UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

*Chapter 3*

RESEARCH METHODOLOGY DISCUSSED

*To learn is a natural pleasure, not confined to philosophers, but common to all men.*

Aristotle, *Poetics* [4th C. BC]

## Introduction

The research was done over a longer period of time, data was collected from the same population at more than one point in time and the design was non-experimental; it could therefore be described as being a longitudinal research effort. (In general a nonpositivist approach to the research was followed.) The approach, however, drew from several research methodologies and these methodologies, and their bearing on the research at hand, will be discussed in this chapter.

## Objectivism versus Subjectivism and Order versus Conflict

Burrell and Morgan [1979] combined the assumptions about the nature of science (where there are two distinct schools of thought, namely OBJECTIVISM and SUBJECTIVISM) and the assumptions about the nature of society (with once again two models, namely that of ORDER/INTEGRATION and CONFLICT/COERCION) into a framework of four paradigms to aid in the analysis of social reality.

According to Burrell and Morgan, this framework (see *Figure 9*) defines four distinct sociological paradigms to be viewed as contiguous but separate. They are of the opinion that these paradigms define fundamentally different perspectives from opposing standpoints. Thus "*to be located in a particular*

57

*paradigm is to view the world in a particular way*". They emphasise that the four paradigms are mutually exclusive and that a synthesis of these perspectives is not possible. They do, however, concede that it is possible to operate in the different paradigms but only see that it can be done sequentially over time [Burrell & Morgan, 1979].
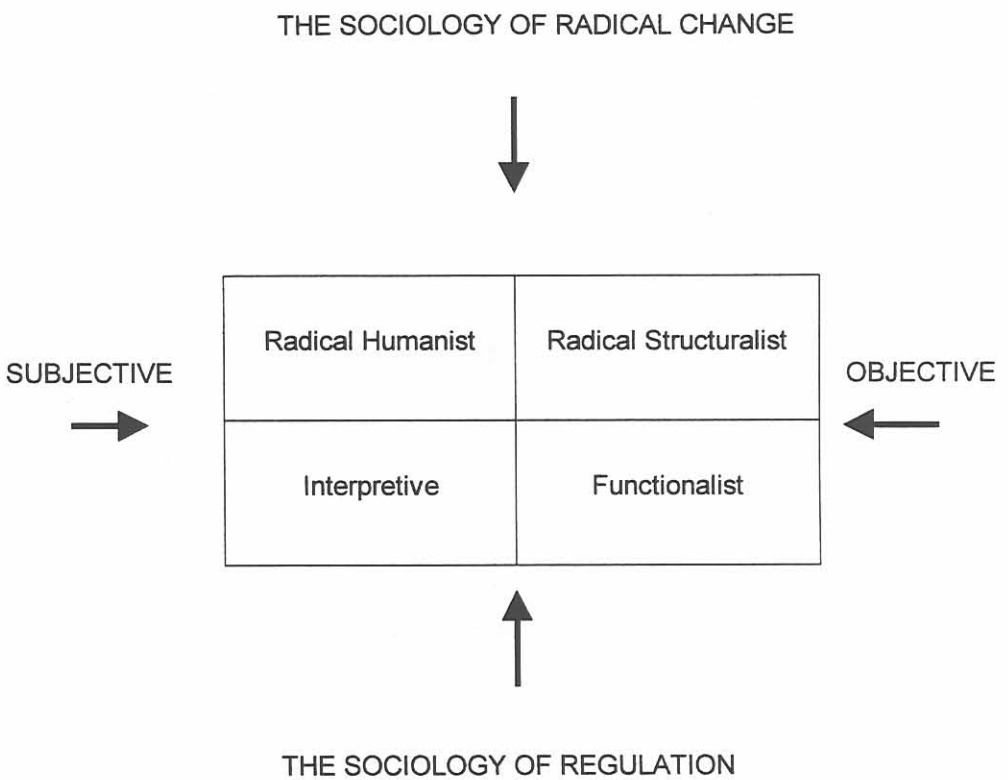
THE SOCIOLOGY OF RADICAL CHANGE

SUBJECTIVE

| Radical Humanist | Radical Structuralist |
|---|---|
| Interpretive | Functionalist |

OBJECTIVE

THE SOCIOLOGY OF REGULATION

FIGURE 9:    A framework of sociological paradigms

## Combining the four paradigms

Du Plooy, Introna and Roode [Roode, 1993] propose that researchers should not be restricted by these mutually exclusive paradigms as defined by Burrell and Morgan but should rather use them in a creative way to view the research problem from various vantage points. Thus the researcher *"should deliberately pose questions to explore different aspects of the problem or situation at hand"*. They suggest that the researcher use the following diagram to inquire about the different facets of the research problem, allowing him/her to obtain as much information about the problem as possible.
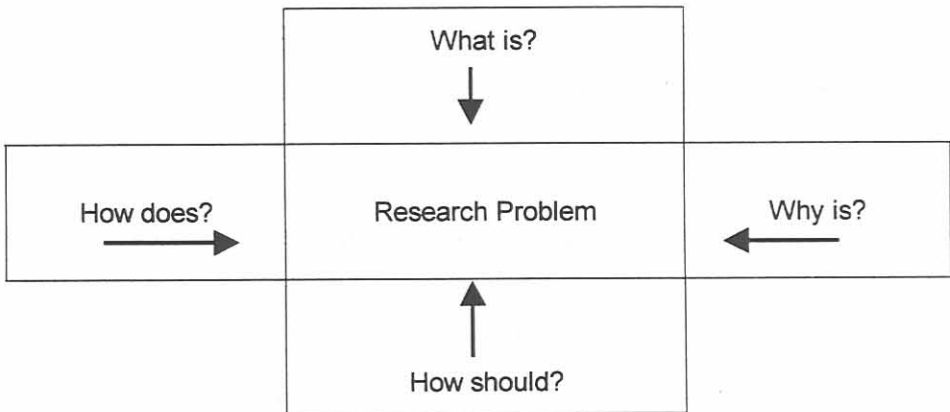


FIGURE 10:     The Du Plooy, Introna and Roode research question framework

In the above diagram the **why is** relies on the Functionalist paradigm (of Burrell and Morgan), the **what is** on the Interpretive paradigm, the **how does** on the Radical Humanist paradigm and the **how should** on the Radical Structuralist paradigm. Thus the suggested framework allows the researcher to get a holistic view of the problem [Roode, 1993].

The framework, described by Roode, was used to generate the research questions of this study which were posed in Chapter 1.  The questions that initiated this research are:

WHY IS?          WHY IS the "chalk-and-talk" lecturing method not a
                 successful teaching method for second language
                 learners?

                 WHY IS verbatim studying the preferred study method
                 for students from academically disadvantaged
                 backgrounds?

                 WHY IS teaching geared towards the individual when
                 most working environments expect their employees to
                 be able to work effectively in teams?

HOW              HOW SHOULD teams be constituted?
SHOULD?

                 HOW often SHOULD formal and informal lectures be
                 alternated?

                 HOW SHOULD students be assessed?

WHAT IS?         WHAT IS successful learning?

HOW DOES?        HOW DOES one measure success?

Sten Jönsson is of the opinion that action research will become more common as the interpretive and critical approaches in social research become more acceptable.  He agrees with the action research definition of Argyris *et al.* [1985], namely, that scientists in collaboration use it in

conjunction with the participants of the study. According to Argyris *et al.* the main feature of action research is that it is –

> *...expressly designed to foster learning about one's practice and about alternative ways of constructing it* [*op.cit.*: 237].

According to Jönsson each of the three broad research approaches (found in the social sciences) has their specific strengths and limitations. The **critical** approach is close to action research in that it aims to uncover conflicts and contradictions in the organisational structures being studied. With the **interpretive** approach the researcher must be able to "place himself in the shoes of the actor". However, the **positivist** approach is still the dominating approach and assumes independence between researcher and research object. Action research definitely does not match the criteria of the positivist approach but can be both interpretive and critical, depending on the values of the researcher and the research objectives [Jönsson, 1991].

## Soft Systems Methodology

The research approach of this study lends from the framework described in Roode [1993] in that it tries to see the problem holistically. In addition, the Soft Systems Methodology (SSM) was judged to be best suited to manage the research process [Checkland & Scholes, 1990].

Research in education can be described as an endless cycle of experience leading to purposeful action and SSM (as described by Checkland and Scholes) is:

> *... an organized way of tackling messy situations in the real world. It is based on systems thinking, which enables it to be highly defined and described, but is flexible in use and broad in scope.*

A graphical representation of basic SSM is given in *Figure 11*. This diagram shows the operation of a cyclical learning system where a situation which concerns the researcher exists; some relevant human activities are selected to remedy the situation; these models are compared to the real-world situation; and some action is initiated to improve the original problem situation.



Yields choices of

Relevant systems of purposeful activity

A real-world situation of concern

Comparison of models with perceived real situation

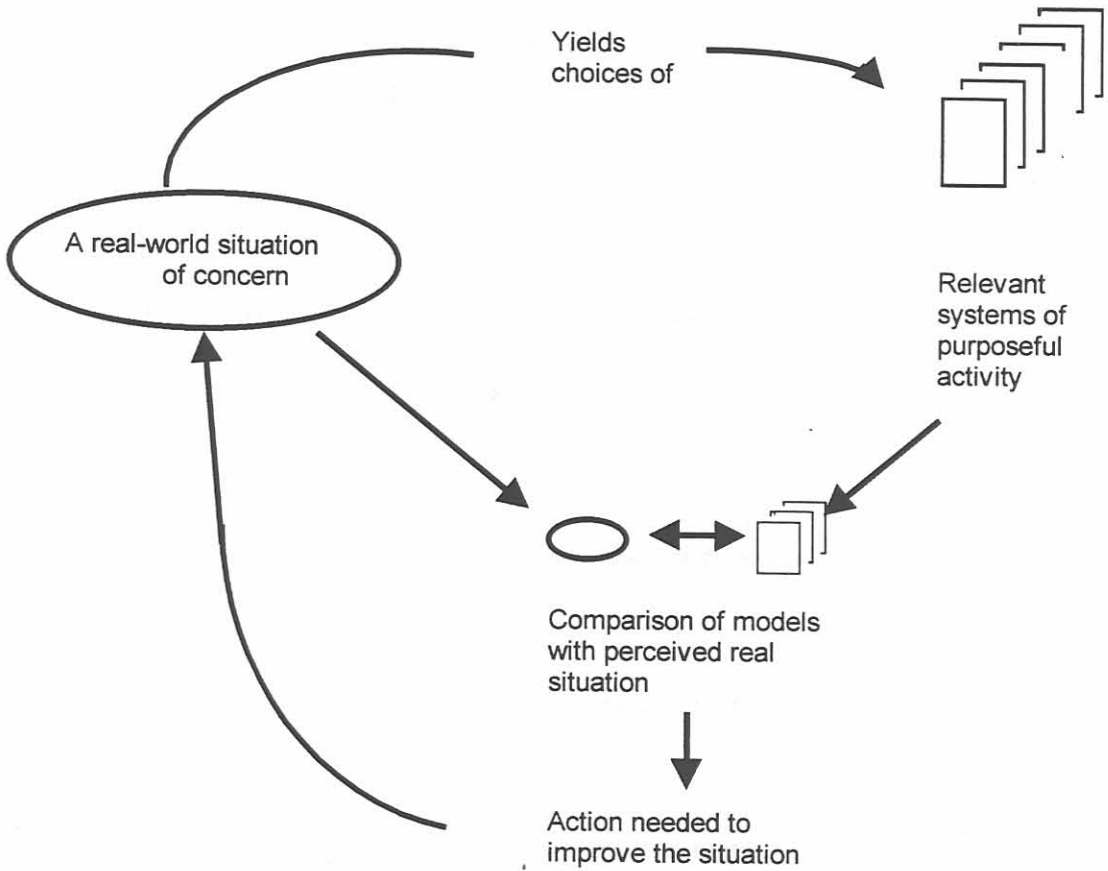Action needed to improve the situation

FIGURE 11:     The basic shape of SSM [Checkland & Scholes, 1990: 7]

This diagram does not, however, do justice to the rich complexity of real-world problems. For instance the "world views" of the researchers, as well as the participants, are not depicted in the diagram. To put this in perspective: for any *purposeful action* a number of *relevant systems* are possible,

depending on the *particular interpretation* of the problem, which of course depends on the "world view" of the participants.

In order to articulate the purposeful action of a relevant system, a so-called "root definition" is formulated.

A root definition -

*...expresses the core purpose of purposeful activity systems. That core purpose is always expressed as a transformation process in which some entity, the 'input', is changed, or transformed, into some new form of that same entity, the 'output'.* [Checkland & Scholes, 1990].

To formulate a root definition the following elements should be considered (these elements spell the word CATWOE):

CUSTOMERS                              Beneficiaries of the transformation

ACTORS                                 Those who would do the transformation

TRANSFORMATION PROCESS                 The conversion of input to output

WORLD VIEW                             The perspective that necessitates the transformation

OWNERS                                 Those who could stop transformation

ENVIRONMENTAL CONSTRAINTS              Constraining elements outside the system

CATWOE within the methodology of SSM thus:

*...seeks to provide help in articulating and operating the learning cycle from meanings to intentions to purposeful action without imposing the rigidity of technique* [Checkland & Scholes, 1990].

The transformation, as described in CATWOE above, can be broken up into several transformations. However, to simplify this discussion, the transformation of this study is described only in the following broader (inclusive) terms.

The elements of CATWOE as applied to our problem:

| C | "customers" | Beneficiaries of T (the transformation) are the students |
|---|---|---|
| A | "actors" | Lecturers and empowered students |
| T | "transformation process" | Conventional lectures (where learning equaled the ability to reproduce) to teamwork and cooperative learning (sharing of knowledge, expertise and acquiring lifelong learning skills) |
| W | "Weltanschauung" (World view) | The sharing of knowledge and information is necessary if we want to cope with an everchanging and growing knowledge base. |
| O | "owners" | Students, lecturers and university structures |
| E | "environmental constraints" | Scarce resources (laboratories and assistance, historically underprepared students from disadvantaged backgrounds) |

Thus the root definition for the above transformation, with the world view of this project, is as follows:

**Root Definition**     Lecturers can create lifelong learning opportunities for university students (from diverse backgrounds) by introducing teamwork and cooperative learning, so that they can cope with an ever-changing knowledge environment.

The core of CATWOE is the pairing of the transformation process (T) with the "Weltanschauung" or world view (W), which makes the transformation meaningful.

Argyris *et al.* in their description of the action research methodology say it is a methodology where

> *...the researchers engage with the participants in a collaborative process of critical inquiry into problems of a social practice in a learning context.*

The question can now be raised - what is the difference then between SSM and action research, as SSM is also described in very similar terms?

Perhaps SSM can be best described as a "multifaceted" version of action research in which:

a)      Monitoring and control is done throughout the process against specific defined measures of performance.

b)      Evaluation of the performance of the transformation process can be done by measuring its:

   *efficacy*          checks whether the chosen approach is producing the required output

   *efficiency*        checks if the method is economical on resources

   *effectiveness*     checks if this procedure will withstand the passage of time and satisfy long-term aims

c)      Furthermore controlled action can be taken throughout the process in order to achieve the set objectives.

**Transforming SSM**

In *Figure 11* the basic shape of SSM has been adapted to reflect the "endless cycle" of this research project. Initially teamwork (1 in *Figure 12*) was introduced to complete large tasks that required a broader expertise. Teams were constructed without adhering to specific criteria; students were allowed to form their own teams. Each team consisted of four to six members. These "self-constructed" teams were mostly homogeneous groups, culturally as well as academically. Experience signaled that the teams, where the members lived close to one another, were able to meet more regularly and could therefore complete tasks more effectively. In subsequent academic cycles geographic proximity of residence was taken into account, where possible, with the constitution of teams. However, team functioning was still not optimal as many groups experienced excessive conflict, which detracted from the advantages of teamwork. Team constitution thus needed further adaptation, as it is our belief that learning in teams at university enhances the acquisition of lifelong skills and allows internalizing concepts of the subject discipline in a more relaxed

atmosphere. This approach also exposes the students to group dynamics, thus developing abilities much needed in adult and work life.

Consequently, team constitution was refined by using Belbin's team-role methodology (2 in *Figure 12*) to construct so-called "balanced teams". Past experience in the management development arena signals the need for carefully constructed teams in the learning environment as the learning experience of many teams has been observed as ineffective, and often disrupted, by an imbalance of personality traits. In an effort to control this variable, it was decided to use Belbin's team-role methodology to construct the teams. Belbin argues that no one person possesses all the qualities needed for optimal problem solving, but that the members of a well-constructed and balanced team collectively should display all the needed qualities. Belbin further argues that the repetition of traits in the same team can lead to (amongst others) disruptive arguing, excessive conflict and "groupthink".

Originally teamwork was implemented to accomplish large tasks, such as the presentation of a literature survey or the completion of a project. Teams met in their own time to work on these tasks. Traditional "chalk-and-talk" lectures were given during formal lecture periods. The traditional method of lecturing provides little scope for the development of communication skills, both written and oral. Cooperative learning, where students work together in small groups (or teams) and draw on one another's strengths to complete tasks, was introduced. Cooperative learning allows students to share personal insights gained through individual learning in a group situation. This not only enhances conceptual insight but also fosters effective oral and written communication.

During the next phase of the study, both the concepts of team roles and teamwork were retained and cooperative learning (3 in *Figure 12*) was introduced. Our students are academically and culturally diverse. English is a second or third language for the majority of these students; therefore many find it difficult to verbalise their understanding of the work and thus resort to verbatim studying. Although the introduction of cooperative learning addressed the lack of communication skills, many students still resorted to verbatim studying. This learning behaviour signaled an inclination to concentrate on detail and a failure to see the overall picture. To remedy this inclination, mind maps (4 in *Figure 12*) were introduced.

A mind map is a clear and concise graphical representation of relevant, associated, categorized and hierarchically ordered information. The concept of mind mapping gave learners an effective method of coming to grips with a large body of information. Students were expected to brainstorm a section of the work and to produce a mind map. This process helps to bridge the gap between thinking and writing. All participating team members could use one A3-sized mind map or two A4-sized mind maps during written examinations.

To accommodate the introduction of these innovative approaches, the method of lecturing (5 in *Figure 12*) had to be reviewed. The cooperative learning approach meant that lectures deviated from the traditional presentation style. Students were expected to prepare prior to attending class. The teams discussed the prescribed section of work and identified problematic areas. If none of the team members could explain the problem satisfactorily, the team could call upon the lecturer to clarify. If more teams experienced the problem the lecturer would give a brief presentation-style lecture on that particular section of the work.

The success of these implemented systems is difficult to quantify. Examinations are usually the instrument with which a "successful" course is measured but they do not do justice to lifelong skills acquired using this method of lecturing. New assessment methods (6 in *Figure 12*) thus needed to be investigated. Team assignments, such as the drawing of mind maps, presentations or projects are assessed continuously. Tests and the final examination are written individually. Alternative methods of assessment are currently being considered within the constraints of university examination regulations.

Although student assistants help students during laboratory sessions, students have indicated that they find the assistance inadequate. The training of student assistants to provide informed assistance to students in the laboratories and the creation of an online helpdesk are being considered (7 in *Figure 12*).

Throughout this cyclical process, the various models were monitored. If they did not comply with the defined measures of performance - namely efficacy, efficiency or effectiveness - changes were made and action was taken to improve the situation.

**Yields choices of systems**

System chosen

**Relevant systems
of purposeful activity**

1    Teamwork

**A real-world situation
of concern**

- Underprepared students (historically)
- Language barrier - students cannot
  verbalise their understanding of the work
- Verbatim studying
- "Dated" method of lecturing
- Half-life of contents of subjects
  is diminishing

2    Belbin

3    Cooperative Learning

4    Mind maps

5    Method of lecturing reviewed

6    Assessment of student
performance / learning

7    Method of teaching practical skills /
laboratory teaching

Monitor and take controlled action

**Action needed to
improve the situation**

Define measures of performance:
efficacy, efficiency & effectiveness

**Comparison of models
with perceived real situation**

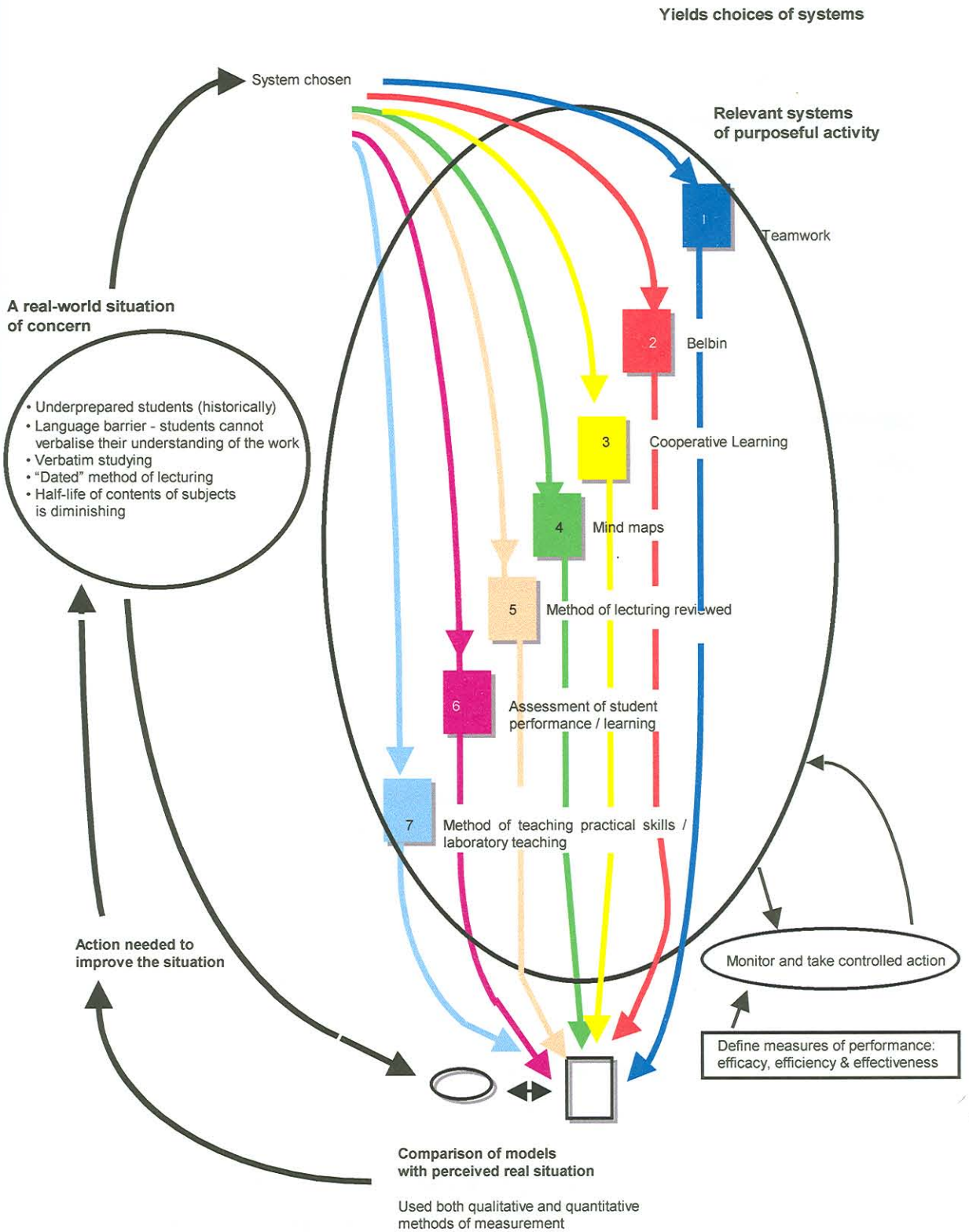Used both qualitative and quantitative
methods of measurement

FIGURE 12:          Basic shape of SSM applied to the problem of graduates who are not adequately
equipped for the job market

The progressive execution of the relevant systems (1, 2, … , 7) as depicted in *Figure 12*, was collated and implemented back to back, in chronological order, as shown in *Figure 13*. It should be kept in mind that the relevant systems of each cycle are retained, refined and implemented in the next research cycle together with new relevant systems.

**Discussion of research cycle as depicted in Figure 13**

**A**      *A real-world situation of concern*

UWC students typically come from varied academic and socioeconomic backgrounds. Most are first-generation university students and a large proportion come from educationally disadvantaged communities. The fact that English is not the home language for the majority of our students has a bearing on the difficulties students experience with verbalising their understanding and they resort to memorising instead of understanding the prescribed text. In a changing world, in particular a dynamic computer environment, it is counterproductive to memorise material that has no significant longevity. A paradigm shift from teaching to learning is therefore indicated. Teaching methods should create the opportunity for students to acquire lifelong skills.

**B**      *Relevant systems of purposeful activity*

Research started in 1995 with teamwork. Teams were constituted in such a manner that students were able to work together after hours - that is, they lived close to one another. At the same time cooperative learning was introduced in tutorial sessions but "chalk-and-talk" lectures were still given.

It was felt that the constitution of groups needed some refinement as the geographical proximity of their homes mostly implied that groups were not culturally diverse. Furthermore, some groups fell apart because of personality clashes and ability imbalances. Therefore, in 1996, it was

decided to implement Belbin's methodology to constitute more "balanced" teams. Mind maps were introduced at the same time to allow students to see the larger picture and not to get bogged down with the detail of the study material.

In the 1997 cycle care was taken that students within a group were academically diverse. In order to get to know students quickly student names and photographs were collated within groups. "Chalk-and-talk" lectures were kept to a minimum and more time was allocated to group work.

Currently alternative methods of student assessment and laboratory teaching are being evaluated.

**C**      *Monitoring and taking controlled action with predefined measures of performance*

The lecturer becomes a facilitator with this method of teaching and needs to be attuned to the needs of the students. Careful monitoring of group function is indicated and if necessary the lecturer must intervene to ensure that learning opportunities are used fruitfully (*efficacy and effectiveness*). Weekly reporting by the groups via e-mail can sensitise the lecturer to dysfunction within the group. *Efficiency* is ensured as working with groups is more economical on resources than addressing individual problems.
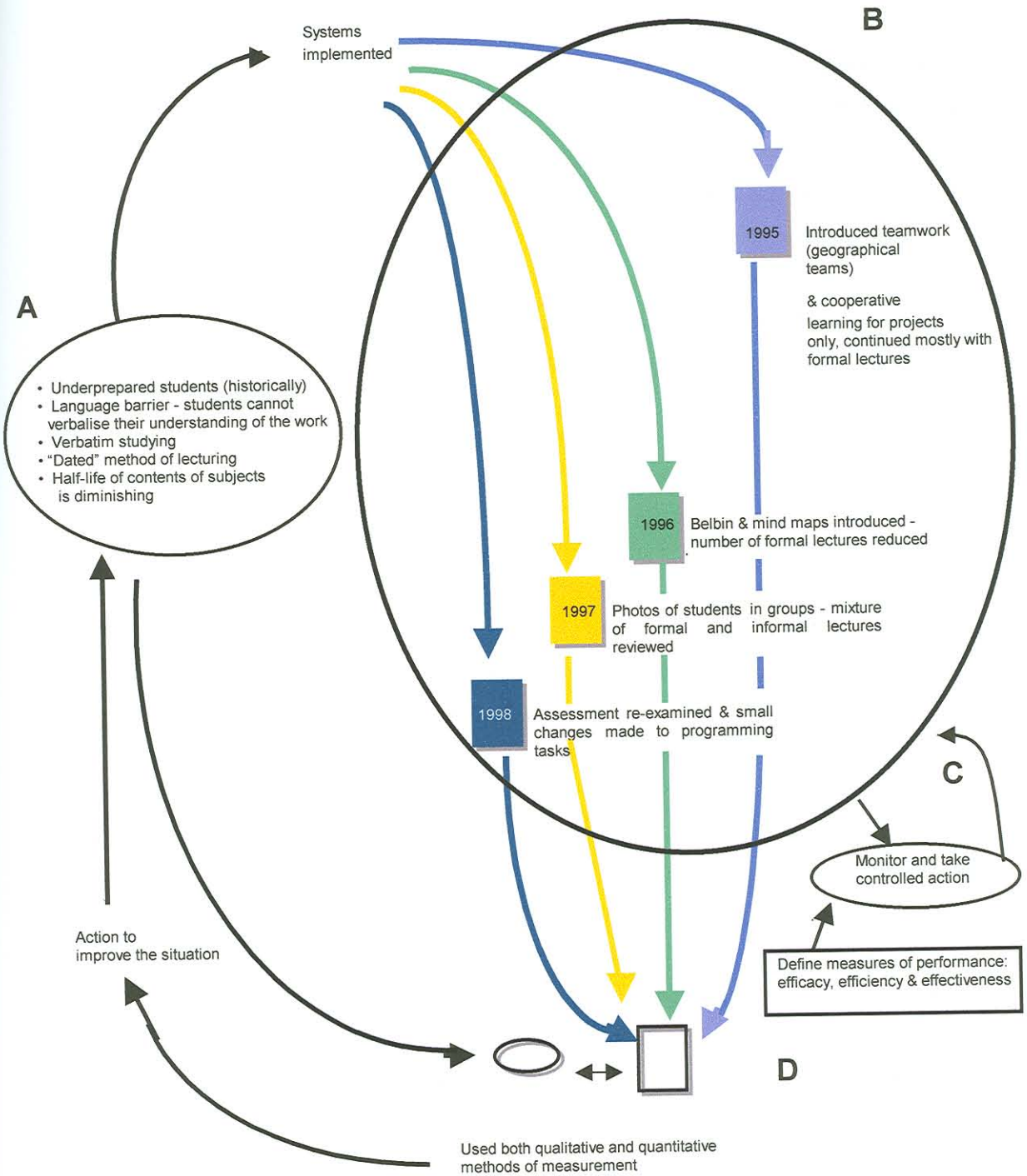
Systems
implemented

B

A

- Underprepared students (historically)
- Language barrier - students cannot
  verbalise their understanding of the work
- Verbatim studying
- "Dated" method of lecturing
- Half-life of contents of subjects
  is diminishing

1995 Introduced teamwork
(geographical
teams)

& cooperative
learning for projects
only, continued mostly with
formal lectures

1996 Belbin & mind maps introduced -
number of formal lectures reduced

1997 Photos of students in groups - mixture
of formal and informal lectures
reviewed

1998 Assessment re-examined & small
changes made to programming
tasks

C

Monitor and take
controlled action

Action to
improve the situation

Define measures of performance:
efficacy, efficiency & effectiveness

D

Used both qualitative and quantitative
methods of measurement

FIGURE 13: Annual cycles of the model of SSM [Checkland & Scholes, 1990] used

73

**D**     *Comparison of models with perceived real situation*

Both qualitative and quantitative instruments of measurement were implemented. Why use both these instruments? It was felt that research in education could be compared to a naturalistic study where inquiry demands a human as instrument, adaptive to an indeterminate situation. Qualitative methods, such as interviewing [Schön, 1983], observing and taking note of nonverbal cues, come more easily to the human-as-instrument. However, the quantitative paradigm creates more opportunities for the naturalistic investigator [Lincoln & Guba, 1985] and by combining these methodologies it was felt that the research findings would be more comprehensive.

**Integrating approaches**

Lee [1991] has discussed the feasibility of integrating an interpretive approach with the traditional positivist approach, and showed that the two different approaches are mutually supportive, not mutually exclusive. Naturally, it would only make sense to add an additional layer of research if the results benefit the study - in other words, if the additional work leads to conclusions, which would not otherwise be drawn. In chapter 5 this point will be further discussed.

According to Strauss and Corbin [1990] grounded theory is not developed before research is done and then tested to confirm the theory. Rather it is an inductive process whereby data is collected, analysed and certain phenomena, relevant to the research, are allowed to *"emerge"*. Pandit [1996] is of the opinion that a synergy is created if quantitative data is collected to corroborate the findings of qualitative data. And qualitative data allows the researcher to understand the *"rationale of the theory and the underlying relationships"*.

By drawing some of the research methodologies together (the qualitative, quantitative, interpretive and SSM research methodologies) a clear picture of the research problem will emerge. If the results are furthermore interpreted from various perspectives the problem can be evaluated holistically.

**Conclusion**

Research in education is at best "fuzzy" and SSM was an effective encompassing method of dealing with the research process. SSM allowed the researcher to become part of the research process. The cyclical nature of SSM is well suited to the educational field in that small adaptations can be made with each new cycle. Both qualitative and quantitative research methodologies were used to collect data and to measure the effectiveness of interventions implemented. Careful monitoring was implemented throughout the research process and controlled action was taken to achieve set objectives.

In the next chapter the research problem of underprepared students, the language barrier, the "dated" method of lecturing and verbatim studying will be revisited. Each period of the study will be discussed as a separate case study. In chapter 5, the research will be viewed from different perspectives. These perspectives include a perspective using Knowledge Interests as defined by Habermas, a perspective using hermeneutics, a perspective using Interpretative Research and Giddens' *consequences of contemporary modernity* as a perspective.

By viewing the problem from various vantage points, emergent themes will come to light and in the tradition of the grounded theory approach *"what is relevant to the area of study will be allowed to emerge"* [Strauss & Corbin, 1990]. These emergent themes will allow the development of a framework for group constitution for small group learning in the field of information technology. This framework will be discussed in Chapter 6.