. It is also possible to investigate « hypothetical problem solutions » using SSM. Returning to our structured problem: « Classes are too large to ensure quality learning », one possible solution would be to « reduce class size ». This provides us with a simple « demonstration », for the purposes of this paper, of how SSM enables the analyst to consider the implications of carrying out a possible problem solution. In order to do this it is necessary to consider this action or « transformation » from large to small class size, as a system. To reaffirm what is meant by systems, they are open to input and export output, they interact with their environment to survive, they have a boundary, a purpose and they react to control measures such as feedback.

The explanatory paragraph, Root Definition (RD), is formulated by applying the acronym CATWOE which stands for **Customer** — who would benefit from the system, **Actor** — who would participate in the system, **Transformation** — what the system would do, **Weltanschauung** — the context in which it does it, **Owners** — who would own the system, **Environmental** constraints — what would constrain the system.

Related to our example we arrive at:

C — Students, lecturers
A — Students, lecturers
T — Reduce class size
W— Classes are too large to ensure quality
O — Budget holders, decision makers
E — Resources, Timetable

N.B. lecturers benefit from reduced class size as a smaller class is deemed easier to teach and a fair assumption may be that teaching is thus more effective.

The root definition might read thus:

> « To reduce class size in order to ensure quality is under the jurisdiction of budget holders and decision makers. Students and lecturers would be involved and also benefit, but there is a resource/timetable constraint ».

Once the system has been named in the root definition the next stage of SSM allows us to construct a model depicting how we envisage effecting the transformation from large to small class size.

Phase 4 — Conceptual Model

Figure 4 depicts a Conceptual Model (CM) relating to the example above. It is a very simple representation of how SSM investigates a course of action. Each bubble represents an action deemed necessary to effect the transformation of the system, i.e. reduce class size. Arrows are added to show logical flow of actions and also where logical dependencies are needed, to show which action is dependent on the completion of which previous action. Each bubble may be « exploded » to a lower level and this may happen as many times as considered necessary to arrive at a set of defined goals. i.e. 1.1 may be exploded into a CM which maps activities associated with the transformation, « establish optimum class size », until it is agreed that class size may be reduced by 20%. SSM ensures that all possibilities are investigated and structures what would otherwise be an ad-hoc common sense approach to problem solving. Perhaps it can be said that one of the most worthwhile facilities that SSM provides is the ability that the analyst has to model what the effect of introducing a particular problem solution would be before it is actually introduced. « World views » of particular systems/ideas about possible solutions to a problem can all be fully explored in a coherent, logical and hypothetical fashion through the use of this technique.

Phase 5 — Comparison of stage 4 (Conceptual Model) with stage 2 (Problem situation structured)

This is a simple verification stage to ensure that the original problem is being adhered to; that the investigation is still « on course ». With regard to this example it might well be questioned how far reducing class size by 20% actually relates to the original structured problem statement in stage 2 of SSM, namely, « classes are too large to ensure effective learning ». This may well instigate further investigation before it is established that reduction of class size by this factor is both feasible and desirable. This analysis takes place at stage 6.

Phase 6 — Feasible and Desirable Changes

Each activity set/proposed hypothetical solution is scrutinised from a feasibility standpoint. Would it be possible to resource a 20% reduction in class size? What are the implications of doing this? etc. Obviously

there is a lot of reiteration between stages 4, 5 and 6 until a set of implementable goals are established.

Phase 7 — Action

It is at this point that either goals are implemented or other initiatives begin. An objective arrived at through SSM with regard to this particular example may have been to ensure that class size does not exceed 15 students. Sometimes however, goals identified at stage 7 of SSM may invite further methodological manipulation of a different nature. For example, computer-based goals such as « install 10 new PCS with tailor-made CALL material », (so that students could be more autonomous within the classroom and hence more numerous) would require support from a « hard » methodology such as SSADM. This is essential to develop computer-based material and manage the installation procedure in a coherent and well documented fashion. Models used within SSADM, however, are not solely restricted to supporting automation as was mentioned above in the DARC example.

Conclusion

Ideas about possible solutions/ways of looking at a problem can be fully explored in a coherent, logical and hypothetical fashion through the use of this technique and hence a deeper understanding of the problem domain can be gained. SSM also provides the analyst with the ability to model what the effect of introducing a particular problem situation would be before it is actually introduced.

At present, this particular research project is in its intermediate stages and it is hoped that in due course a report can be made available which details results. The technique was introduced to those associated with the programme at the last IWLP conference, Preston, September 1994, and has been conclusively encouraged. It was felt that any direct research into the IWLP would be beneficial and as such it is hoped that results will be useful to all concerned. However, it should be noted that SSM has been used for a great many systems analysis projects on a national basis within industry and the public sector. The methodology has withstood the acid test of implementation and extensive use by analysts and « pseudo-analysts" in industry.

The writer has hoped to demonstrate that the systems approach is one which offers a valuable tool to researchers in any discipline and has attempted to at least encourage readers to consider the technique as a serious research option.

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The questionnaire and subsequent short report written for DARC were submitted with this paper but could not be published for lack of space. Copies can be obtained by contacting the author at the address given.

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