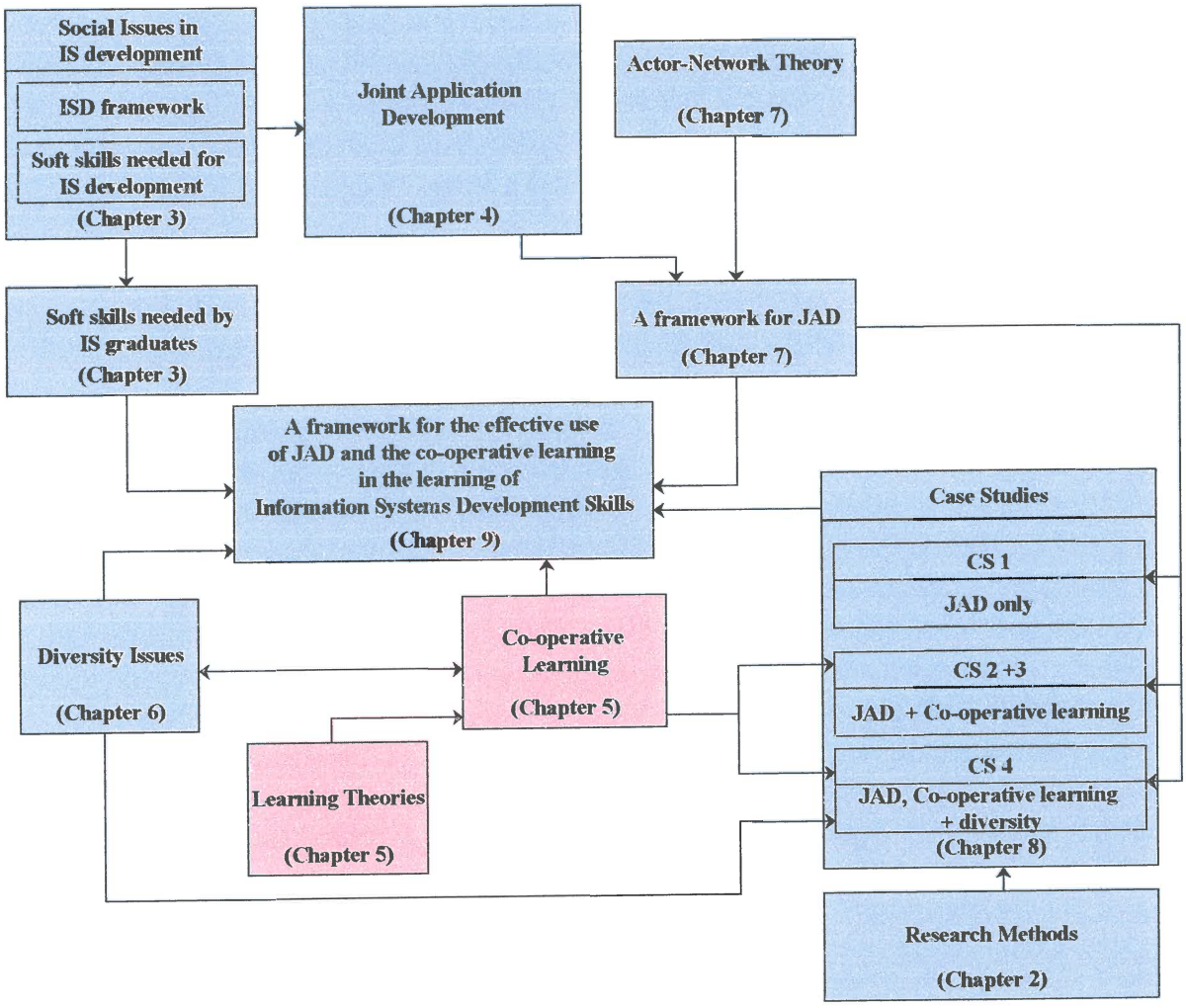
Chapter 5

Learning by Co-operation



Chapter 5

Learning by Co-operation

The skills and dispositions that are needed by people in order to achieve success include "*the capacity for critical thinking and complex problem solving, respect for people different from oneself, principled ethical behaviour, lifelong learning and effective interpersonal interaction and teamwork.*" [Gardiner, 1994, p.1]. Fostering the learning of these skills is difficult.

This chapter firstly presents some of the learning theories that are the basis of the idea of learning by collaboration. Collaborative and co-operative learning are then described, together with techniques for making co-operative learning more effective. Co-operative learning techniques were combined with the JAD techniques in order to foster more effective groups and more effective learning during the second, third and fourth case studies reported in Chapter 8.

5.1 LEARNING THEORIES

Three learning theories that are relevant to the concept of learning by collaboration will be briefly described in this section. These are the Sociocognitive Learning Theory of Piaget, the Sociocultural Learning Theory of Vygotsky and Social Constructivist Theory, which is the learning theory upon which the research is based.

5.1.1 Piaget's Sociocognitive Learning theory

Knowledge is a state of understanding that is acquired by learning [Wells, Chang & Mahler, 1990]. Knowledge cannot be passed from one person to another in the same way that a book or map can be passed, as individuals must make sense of that information for themselves. Knowledge can only exist in the mind of an individual.

Piaget believed that a person structures reality using internal structures that he termed schemas. As people learn they can develop new schemas (by a process of **assimilation**) or they may modify existing schemas (by a process of **accommodation)**. These two processes of assimilation and accommodation occur in most effective learning [Brady, 1985]. According to Piaget [Brady, 1985], a person tries to achieve a state of equilibrium whereby anything new that is assimilated is compatible with what is in the existing schemas. When a person assimilates information that conflicts with existing schemas then there is a lack of balance and changes in the cognitive structure are necessary.

Piaget's theory was concerned with individual development, but also emphasised, in his earlier work, the importance of social interaction on that development [O'Malley, 1995b]. Interacting with one's peers will lead to a recognition that there are alternative perspectives, this will produce cognitive conflict and will motivate one to change existing schema in order to arrive at a solution that allows equilibrium.

When peers are working together, there needs to be a difference in perspectives in order for social cognitive conflict to occur. Piaget thus predicts that the members of the groups should be at an equivalent level of understanding, so that one member of the group does not dominate the other, but should differ in their underlying conceptions of how to solve a problem [O'Malley, 1995b]. Group members should, however, recognise the need to reach agreement and justify their different points of view. They should also recognise that each member has equal rights.

Language is seen as important, in that it is the method whereby the groups express their thoughts and argue with one another. There must be shared understanding of the language being used [Brady, 1985].

5.1.2 Vygotsky's Sociocultural Learning Theory

Vygotsky believes that all individual development has its origins in social processes.

Vygotsky [quoted in O'Malley, 1995b] proposed that "*any higher mental function was external and social before it was internal.*" He believed that interaction between people formed the foundation of "inner dialogues" and that it is through these inner dialogues that we structure our thoughts [O'Malley, 1995b]. He proposes that internalised language is the basis of thought and that all higher functions like memory, attention and perception develop from relations between people that become internalised [Smith, 1992].

Vygotsky predicts that attempts to co-ordinate perspective and jointly get to a solution will be more valuable than just having different perspectives of what the solution should be [O'Malley, 1995b]. Learning is seen as a social process that involves human beings in communication with one another.

Bereiter [1994] criticises this view saying that there is evidence from Piagetian studies that children learn much from their physical world before they could have learnt from social or cultural interaction with others. He says that while social learning plays a major role in learning, it cannot be said to be the only method by which people learn.

As the learner learns they become inducted into the culture of the specific community and the more experienced member can support the less experienced member [Magadla, 1996]. The nature of the collaboration should be such that the students help one another to reach the solution – this means that students in the group do not need to be equal in ability but may have experts and more novice people paired together.

Rogoff [reviewed in O'Malley, 1995b] suggests that how the groups are formed may depend on what the learning outcomes are for the group. Piaget was concerned with changing perspectives and restructuring of concepts and therefore advocated using groups with group members of equal academic ability. Vygotsky, on the other hand, was interested in acquiring understanding and skills and therefore advocates using mixed ability groups who jointly construct solutions.

The lecturer's role is seen as that of a mediator between the students' personal meanings and culturally established meanings of the broader academic society [Cobb, 1994]. The students and lecturers are involved in a process of negotiation and both contribute towards the learning and development process within the classroom. Lecturers and students use one another's contributions to make learning possible.

5.1.3 Social Constructivism

Constructivism is a theory that helps us to understand how people learn by constructing knowledge. Radical constructivism is based on the work of Piaget and promotes the idea that there is no shared understanding and that learning is a process of individual self-organisation of thought. Social constructivism, on the other hand, recognises that knowledge construction is a social process and that learning involves developing a personal meaning as well as being able to communicate with others in the discipline [Magadla, 1996]. Social constructivism studies the process of collaborative construction of knowledge that occurs when groups of people interact [Stacey, 1998].

Radical constructivism is concerned with the mental activities of the learner. Socioculturalism pays attention to the cultural practices of the learner's situation. Social constructivism does not see that these things are incompatible [Bereiter, 1994]. Cobb [1994] supports this by saying that the sociocultural perspective helps to define the conditions under which learning can take place while the constructivist perspective focuses on what students learn and the processes by which they learn. Social constructivism tries to marry these two ideas.

The process of constructing knowledge, dealing with misconceptions and using social interaction to promote learning will be described below. The implications of this for learning are then presented.

5.1.3.1 Constructing knowledge

Constructivism emphasises the active role of learners in constructing their own knowledge [Dufresne, Gerace, Leonard, Mestre & Wenk, 1996; Ben-Ari, 1998]. Different students will learn in different ways. They use their existing knowledge to make sense of any new knowledge presented to them. Although we teach all our students in a class the same way, they may each come away with a different understanding of what has been presented [Mestre, 1994].

The content, the context, the learner's activity, the prior knowledge of the learner and the goals of the learner will all determine what the person understands [Savery & Duffy, 1995]. Constructivists see "*a relationship between the practices of knowing and what is known. Knowledge is envisioned as tentative and uncertain, having multiple constructions and forming through negotiation with community boundaries.*" [Popkewitz, 1998, p.549].

As learners can only interpret information in the light of their own experiences, what and how that interpretation takes place will be, to a certain extent, individualistic [Jonassen, 1991]. Knowledge acquisition is a recursive practice where new knowledge is combined with existing knowledge to create new cognitive structures. Knowledge can also be created by reflecting on old knowledge [Ben-Ari, 1998]. Constructivism impresses on us the need to understand more about individuals and how they learn [Gruender, 1996]. The implication of this is that learners need to actively engage in the construction of their own knowledge and that we need to test that this construction is taking place correctly. Learners also need the time to reflect on their own understanding of problems [Savery & Duffy, 1995].

Some radical constructivists take this idea of constructing knowledge to the extreme and insist that, as knowledge is local to an individual, it cannot be taught or found in books and other materials. They claim that there can be no shared reality or shared understanding of language [Magadla, 1995]. This has been challenged and does not

seem to be the current view of most education researchers [Gruender, 1996; Reigeluth, 1991]. Reigeluth [1991] argues that there are many types of skills that need to be learnt and that conventional teaching methods are probably fine for some of them.

The Cognitive Flexibility Theory, an extension to the constructivist theory, takes this construction of knowledge a step further. Spiro, Feltovich, Jacobson & Coulson [1991] claim that, in ill-structured domains, the student cannot merely use his or her pre-existing knowledge, but must be flexible about using that knowledge. The prior knowledge itself must be reconstructed. Instead of retrieving from memory an item that tells the person how to act, the person needs to bring together knowledge from a variety of memories and adjust these to suit the new problem to be solved.

5.1.3.2 Misconceptions

As learners use their previously held beliefs and knowledge to understand any new concepts, this can also mean that they use their previously held incorrect knowledge and misunderstand what is being taught. This is especially true in the sciences where many misconceptions or alternative conceptions have been identified [Dufresne et al., 1996]. Even when two people have a discussion and think they understand each other, there is the chance that they do not perceive the same reality [Duffy & Jonassen, 1991].

When learning science, for example, students often have a "private understanding" or "*naive model*" of how things work [Perkins, 1991]. The concepts of speed, velocity, acceleration and force, for example, are concepts that have different meanings in everyday life to the meanings that scientists have for them. This can cause difficulties for students learning physics.

5.1.3.3 Social interaction

Although learners construct their own knowledge, their interaction with others will also influence their learning according to social constructivists. Radical constructivists have

a problem with the idea that learning can take place by internalizing from the social to the internal cognitive realm. The social constructivists borrow from the work of Vygotsky to allow for this process of internalization [Cobb, 1994].

Cognition has a social nature and the community that we live in will have an influence on the knowledge that is constructed [Dufresne et al., 1996]. This is true for scientific education too where knowledge is often stated in terms of symbols and constructs that have been agreed upon by the scientific community to interpret nature [Magadla, 1995].

Social interaction can promote learning. The learner can explain his or her own understanding and receive feedback from others. This process forces learners to clarify their own understanding when explaining it to others. Learning in groups often involves gaining group consensus, which means that learners must convince one another of the right approach or learn from each other that their approach has flaws [Stacey, 1998].

We must encourage students, not only to be problem solvers, but also to make sure that others accept their solutions. They should be able to have an argument with others and defend their ideas while being flexible enough to change their ideas if others can prove their ideas to be better. Collaborative groups are important because they allow students to test their understanding and examine the understanding of others. This, in turn, will allow them to get a deeper understanding of what they are studying [Savery & Duffy, 1995].

5.1.3.4 Implications for teaching and learning

The main implication of the constructivist view of learning for teaching is that teaching should be aimed at helping the students create within themselves the constructs they need, how to learn these constructs and how to explain these to others [Gruender, 1996]. We should also enable students to learn by connecting the new knowledge to their previous experience and knowledge. Social constructivism promotes the idea that this activity should include interaction with other people as we learn better when we work with

others.

Gravett [1995, p.34] suggests that when constructing courses, we should not only look at the content of the course but also "*the principles, key concepts, scientific thought processes and how they interrelate, support and illuminate one another*".

Constructivism does not tell one how to teach. It does, however imply that students should be exposed to learning opportunities that enable them to [Brooks & Brooks, 1993; Dufresne et al, 1996; Swan & Hughes, 1993; Jonassen, 1991; Savery & Duffy, 1995]:

- examine their own ideas;
- participate actively in their learning;
- change from remembering and reciting information to learning independently using critical thinking skills;
- engage in writing, talking, describing, explaining and reflecting;
- realise the purpose of the learning activity;
- develop ownership of the problem or task;
- work in an environment that closely matches the one that they will need to function in later;
- determine the extent to which new experiences make sense in the light of their own ideas;
- consider alternative explanations; and
- evaluate the usefulness of a number of perspectives.

This means that lecturing is likely to be less effective than the more active approaches to learning. Methods of teaching that encourage students to think about what they are doing and make strong connections between their new knowledge and existing knowledge are likely to increase the amount of learning that takes place [Selden, 1996]. Students can be emotionally attached to their own ideas (even if they are misconceptions) and will not give them up easily. It can, therefore, take some effort to challenge students into revising their ideas. Feedback from others is important in this process [Ben-Ari, 1998].

Students actively construct their own frameworks. They could also have their own preferred learning style - some may prefer writing, others talking, reading or listening. Having multiple learning methods and active learning strategies will provide an environment where the students can have some flexibility in constructing their own knowledge according to the learning style that best suits them [Abraham, 1995/1996].

Constructivism implies that students should develop metacognitive skills. This means that they need to think about the way that they think. Metacognitive training will help students develop the skills they need to construct connections and apply strategies for better achievement [Mevarech, 1996].

Social constructivism implies that the activities should be ones which include interaction with other people. This enables the students to learn from others as well as realizing any problems that they may have with their own ideas [Stacey, 1998]. Social constructivism recognises that the students interaction with others can help them to internalize what is to be learnt. The use of small groups, co-operative work, case studies in groups and discussion teaching can all stimulate learning in the social constructivist classroom [Abraham, 1995/1996].

The Cognitive Flexibility Theory, which is an adaptation of the constructive theory, adds another factor to the way that we should teach. Spiro et al. [1991] claim that when teaching and learning the same material should be covered at different times, for different purposes and from different conceptual perspectives. This will enable students to understand the material and be able to use it in different contexts and integrate the material with other material to solve complex problems.

5.2 COLLABORATIVE AND CO-OPERATIVE LEARNING

One of the important lessons to be learnt from the constructivist approach is that active student involvement is necessary for learning. What lecturers tend to do, however, is lecture. While instructing, lecturers fail to determine if the misconceptions students have,

are interfering with their ability to understand the current work being taught. Students should be challenged with the gaps, flaws or discrepancies in their existing knowledge in order to help them change the way that they perceive and learn something new [Gravett, 1995]. This could be done effectively using various types of collaborative work where students must defend their own ideas and listen to others.

Learning can occur in an individualistic, competitive or collaborative situation [Johnson & Johnson, 1986]. In an individualistic learning situation the students' goals are independent and the achievement of one student is unrelated to the achievement of other students. In a competitive learning situation the students' goal achievements are negatively correlated in that when one student achieves his or her goal then others will fail. In co-operative learning situations there is interdependence between the goals of the students. Students work together and perceive that they can only reach their goals if the others in their group also achieve.

5.2.1 What are collaborative and co-operative learning?

Roschelle and Teasley [1995, p.70] differentiate between collaboration and co-operation in the following manner. They define collaboration as "*a co-ordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem*". They say that co-operative work "*is accomplished by the division of labour among participants*", and that it is *"an activity where each person is responsible for a portion of the problem solving"*. Co-operative work would thus seem to be a special form of collaborative work.

Co-operative learning is the instructional use of small groups where students work together to maximise their own and each other's learning [Johnson, Johnson & Smith, 1991]. Hilke [quoted in de Villiers, 1995, p.12] says that "*Co-operative learning is an organisational structure in which a group of students pursue academic goals through collaborative efforts. Students work together in small groups, draw on each other's strengths, and assist each other in completing the task. The method encourages*

supportive relationships, good communication skills and higher-level thinking abilities."

Co-operative and collaborative learning give the individual opportunities to learn by expressing their own ideas and exploring those of others in a group. It is not about competing but rather about using the diverse resources of the group to deepen understanding, sharpen judgement and extend knowledge [McConnell, 1994].

When students collaborate, they share the process of constructing knowledge. This enables the students to think about and elaborate on their own ideas and those of others in the group. The student's fellow group members become collaborators rather than competitors in the learning situation [Strommen, 1992].

5.2.2 Essential features of effective co-operative learning

Co-operative learning is not just another name for group work. Simply placing students in groups and telling them to work together will not mean that they know how to co-operate or that they will co-operate.

Johnson, Johnson and Smith [1991] say that there are five basic principles that should be followed in a co-operative learning situation. These are positive interdependence, face-to-face promotive interaction, individual accountability, social skills and group processing. These five principles are described below:

5.2.2.1 Positive interdependence

Positive interdependence is achieved when each member of the group perceives that he or she cannot succeed unless the other members also succeed and that collaboration is necessary in order to complete the task. The work of the different team members must be beneficial to the other team members. Sharing resources, providing mutual support and encouragement and celebrating joint successes is important to the group. Team members must rely on one another to achieve the goal [Felder & Brent, 1994].

5.2.2.2 Face-to-face promotive interaction

Some or all of the work must be done interactively with group members giving feedback, challenging one another's reasoning and teaching and encouraging one another [Felder & Brent, 1994]. Individuals must encourage and facilitate each other's efforts to achieve, complete tasks and reach the goals of the group [Johnson, Johnson & Smith, 1991].

Promotive interaction is characterised by individuals who [Johnson, Johnson & Smith, 1991, p.30] "*provide each other with efficient and effective assistance; exchange needed resources such as information and materials; provide each other with feedback to improve their subsequent performance of their assigned tasks and responsibilities; challenge each other's conclusions and reasoning to promote higher-quality decision making and greater insight into the problems being considered; advocate the exertion of effort to achieve mutual goals; influence each other's efforts to achieve the group's goals; are motivated to strive for mutual benefit; acting in trusting and trustworthy ways; and exhibit a moderate level of arousal characterised by low anxiety and stress.*"

Note that negative interdependence will result in students obstructing each other's learning and discouraging each other's efforts to learn.

5.2.2.3 Individual accountability

There are two aspects to individual accountability. One is that the performance of the student needs to be individually assessed and the second that each member of the group must be held responsibly by the other members for contributing his or her fair share of the work [Johnson, Johnson & Smith, 1991].

One of the problems of conventional group work is that of "social loafing" whereby some students sit back and allow the rest of the group to do the work [Abrami, Chambers,

Poulsen, de Simone, d'Appollania & Howden, 1995]. This can affect the motivation of the rest of the students in the group. This type of problem is most likely to occur when it is difficult to identify each member's contribution or when members do not feel that they are responsible for the final outcome.

5.2.2.4 Social skills

Social skills are the fourth essential element for co-operative learning groups according to Johnson, Johnson and Smith [1991]. This aspect involves using the appropriate interpersonal or social skills at the proper time. Students must get to know and trust each other, communicate accurately and unambiguously, support one another and resolve conflicts constructively. Students must be encouraged to develop and practise trust-building, decision-making, communication and conflict management skills [Felder & Brent, 1994]. The skills of co-operation are essential for the workplace today [Hamm & Adams, 1992].

These skills are not ones that students can be expected to have instinctively, which means that they may have to be taught to the students if they are to be effective.

5.2.2.5 Group processing

Group processing is defined by Johnson, Johnson and Smith [1991, p.22] as "*reflecting on a group session to describe what actions of the members were helpful and unhelpful and to decide what actions to continue or change*". This will help to clarify and improve the effectiveness of the collaboration. Felder and Brent [1994] support this by saying that team members must set up group goals, assess how they are achieving as a team and identify changes that they need to make to become more effective.

This process can help maintain good working relations among the group members, help the students learn co-operative skills, ensure that members receive feedback on their participation, ensure that students think on the metacognitive level as well as the

cognitive and provide a means to celebrate the success of the group.

5.2.3 Advantages of co-operative learning

Co-operative learning has two main outcomes [Schmuck, 1985; Nijhof & Kommers, 1985]:

- The first outcome is that students learn by co-operating. The students' academic performance is improved as they co-operate with one another.
- The second outcome is that students learn to co-operate. The students learn to work as a team and learn the skills necessary for working with other people.

5.2.3.1 The effect on academic achievement

There are many studies that report on an improvement in students' academic achievement after working in co-operative groups. Johnson and Johnson [1990] investigated 323 studies conducted during the previous 30 years. They did a meta-analysis of the results of these studies and found that the average of the student learning by co-operative learning was two-thirds of a standard deviation above those learning in a competitive environment and three-quarters of a standard deviation above those learning in an individualistic environment. This positive effect on academic achievement has been found in high-, medium- and low-ability students.

Kagan, Zahn, Widaman, Schwarzwald and Tyrrell [1985] report on three major studies done in America that show that minority students (Mexican-Americans and African-Americans), suffer academically in traditional classroom situations. They found, however, that the minority students showed dramatically greater gains academically in the co-operative classroom as compared to the traditional. Knight and Bohlmeyer [1990] suggest that this could be attributed to the fact that these children see the reward structure of co-operative learning as being more consistent with their own co-operative values than the reward structures of a traditional classroom.

One of the suggestions made is that co-operative learning motivates the students to take a more active role in their learning. Learners are able to take control of their own learning within the social context of the co-operative learning group [McConnell, 1994]. By discussion, students can validate their own ideas, gain multiple perspectives of the solution and engage in conflict resolution with others. Students who work together experience this as fun which is a further motivating factor [Hamm & Adams, 1992]. Sharan and Shaulov [1990] studied students' motivation specifically and found that co-operative learning increases students' interest in learning tasks and that their motivation was improved.

Co-operative learning enables students, through discussion, to bring different perspectives to the designing of solutions and should help students to consider more options and issues. Students are encouraged to exchange views with others and become more aware of alternatives [Parsons & Drew, 1996]. This process also helps students to clarify their ideas and develops their critical thinking skills [McConnell, 1994]. Controversy among the group members demands that they reach a higher level of understanding [Knight & Bohlmeyer, 1990].

The process of students teaching one another could also be a factor that promotes the higher academic achievement [Hamm & Adams, 1992]. If a person wants to ensure understanding then he or she can try teaching that to someone else. Through the process of teaching, explaining and defending one's solution a greater understanding develops.

Two essential skills for being an effective thinker can be developed in co-operative groups according to Davidson and Worsham [1992]. These are the skill of good question formulation and the skills of formulating significant problems.

The problems that can be handled by a group can be done in greater depth and be more complex than the problems solved by individuals. Groups are generally able to come to a better solution or design than someone working on his or her own [Parsons & Drew,

1996]. Many students are leaving tertiary institutions with passive knowledge, i.e. they are able to produce facts on demand, but they are unable to understand the concepts and principles which enable them to apply their knowledge in real life [Gravett, 1995]. Co-operative learning tries to address this problem.

Felder and Brent [1994, p.2-3], in an ERIC report, summarize by saying that, relative to students who are taught using lecturer-centred lectures and individual assignments, students taught using co-operative methods exhibit: "*higher academic achievement, greater persistence through graduation, better higher-level reasoning and critical thinking skills, deeper understanding of learned material, more on-task behaviour and less disruptive behaviour in class*".

5.2.3.2 The effect on social relations

Co-operation is an essential skill in most jobs today [Hamm & Adams, 1992]. This is especially true in the field of Information Technology where software developers have to work in teams with users to create effective systems. The skills of working in teams, group dynamic skills, communication skills and consensus finding skills are important in the work place and need to be developed in IS students as discussed in Chapter 3.

Co-operative learning helps to develop the student's interpersonal skills and qualities and makes them better team members. Meyer [1993] claims that group work promotes a "humane and democratic attitude" on the part of students. The students learn to work together and can both give and receive help. This builds more supportive relationships between students in the class [Felder & Brent, 1994]. Support from peers can also help to reduce dropout rates [Stacey, 1998].

Co-operative learning techniques put heterogeneous groups of students together. Students from different sexes, races and cultural backgrounds all work together towards a common goal. Slavin [1985] reports that, in 14 studies of co-operative learning and inter-group relations, all but two found a positive affect on group relations and interracial

relations. This is supported by the studies of Johnson and Johnson [1985] who say that they have found evidence that co-operative learning promotes greater interpersonal attraction and more positive relationships among students who work in co-operative learning environments than those that work in individualistic or competitive environments. Johnson and Johnson also reviewed the work of 98 other studies and found that these results were supported even when students came from heterogeneous backgrounds. Hamm and Adams [1992] say that co-operating with people who are different from oneself increases respect for diversity.

Co-operative learning tries to accommodate individual differences in the learning process. In co-operative learning "*individual differences are exploited to promote learning*" [Antil, Jenkins, Wayne, & Vadasy, 1998, p.420].

English second language students are provided with opportunities to practise their English within the co-operative learning groups. Abrami et al. [1995] suggest that the students should be grouped together in homogeneous language groups when discussing complex concepts to allow them to explore these in their own language. They should be expected to report back in English, however, thus encouraging them to transfer their knowledge into their new language. Including them in heterogeneous groups with other students has the advantage of allowing them to improve their English skills during the entire co-operative learning experience, however. No references that this has been studied in South Africa have been found in the literature, so it remains an interesting point to research.

Students who have problems academically are often moved to bridging classes or other classes out of the mainstream. Slavin [1985] studied co-operation between mainstream and non-mainstreamed students and found that co-operative learning improved the students' acceptance of one another and also improved the self-esteem of the non-mainstreamed students. An enhanced self-esteem has been found to be significant in almost every study on co-operative learning where it has been measured [Slavin, 1985].

Cohen, Lotan and Catanzarite [1990] add that co-operative learning also helped students to view other students differently. They measured how students perceive the status of other students and found evidence that co-operative learning helped improve students' perceptions of the abilities of low-status students.

Felder and Brent [1994] claim that recent research has shown that co-operative learning lowers the levels of stress and anxiety in students. Mutual support is important in achieving this. The experience of being part of a caring group can foster a feeling of belonging, which helps reduce dropout rates and lowers anxiety [Solomon, Watson, Shaps, Battistich & Solomon, 1990].

5.2.4 Problems with group work

Research has shown that although there are many advantages to working in groups, there are also several associated problems. Some of these will be described below.

Some people are perceived to do most of the work while others are able to relax and depend on the "good" students in their group. The less able team member leave it to others to do the work, thus creating a "free rider" effect. The more able team member who is doing all the work feels like a "sucker" [Johnson & Johnson, 1990]. Abrami, et al. [1995] call this "social loafing". This can be particularly problematic, according to Abrami et al., when students share a grade equally regardless of the amount of effort put in by an individual. The co-operative learning methods described above do try to overcome this by forcing individual accountability or dividing the work in such a way that the students are forced to become expert in their individual section of the work [Slavin, 1985]. The students need to be convinced that they must change from listener, observer and note taker to active problem solver, contributor and discussant [Daigle, Doran & Pardue, 1996].

Some students are merely shy and do not participate in a group for this reason. Some students feel that being put in the public eye is a position of risk [Daigle, Doran &

Pardue, 1996]. Others might dominate the group and, even if the others would like to contribute, those students takes over. The dominant student is often egocentric and refuses to consider the perspectives of others in the group. This usually leads to inferior group problem solving [Johnson, Johnson & Smith, 1991]. The high-achiever may resent or belittle the efforts of the low achiever. Co-operative learning methods try to overcome this by having students become experts at a particular area or by evaluating in such a way that the individual and team scores are used [Slavin, 1985].

Some students have self-oriented needs and this can interfere with the work of the group as a whole [Johnson & Johnson, 1990]. Students with high-level abilities complain about being held back by their slower team mates [Felder & Brent, 1994]. Students may then decide to divide the labour dysfunctionally, for example, one might decide that he or she is the "thinker" and the other person is the "typist" [Johnson & Johnson, 1990]. Another dysfunctional way that tertiary students sometimes divide up work is when one member might do all the work for one project and the other for another. This situation will clearly be counterproductive [Anderson, Reder and Simon, 1996].

There can be problems if students are expected to do group work outside of class time. A great deal of time can be spent with trying to get everyone together for meetings especially if some students are not motivated [Parsons & Drew, 1996]. Even if the meetings take place during class time, some students' attendance of class is not of the best. Students will need to make the shift between attending class through personal choice to attending because it is expected by the group [Daigle, Doran & Pardue, 1996].

It can be difficult for students from heterogeneous cultural groups to communicate freely with one another and get to know one another. This is especially true if there are students from different language backgrounds in the group [de Villiers & Grobler, 1995].

Another problem can occur if the decision making of a group is destructive rather than constructive. This can occur if students do not listen to one another, do not know how to reach consensus or are unable to voice their point of view [King & King, 1998].

Internal pressures within the group may force the members to conform, even if they think differently, without true consensus being reached. Group members try to get concurrence within the group and work to get quick compromises and avoid disagreement, rather than to get the best solution [Johnson, Johnson & Smith, 1991].

The lecturer must be sure that the task given to a group is one that allows the students to arrive at well-argued decisions. There should be scope for students of varying levels of abilities to participate in the group and still feel at ease [Meyer, 1993]. The way that the groups are put together should allow the students to express their own ideas and arguments, but should also enable the student to listen and recognise that others may differ from themselves. Students should not be allowed to stop thinking while others are participating [Solomon et. al., 1990].

Another problem is that the group is often more social than productive. In tutorial classes where the students are asked to divide into groups and discuss problems, we often find that they discuss other topics unrelated to the classroom activity. Lecturers have a problem with monitoring the groups and noticing problems within the groups. They often intervene too quickly or fail to intervene when it is necessary [Solomon et. al., 1990].

Co-operative learning methods have been devised to help reduce some of these problems but they must be implemented correctly. The following section describes how the lecturer can implement effective co-operative learning.

5.2.5 Implementing effective co-operative learning

The co-operative classroom is a complex one and one that requires considerable redesigning on the part of the lecturer. The different features of the classroom environment are also integrated and they affect one another, for example, the teacher's leadership style, the structure of the learning task and the student's social skills will all influence the process [Hertz-Lazarowitz & Shachar, 1990].

This section tries to describe some of the factors that should be considered in order to use co-operative learning methods effectively.

5.2.5.1 Specifying the instructional objectives

Two types of instructional objectives need to be defined for the lesson. The first is the academic objective and the second is the social skills objective [Johnson, Johnson & Smith, 1991; Reynolds, 1994]. The academic objective must be appropriate for the level of skill of the students and will, to a large extent, determine the co-operative learning method, the learning material and the task structure that is chosen. The social skill's objective must indicate to the students what particular group skills will be emphasised during the lesson. The students must be aware of both of these objectives and they should be explained clearly to them.

In order to structure positive interdependence the lecturer should also communicate the goal of the individual and the goal of the group. This will help to foster individual accountability and group cohesion.

The context of the work should also be explained to the students so that they understand how the group activities link with the other parts of the course and with what happens in industry [Reynolds, 1994].

5.2.5.2 Prepare students for group work

Johnson and Johnson [1990] suggest that placing students who are socially unskilled into a group and telling them to co-operate will not work. Students have to be taught the interpersonal and small group skills needed for co-operation.

Thorley and Gregory [1994] suggest that students who are asked to do group work with inadequate training may find the group activity negative. This will then reduce the learning.

Students must be made aware of the importance of prosocial behaviour in the classroom and in the workplace. Factors like being fair, considering others, being helpful and having social responsibility should be highlighted [Solomon, et. al., 1990]. Social skills for group work like co-operation, sharing, negotiation and conflict management need to be taught and practised. The students must learn that their group will be successful through negotiated consensus rather than capitulation on their part [Sullivan, 1992].

Jaques [1991] provides some interactive training exercises that help with team building, thus enabling them to learn to know and trust one another, to not take each other for granted, to become aware of their own effect on the group and to foster an environment where group skills can be practised.

Some of the specific skills that students can be made aware of are [Hamm & Adams, 1992; Cohen, Lotan and Catanzarite, 1990]:

- Encouraging others to talk;
- responding to the ideas of others;
- giving others a chance to take part;
- listening to others;
- rotating tasks;
- showing appreciation;
- criticising an idea and not a person;
- decision making through consensus rather than compromise;
- empathising and encouraging; and
- helping others without giving the answer.

Effective constructive decision-making skills are important in co-operative learning groups. Students must learn the skills of decision making by consensus. This would involve learning to respect one another's opinions, learning to listen to one another, make one's own point of view known, be assertive and being able to evaluate what is being said before reacting [King & King, 1998].

Students must understand the concept of active learning whereby no one knows all the answers and students are encouraged and must encourage one another. It is also important that students understand that doing the work for someone else is not helping that person to learn. There must be intellectual sharing in order to help the other person to gain a greater understanding [Hamm & Adams, 1992].

5.2.5.3 Arranging the room

"*It is in the physical arrangement of chairs that many of the most basic yet influential problems in group discussion can occur. Who sits where and at what distance from whom will affect the social roles and relationships pursued by members*" [Jaques, 1991, p.119]. He goes on to say that the chairs of the group should be arranged in such a way that everyone is evenly spaced, no-one has a special position and everyone is able to have eye contact with everyone else.

This is not always possible, however, especially in tertiary institutions that often have large classrooms with fixed desks and chairs. It is difficult for co-operative learning to take place when students sit in rows facing the teacher. Johnson, Johnson and Smith [1991] have given some ideas for having pairs of students work together which could work in this situation, but generally it is better if the desks can be moved to facilitate group work [Hamm & Adams, 1992].

Desks need to be pushed together to allow the students to face one another and work collaboratively on the task. The students should be able to see all the relevant task material, converse with each other without raising their voices and have eye contact with one another. The lecturer should also have clear access to every group [Johnson, Johnson & Smith, 1991].

5.2.5.4 Deciding on group composition

One of the factors that should be considered is the size of the group. The type of

interaction that is possible will be influenced by the size of the group [Jaques, 1991]. The smaller the size, the greater the likelihood that relationships of trust and sharing will be fostered. The smaller size may, however, have a detrimental effect on the amount of variety that one finds in the group and this may reduce the amount of discussion. As the group size increases the opportunities for each member to contribute diminishes and this often means that the low-ability students contribute much less. Individual accountability will be higher in a smaller group.

Johnson, Johnson and Smith [1991] add that the shorter the amount of time available, the smaller the group should be. Group sizes for co-operative learning are generally between 2 and 6 members. Jaques [1991] suggests that 6 is an optimal number that allows students to register their feelings within the group, allows for a fluid leadership and does not need formal structuring. A group size larger than this requires some allocation of roles and more formal structuring.

Another factor that must be considered when deciding on group composition is whether the group should be heterogeneous or homogeneous with respect to member's ability. Some studies have shown that having students of high-, medium- and low- achievement in the same learning group is best as it fosters a wider perspective on the material and this, in turn, increases the quality of reasoning used by the group. Homogeneous groups can be used to master specific skills, however [Johnson, Johnson & Smith, 1991].

Students often want to choose who they want to work with but this has been found not to be very successful as the groups are often homogeneous [Johnson, Johnson & Smith, 1991].

Robson [1994] suggests that developing a working group requires more than just choosing the right group and introducing the members to one another. Groups should learn and practise group skills within the groups. They should also evaluate the way in which they work as a group. These factors are discussed later.

5.2.5.5 Structuring the task

The task must be explained to the students so that they have a clear understanding of the objectives, what needs to be done, procedures that they need to follow and social skills they are expected to demonstrate [Johnson, Johnson & Smith, 1991].

Positive interdependence must be structured into the task and the reward system, to make sure that the group takes responsibility for each member of their group. The task should also be such that each member must be individually accountable. They should have to do individual tests or be responsible for a particular part of a project [Johnson, Johnson & Smith, 1991].

The task must be structured in such a way that the students perceive that multiple abilities and strengths are needed to achieve success [Cohen, Lotan & Catanzarite, 1990]. This is especially true if we want to enhance the status of students who are seen by their fellow students as being of low status.

The students can then be assigned roles within the task or roles within the group. The following assignments could be made [Johnson, Johnson & Smith, 1991]:

- A summariser can be used to restate the group's major conclusions;
- a checker who ensures that everyone can explain how the group arrived at an answer;
- an accuracy coach who corrects mistakes in other members' explanations;
- an elaborator who relates what is currently being learnt to previous material;
- a recorder who writes down the group's decisions;
- an encourager who ensures that all members contribute; and
- an observer who keeps track of how well everyone is co-operating.

5.2.5.6 Planning instructional materials

The learning materials should be rich and varied so that students with different types of

skills can make different contributions [Cohen, Lotan & Catanzarite, 1990].

If the students have the co-operative skills and are mature and experienced, then the teacher need not arrange the materials in any specific way. If, however, the students are not skilled, the lecturer may want to arrange the materials to promote the idea that the project is a group project and not individual. This can be done by, for example [Johnson, Johnson & Smith, 1991]:

- Giving only one copy of the material to the group so that the students have to work together to be successful;
- giving different materials to the different group members who then have to teach one another or put their pieces together like a jigsaw as in one of the co-operative learning methods called the Jigsaw method; or
- arranging competitions between groups where it is to the group's advantage to make sure that each person in their group knows all the work.

5.2.5.7 Monitoring and intervening

Co-operative learning allows the students to validate their own ideas and this frees the teacher to move about, work with small groups and interact in a more personal way with the students [Hamm & Adams, 1992].

The constructivist classroom is one where the teacher tries to get some insight into how each student understands the work. The teacher should not, therefore, sit back and relax when the students start to work but should be trying to see what the students do and do not understand [Johnson, Johnson & Smith, 1991]. They should also check to see what problems the students are having working in a co-operative way and should assist if necessary. More effective methods of working together can be suggested to groups having problems.

Lecturers should not intervene with groups who are working effectively but should help groups to clarify instructions and even teach skills to a group if that is necessary.

Lecturers should change from an authoritarian way of telling the students when they are right or wrong to rather question the students by asking things like "What are you doing?", "Why are you doing it?" or "How will it help you?" [Johnson, Johnson & Smith, 1991].

The groups should be made aware of their own cognition and group processing by being invited by the lecturer to think about what they are doing. Students should also be made aware of their growth in these areas [Costa & O'Leary, 1992].

Students should be expected to help one another and not to expect help from the teacher until they have tried to help each other [Solomon et. al., 1990]. Teachers are often inclined to intervene too soon or give too much direction to the students and this should be guarded against. The students may have new ideas on the topic being discussed and the teacher will have to be comfortable with sometimes having to say "I don't know" or "Let's find out" [Hamm & Adams, 1992].

One must expect that the noise level in the classroom will rise and authoritarian methods of discipline will not work if the students must be responsible for their own learning. Teachers will have to tolerate this [Hamm & Adams, 1992].

5.2.5.8 Evaluating learning

McConnell [1994] reports on two views on rewarding co-operative learning. Some feel that extrinsic rewards are necessary to motivate students to learn while others suggest that intrinsic motivation, provided by the personal involvement of the students in the co-operative tasks, is sufficient to produce high achievement.

Most authors agree that evaluation should be based both on the activities of the group and the individual in order to promote group interdependence and individual accountability [Johnson, Johnson & Smith, 1991; Knight & Bohlmeyer, 1990; Hamm & Adams, 1992]. Individual accountability can be accomplished by:

- Having group rewards based on the grades achieved by individuals in tests;
- having individual students make presentations of the group project or part of that project; and
- providing incentives for students to work together when learning new material but testing them individually.

McConnell [1994] suggests that as students are playing a major role in their own learning, they should also play a role in evaluating their own work and the work of their team mates. He maintains that the skills of self-assessment are important and should be fostered in students. Students could also be involved in determining the criteria upon which their work and the work of others will be judged. In programming classes students could be used to do walkthroughs of one another's programs and would be jointly responsible for the quality of that program.

Social interaction should also be rewarded and evaluated.

5.2.5.9 Evaluating the group process interaction

The groups can only become more effective if they are able to reflect on how well they are functioning. They should use some time at the end of each group session to describe what actions were helpful and unhelpful and decide what should continue and what should change [Johnson & Johnson, 1990].

The evaluation techniques that are used should also afford individuals the chance to reflect on their own behaviour as well as that of the rest of the group [Jaques, 1991]. Diaries can be used where the students are asked to record ideas about their ideas, concepts, group activities and what they have learnt.

In order to make sure that this takes place properly, lecturers should [Johnson, Johnson and Smith, 1991]:

- Make time at the end of each session for the groups to process how effective they

were at working together;

- observe the groups himself or herself in order to comment if necessary;
- get the groups to describe what actions were helpful and those that were unhelpful in completing the group's work; and
- let the groups decide what behaviours they should change or continue.

5.2.6 Circles of learning co-operative learning method

Various methods of organising co-operative learning in the classroom have been researched. Examples of these include the Jigsaw method, co-op co-op, student teams-achievement divisions (STAD) and group investigation. The circles of learning method was chosen for this study as some of its characteristics were already present in the JAD groups. It has also been described as being effective for the learning of group skills [Slavin, Sharan, Kagan, Hertz Lazarowitz, Webb & Schmuck, 1985]. This method will be described in detail in this section. In Case Study 2, reported in Chapter 8, it will be shown how this method was adapted for use with the JAD techniques in the classroom.

The circles of learning method, developed by Johnson and Johnson, has the students working together as a group to complete a group product. They are required to share ideas, help one another and make sure that all members are involved and understand the group's answers.

Eighteen steps have been identified for implementation of this method although some of the steps are optional [Knight & Bohlmeyer, 1990, p.2-3]:

- Clearly specify instructional objectives.
- Limit the group size to no more that six with smaller size groups for students that are new to co-operative learning to ensure that everyone will participate.
- Structure groups so that they are heterogeneous with respect to ability, sex and culture. Homogeneous groups can be used sometimes in order to master specific skills.
- Arrange groups in circles to facilitate communication.

- Use instructional materials that will promote interdependence among students.
- Assign roles to ensure interdependence. One could assign a summariser-checker to summarise the lesson and quiz group members; an encourager to encourage everyone to participate; a recorder to write down group decisions and an observer to make sure that the group collaborates.
- Explain the academic task.
- Structure positive goal interdependence by having the group produce a single product or by providing group rewards based on the individual performances of the different group members.
- Structure individual accountability for learning by giving individual tests or expecting the individual to explain the work to others.
- Structure inter-group co-operation.
- Explain the criteria for success. Explain how the individual grades work and how one can earn points for one's group.
- Specify desired behaviours. These might include: Using people's names, taking turns, making sure each person understands and agrees with the group's answer.
- Monitor students' behaviour, continually looking for problems with the task or with the collaborative effort.
- Provide task assistance. At times the teacher will need to intervene, clarify instructions, encourage discussions or even teach.
- Intervene in order to teach collaborative skills of effective communication, building a trusting environment and managing controversy.
- Provide closure to the lesson with summaries by students and teacher.
- Evaluate the students' work. Group or individualist incentives can be used although there should be some group incentive.
- Assess group functioning through ongoing observation and discussion of the group process.

The circles of learning co-operative learning method allows the students to work together in a structured manner to achieve a common goal. Students learn, not only about the topic they are studying, but also about working together and co-operatively with the other

members of their group.

5.3 SUMMARY

This chapter firstly answered the question: "*What is the social constructivist learning theory?*" There are many learning theories. The three learning theories discussed in this thesis, namely, the Sociocognitive Learning Theory, the Sociocultural Learning Theory and the Social Constructivist Learning Theory all agree that learning is promoted when students work with one another. The three learning theories may structure the learning process or the group interaction differently, but they all agree that social interaction improves learning.

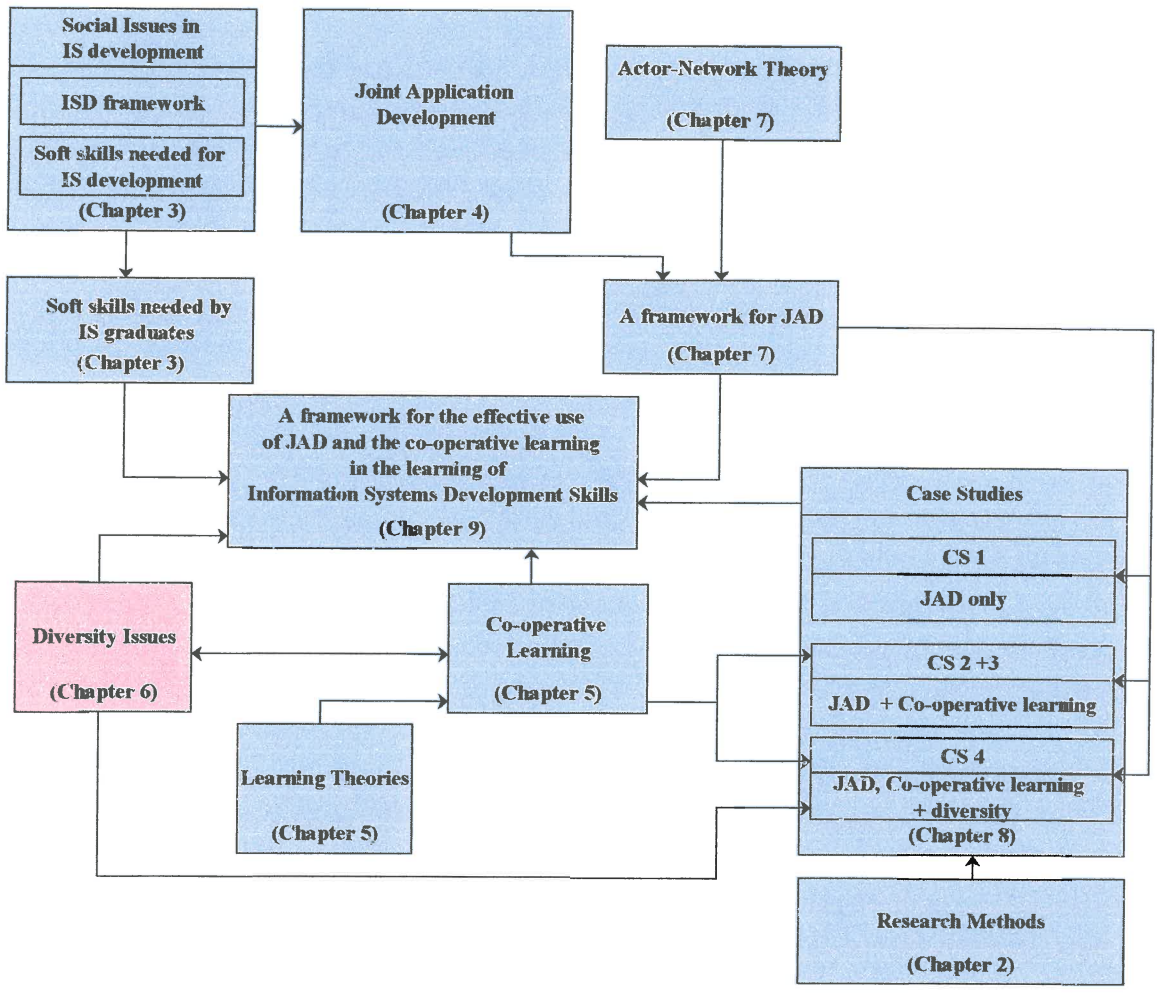
The chapter then went on to answer the question: "*What is co-operative learning?*" Co-operative learning provides a way of structuring the group work so that learning can be better facilitated. The students' and lecturers' roles are well defined so that the learning process can be effective.

Co-operative and collaborative learning are important to help students learn academically and socially. Merely putting students into groups and telling them to co-operate is not sufficient, however. Activities must be carefully planned in order to achieve the maximum benefit to the student, both in learning the material and learning the social skills.

In Chapter 8, this thesis will look at how the techniques of co-operative learning were combined with those of JAD in order to promote effective learning in the classroom.

Chapter 6

Diversity in the classroom



Chapter 6

Diversity in the classroom

During the research period of this study, it became evident that the diversity of the students played a major role in their experiences within the classroom and within the JAD groups. It was, therefore, decided that methods of dealing with diversity need to be explored and studied in order to enhance the learning experiences of the entire class.

South Africa has a rich multicultural society. This is shown by the country's 11 official languages. Diversity is not only language or culture, however, and this will be explored in this chapter.

This chapter looks at what diversity is, diversity in South Africa, the problems that diversity brings with it and the methods that people have devised in order to overcome those problems. The chapter will specifically look at the problems and diversity issues involved with group work in order to apply these within the JAD groups.

6.1 WHAT IS MEANT BY DIVERSITY?

Students come to tertiary institutions with a wide range of experiences and backgrounds [Koger, 1995]. Dimensions of diversity include those aspects with which we are born, for example, intelligence, gender, race, age, physical abilities and sexual orientation. A second dimension of diversity that affects us are those diverse aspects that we acquire and these include language, education, religious beliefs, culture, social class, geographic location, income, work background and marital status [Appelbaum, Shapiro & Elbaz, 1998; Lynn, 1998; Goduka, 1998].

Learners also have different learning styles, psychological dispositions and needs, together with diverse intelligence. Some students learn well in groups while others prefer to work individually. Some need quiet in order to concentrate while others prefer working in an environment where there is noise and movement. Some students need structure and support while they study, while others are more independent and prefer to learn in their own way. Some students learn best in an informal environment while others prefer the more formal classroom. Some students prefer a lecturer who deals with them personally while others prefer to be left on their own. All of these learning styles reflect diversity that the lecturer must deal with in the classroom [Goduka, 1998]. Culture can affect learning styles. Cultural factors like how a particular culture exercises control over their children and even physical factors like nutrition can affect how students learn.

Each learner has unique gifts and unique needs that should be taken into consideration when developing learning environments, curriculum material and instructional strategies [Goduka, 1998].

One must be careful of seeing diversity only as a problem. Diversity can be a positive force. A diverse group brings a wide spectrum of backgrounds, interests, points of view and ways of doing things into any interaction. This encourages creativity and brings fresh perspectives which leads to better decision making [Appelbaum, Shapiro & Elbaz, 1998].

6.2 DIVERSITY IN SOUTH AFRICAN TERTIARY EDUCATION

South Africa is a country of diversity with the challenge of overcoming the legacy of apartheid. Apartheid created a division between the haves and the have-nots. This chasm is also evident in education where apartheid created an educational system that was unequal and rewarded whites while disadvantaging the blacks in the country [McMillan-Lonesome, 1996].

The diverse student populations coming into tertiary education are often seen as a

problem in South Africa [Goduka, 1996a; Starfield, 1996]. Students from different backgrounds, with very divergent educational standards, come into tertiary education and are all given the same work and expected to understand it in the same way. Tertiary institutions continue to teach the same curricula in the same way as they did when they had a predominantly white, male student body.

While black students are a majority at the Port Elizabeth Technikon, where most of this research has been done, they are in the minority in the fields of technology and in particular in Information Technology. This can partly be attributed to the students' schooling where students are not encouraged to do subjects like Mathematics.

English is seen as a major symbol for success and power in South Africa [Goduka, 1998]. The apartheid policy of South Africa's previous government used language policies in education to try to dominate culturally and politically. This came to a head in 1976 when Afrikaans was imposed as a mandatory language for the medium of instruction in African schools and was the trigger for the struggle and mass protests that occurred from that date. Under the new constitution the importance of affirming and validating cultural and linguistic diversity is recognised. Eleven official languages are recognised but English is used for communication in official documents and remains the dominant language for tertiary education in South Africa. Tertiary institutions are now faced with students trying to cope with tertiary education in their second or even their third language. Creating classrooms and group discussions where these people have an equal opportunity of understanding and participating with their English counterparts, is a challenge for South African lecturers [Goduka, 1998]. In the Eastern Cape, where this research took place, there are three main languages used, namely English, Xhosa and Afrikaans.

Students have often been taught by rote learning and learning only from the text book during their secondary schooling. They find it difficult to work without a text book or to engage in free enquiry and discussion [Ruth, 1996]. Many of the students from disadvantaged backgrounds, find it difficult to ask questions in class or to participate in

classroom discussions especially when the whole class is present. Some are afraid that their language skills are not adequate or that their questions may be seen as naive by the other students in the class.

Many of the students coming into the tertiary institutions in South Africa are inadequately prepared for the new role that they must play. They are often first generation students whose parents have high expectations of them, thus putting them under a lot of pressure. Apartheid education was designed to promote an authoritarian way of teaching and students were taught not to question [Ruth, 1996]. Current teachers, brought up with this method of teaching, continue to teach in this way. This authoritarian school system means that students are afraid, especially at first year level, to interact with their lecturers [Winschiers, 1997].

Students' attitudes can also be a problem. Students see it as the staff members' role to provide them with answers to questions and to make sure that they pass [Sanders, 1992]. They are thus reluctant to do assignments which require them to find information or solve problems that have not previously been done by their lecturers.

While ill-prepared students are a problem, the diversity of students should not be seen as a problem but rather as an opportunity according to Goduka[1996b]. She states that the problem occurs when we try to change our diverse student population to all be the same. Diversity should be integrated into the curriculum and learning environments allowing each student to be different and understanding those differences.

The Xhosas use the concept of "*ubuntu*" to describe humanness. This ethos is based on collectivism and is core to Africans, Asians and Native-Americans, among others. Goduka [1996c] describes the following sentiment in Xhosa "*Umntu ngumntu ngabantu*" or, in English, *"I am we; I am because we are; We are because I am."* as being indicative of the philosophical thought of Africans who work well in collective, pluralistic processes rather than the more individualist, one-dimensional processes of the Western cultures. She goes on to say that neither of these attitudes are better than the other, but

that understanding the difference will enable us to adapt our classrooms to the needs of different students.

6.3 PROBLEMS ASSOCIATED WITH DIVERSITY

Ignoring the diversity in our classrooms can help to make students feel marginalised and can increase the domination process within tertiary institutions [Sanchez & Fried, 1997].

6.3.1 Problems of stereotyping and prejudice

People need to have a sense of belonging. Belonging to a group helps with feelings of social integration, a sense of security and commitment, a reassurance of our worth, self esteem and gives an opportunity to get guidance from the group [Cushner, McClelland & Safford, 1992]. Social identity is part of how people identify themselves. Being part of a group leads to dividing the world into in-groups and out-groups where other people are perceived as either being from one's own group or belonging to the other group. [Baron & Byrne, 1991] Aspects that are used to determine groups include race, age, sex and culture. Members of the out-group are seen as homogeneous and not as individuals. This leads to stereotyping and prejudice [Visser, Cleaver & Schoeman, 1999].

In order to simplify the world, people tend to organise information into categories that make sense to them. Categorisation can also lead to stereotyping [Cushner, McClelland & Safford, 1992]. Stereotyping suggests that all people of a particular group possess specific traits or characteristics. If someone has acquired a stereotyped framework, then they will tend to notice information and facts to fit that framework and will disregard information to the contrary [Baron & Byrne, 1991]. The stereotype is thus self-confirming.

Prejudice is an "*antipathy based on a faulty and inflexible generalisation.*" [Towson, 1985, p.266]. This means that a person who is prejudiced has negative feelings towards

another person based on their faulty ideas of that person on the basis of that person belonging to a specific group. Discrimination takes this a step further, where this prejudice is turned into negative action towards those people [Baron & Byrne, 1991].

A problem that people experience is that they have a tendency to be ethnocentric. This implies that they make judgements based on their own standards and then apply these to others. These judgements can often be prejudicial [Cushner, McClelland & Safford, 1992].

6.3.2 Problems associated with diversity of language

Students who have English as their second or third language and who must participate in an English classroom will be at a serious disadvantage to their English counterparts [Goduka, 1998]. At tertiary level students are, not only expected to participate in English, but also to participate using the language and terminology of their chosen subject area. This can cause added problems for a student with English as a second language who may not realise that, for example, a term in one subject area may have a different meaning to one in another subject area [Starfield, 1996].

The students who is studying in a second or third language will take more time to process information and will be easily intimidated by being asked to read or write in that language [Wood, 1998]. English second language students can experience problems reading texts. Their language skills are inadequate to cope with the complexity of the texts and the academic language that is used in those texts. This leads to a lack of confidence in their own abilities, a lack of self esteem as well as a misunderstanding of the material.

The problem is exacerbated as the students will often not admit to the fact that they do not understand as they are afraid that they will embarrass themselves in front of the other students [Lőtter, 1998].

The lecturer should also guard against letting his or her face take on a pained expression of concentration when listening to an English Second Language student. While this may be done in order to listen carefully, it may discourage further participation on the part of the student [Lou, 1994].

6.3.3 Problems associated with diversity of culture

Culture "*refers to those idealised cognitive models that form one's world view and that are shared among members of a particular group typically, although not always, a group sharing a common language. These models, derived from shared experience are strongly constitutive of one's understanding of oneself and one's relations with others, and are schematic mental representations of typical situations, persons, actions and objects.*" [Wood, 1998, p88]. Culture can thus be thought of as the "*systems of thought within which people interpret, assess and explain their life world.*" [Bitzer & Venter, 1996, p16].

As people from different cultures communicate, they bring with them their cultural knowledge and background. This causes them to speak from their cultural perspective and interpret the communication of others from this perspective [Moahloli & Phooko, 1998].

Mistrust and miscommunication between diverse cultural groups can be a major source of conflict according to Appelbaum, Shapiro and Elbaz [1998]. Miscommunication can be caused by misperception. People tend to perceive what they expect to perceive and that means that they are selective, consistent and inaccurate. Misinterpretation is another way in which people miscommunicate. This occurs when we try to categorize what another person is saying by our own standards and perspectives. A further source of miscommunication occurs when we misevaluate what is being done by using our own culture as a standard of measurement by which we judge everything else.

An example of cultural communication problems is given by Cushner, McClelland and

Safford [1992]. They describe how children of African or Mexican descent are taught to show respect by avoiding eye contact, while American children are taught to look a person in the eye when being reprimanded. The American teacher can interpret the child's response as being disrespectful. This problem is also evident in South Africa, where the Xhosa children are taught to avoid eye contact to show respect and those of Western origin expect children to keep eye contact.

Another problem in multicultural education is that academics often have little understanding of the cultural heritage of the students. This means that they are unable to imagine the mental models that the students are forming as a result of their lecture [Wood, 1998]. Although the student from a disadvantaged background may have a rich experience of life, this experience does not seem to count for much in the academic environment.

As mentioned before, many of the African, Asian and Latin-American cultures tend to be based on collectivism, while the European or Western cultures are more individualistic [Goduka, 1996c]. In an individualistic culture the person will be primarily concerned with his or her own needs and those of his or her immediate family. Privacy is valued [Terblanche, 1996]. People belonging to more collective cultural groups tend to play down their own individual emotions and needs to go along with the needs of the group. The people from these type of cultures tend to rely on their own group to see to their needs. This has an effect on communication, for example. A person from an individualistic culture will be inclined to use direct and explicit language and will rely on direct linear logical patterns of reasoning. Someone from a collective culture would be more inclined to use indirect verbal interaction and would use more spiral-type reasoning methods. The individualistic cultures tend to deal with conflict through confrontation, where as collective cultures try to be more passive and accommodating [Terblanche, 1996]. These communication patterns between the different cultural groups can cause problems in heterogeneous classrooms and heterogeneous groups.

Problems can also occur if some members of the class are egocentric and individualistic

as is often the case with students who have been brought up in a Western culture [Graves & Graves, 1985].

Some cultures do not encourage children to ask questions or participate in conversations with adults or teachers. This can cause students to feel very apprehensive about participating in class or group discussions [Tomić, 1996].

6.3.4 Problems associated with diversity of gender

Gender is another source of diversity that brings problems to the classroom. Gallos [1995] reports on studies of women studying at Harvard. These were successful women who had been accepted at an elite university and yet it was found that the women still had more self-doubt and questions about their capabilities and intellectual competence than their male counterparts. Research has shown that men talk more than women in a group and that they interrupt women more often than women interrupt them [Rosser, 1998].

Most women need support and confirmation in order to grow intellectually. Relationships and caring are seen as essential for women according to Gallos [1995]. Group work is a more positive learning method for women than for men [Rosser, 1998].

Gender can be an issue when allocating roles within a group. Females often have the social skills necessary for managing the group, while the males may have better technical skills [Rosser, 1998]. In some cultures, females have a difficult time asserting themselves when there are males in the group and some males have difficulty in working with female leaders. Men might also see women as being good secretaries, for example, and put them into this role. This can lead to conflict.

Another source of gender bias is due to the lecturers themselves. Research has shown that teachers are more likely to interact with white male students than with women and men of colour [Lou, 1994]. This is often not a conscious act on the part of the teacher.

6.4 METHODS OF DEALING WITH DIVERSITY

Diversity can be an enhancement to learning rather than a hindrance if it is integrated into the classroom process in an effective way. Students need to learn to work in a multicultural workforce and their classroom experiences can help them to develop the social, cognitive and communication skills necessary to do this [Lynn, 1998]. Teaching students in a multicultural classroom to be able to practise their profession in multicultural settings is crucial according to Sanchez and Fried [1997].

Frederick [1995, p.83] maintains that a "*genuine 'intercultural' education only begins to happen when students of different cultures, classes, ethnicities, ages, sex and learning styles interact with each other*".

The challenge in dealing with diversity is to preserve the identity of each group while taking into account the identity of each of the other groups [Moahloli & Phooko, 1998]. In order to achieve this lecturers need to be honest, open and flexible in their classrooms [Koger, 1995]. The lecturer plays a major role in empowering or disempowering the students in the classroom and can be a major determinant of how well the diverse students learn and perform in class [Sfeir-Younis, 1993].

Lecturers will also need to acknowledge that there is a problem and should be open and flexible to ideas on how to deal with the problem [Sanchez & Fried, 1997].

6.4.1 Affirming diversity

Affirming diversity does not mean "*tolerance, acceptance, patronization, benevolence or compassion*" as this would assume that one comes from a place of superiority. "*Affirming diversity means to acknowledge, validate, respect and be sensitive to the diverse nature of humankind.*" [Goduka, 1996a, p.30]. The diversity of students' learning and participation styles should be affirmed. "*The rejection of a student's cultural way of knowing and participating is tantamount to the rejection of the student.*" [deVoogd, 1998,

p.354].

Lecturers should recognise diversity within their classrooms but should not assume that individuals from one particular group have a particular learning style [Lőtter, 1998]. While it may be true that cultural factors can affect learning style, Goduka [1998] maintains that lecturers should be careful of fostering stereotypes. This could lead to a misunderstanding of a learner's learning style which in turn could lead to a lecturer underestimating a person's intellectual potential and cognitive abilities.

The use of separate academic support programmes where students are taught academic skills in isolation has not been a good strategy. Wood [1998] suggests that development activities need to take place within the academic departments rather than in isolation. It has been found that students have difficulty transferring the knowledge learnt from one context to another. This puts an added burden on the lecturer who may need to give additional material or create case studies that are more appropriate to their diverse student body [Wood, 1998].

Lecturers should try to use examples, analogies and materials from diverse students experiences in order to help them to connect with their prior understandings [Frederick, 1995]. Moahloli and Phooko [1998] suggest that this implies that students should try to contextualise new information in terms of the different students' real-life experiences. These ideas are supported by Gallos [1995] who studied gender issues and found that classrooms should try to draw on experiences that both men and women can relate to. According to him, successful women should be well represented in examples, case studies and illustrations. The same might be said for any other group within the classroom.

6.4.2 Develop a student-centred approach

Dealing with diversity implies that one needs a strong student-centred approach rather than an approach where the lecturer is the source of power in the classroom [Tomić,

1996]. In order to do this lecturers will need to have a strong sense of their own cultural identity. Lynn [1998] supports this, saying that lecturers need to be open and flexible to the needs of students. In order to do this they need to be competent facilitators of learning rather than acting as the expert or authority in the classroom.

The lecturer must be prepared to change his or her role for the different students in the classroom. At times the lecturer will be a teacher, at times a coach, a cheerleader, a promoter, a mentor or guide. Lecturers need to develop the skill of discerning the needs of a student and adjusting their response accordingly [Lou, 1994].

Lecturers should offer support without interference in order to create self-directing, resourceful learners [Tomić, 1997]. Lecturers who try to control student thinking and behaviour, will fail to help students to reach their full potential [Sanchez & Fried, 1997]. Students should not be labelled as trouble makers if they question the inequalities that exist in the classroom or tertiary institution.

Lecturers should develop the ability to listen and to become skilful at cross-cultural communication in order to support students from different cultures [Moahloli & Phooko, 1998]. Sanchez and Fried [1997] maintain that it is essential for lecturers to try to get both the dominant and the non-dominant class members to take part in discussions in a way that is non-threatening.

Lynn [1998] maintains that the challenge lies in creating a class that encourages students and the lecturer to see one another as individuals while still recognising that these individuals belong to a culture with specific norms, values and beliefs. Student-centred discussions should be encouraged. Students must be required to interact with one another both in and out of the classroom and mutual tasks should be assigned that require the students to work together. The JAD sessions discussed in the following chapter were a way to achieve this.

Diversity must be accepted as the basis for the promise of equality for all [Khotseng,

1996].

6.4.3 Dealing with communication issues

When communicating with others, an openness is needed. It is important to try to perceive a situation from another person's point of view. *"No view of the world can claim exclusive validity for itself. Every interpretation reaches its limits in the view of another person. A new complexity in the experience of the world comes about in which the other person's view must always be kept in mind as a possibility."* [Wulf, 1998, p.16].

Cushner, McClelland and Safford [1992] suggest some specific skills that one should try to address in intercultural communication:

- display respect for one another;
- respond non-judgementally to the other person;
- recognise that the other person is an individual - don't stereotype them;
- have empathy with the other person;
- build a relationship;
- interact with the other person - don't dominate them or be passive; and
- be able to adjust to new situations.

Starfield [1996] recognises the problem of students not just having a problem with English but also having a problem with dealing with the English associated with a particular subject area. She suggests that curricula need to be changed in order to make them more sensitive to the needs of people who are not of, what she terms, the *"dominant cultural group"*. Lecturers need to be more explicit in assignments throughout the semester in order to make it clear to students what is required so that students can learn how to deal with the terminology and assessment methods of the subject concerned in English. This will help them to learn the language that is used for reasoning, thinking and debating in that subject area.

Wood [1998] suggests that opportunities should be given within the classroom for

students to communicate in their own language or to explain to one another concepts that they may have misunderstood in English.

A problem that lecturers often have in the multi-language classroom, is that they do not learn the names of the students or that they cannot pronounce those names. In order to make all the students feel accepted in the class, the lecturers should make a concerted effort to learn and pronounce the names of all the students in the class [Bitzer & Venter, 1996]. This will also enable one to call on all the students in the class to participate, rather than leaving some out whose names cannot be pronounced.

Sanchez and Fried [1997, p.30] say "*students may become experts in the 'techno' sphere but be unable to move beyond it. We must spend at least as much time helping students to learn the language of critique and understanding as we do in helping them learn the language of bits, bytes and statistics.*" The challenge is to integrate the techno-intellectualism with the humanistic intellectualism in order to empower people.

6.4.4 Changing students' attitudes

Frederick [1995] suggests that students should be made aware of the complexities of the diversities within the classroom. They should become aware of what makes them like others and what makes them different. The lecturer must encourage students to be respectful of one another. The ideal would be to have an environment where every student feels comfortable with his or her own perspectives and biases and knows how to express these without offending others [Lou, 1994].

There are various psychological theories that help people to recognise that they are prejudiced or using stereotypes. Two of these that have been suggested should be in any programme that tries to address the problem, will be described briefly below [Baron & Byrne, 1991; Visser, Cleaver & Schoeman, 1999]:

Contact theory

Contact theory maintains that contact between different groups can decrease prejudice as the different groups get to know one another. As people realise their similarities with others and discover their misconceptions caused by stereotyping, they will decrease their idea that the "out-group" is homogeneous. There is a problem, however, as it has been shown that the contact should take place between people of similar social and economic status in order for change to occur. Contact theory also supports the idea that the contact should occur within an informal setting where the group is required to work towards a common goal [Baron & Byrne, 1991]. The former would be difficult to achieve in South Africa where economic and social differences are so wide. Research in South Africa has shown that contact between groups in a particular research project has led to a decline in prejudice in the white group with the blacks becoming more aware of their social identity [Visser, Cleaver & Schoeman, 1999]. Small groups and co-operative learning groups are an ideal way to promote contact but they need to be structured to achieve this [Sharan, Russell, Hertz-Lazarowitz, Bejarano, Raviv & Sharan, 1985].

Studies in other countries have shown that generally co-operative groups do not have this equal-status condition of contact theory. They have, however, been shown to be effective in helping students from different groups to like one another. This could be due to the students being required to participate in an equal and interdependent manner in co-operative groups according to Towson [1985]. It could also be that, although the students like each other more, this does not mean that their respect for one another has increased. Towson [1985] goes on to suggest, that maybe the goal of co-operative learning groups should not be universal love and brotherhood, but should rather be social integration without overt conflict, where group members can trust and listen to each other sufficiently well to complete the task.

Social identity theory

Social identity theory maintains that a person will strive to establish and maintain a

positive self identity and that this identity will have both a social and a personal component. People go through a categorization process in determining the groups that they belong to. This then leads to an "us" and "them" recognition. Students should be allowed to keep their individual identity but they should also be encouraged to self-disclosure in order to get to know other groups better and understand them better [Miller & Harrington, 1990]. One must, however, be careful of making in- and out-group categories more salient to the students. Visser, Cleaver and Schoeman [1999] suggest that any intervention programme should try to use as a basis both contact theory and social identity theory.

Guidelines for making diverse students feel safe in the classroom

It is important that each student feels safe within the classroom. Students should feel comfortable to listen to new information and other people's points of view as well as share their own feelings and ask questions [Koger, 1995]. Some guidelines for both students and lecturers to achieve this include:

- Make sure that the class understands that everyone should respect one another and that people should never attack other classmates or ridicule them. Listening without interrupting is one way in which respect is shown.
- Discuss with students the problem of prejudice and stereotyping. Encourage people to recognise that we all grow up with assumptions about other groups and that, while this is natural, everyone should try to acknowledge it and change to deal with it. Use experiences of being stereotyped or unfairly treated in order to help develop empathy with others.
- Lecturers should focus on the positive aspects of the different groups in the class and not just the negative. Students will feel more secure and less likely to defend themselves than if they are being attacked for being prejudiced [Visser, Cleaver & Schoeman, 1999].
- Koger [1998] suggests using examples from our own lives in order to examine the problems and how these have been overcome.
- Encourage students to share their feelings and experiences of discrimination.

Acknowledge all students' pain and unjust treatment.

- Challenge students assumptions, biases or stereotypes.
- Discuss differences in styles of communication and conflict. While some may see an exchange as an exciting argument, another might see it as an attack, for example.
- Make distinctions between the way people behave and the people themselves. Encourage students to be responsible for change rather than just feel guilty.
- Help students to develop the skills that they need for empowerment. This includes empowering students to become change agents within their economic, social and cultural systems [Sanchez & Fried, 1997].

Some authors suggest that it is useful to have special classes for students to learn about each others cultures [Bodibe, 1997]. One must be careful that this does not turn into a "*tourist*" view of the culture where stereotypes and generalisations about the culture are made worse rather than better. Goduka [1996c] suggests that one needs to have activities that foster critical thinking about prejudice, racism and try to affirm unity and diversity in the curriculum rather than just "*visiting*" other cultures. This needs to be an ongoing process. Towson [1985] proposes that students should be taught to see behaviour in terms of the other person and by their norms and values. Miller and Harrington [1990] argue against having students having discussions about their similarities and differences. They say that any group labelling will create boundaries and that building bridges between groups does not occur by making groups aware of in- and out-groups.

Allport [referred to in Nieto, 1992] found that indirect approaches worked best. The most effective programs fostered contact among students, led to a sense of equality in social status, avoided being artificial and enjoyed the support of the community. He suggests that action is more important than just giving the student information and that multicultural programs should be natural and meaningful to the students.

Not only students' attitudes to other people need to be addressed, but also students'

attitudes to themselves. Low self-esteem is likely to undermine a student's ability to interact with others as well as his or her academic performance [Schmuck & Schmuck, 1988].

Teamwork and projects in teams whose members are diverse, should be encouraged in order to enhance intergroup unity with the classroom [Bekker & Minnaar, 1996]. Methods of dealing with diverse groups in the classroom will be described next.

6.5 DIVERSITY IN GROUPS IN THE CLASSROOM

Some proponents of group work see it as a means of assimilating the minority group into the more dominant group. One of the aims of the group work, according to assimilationists is to foster ethnic integration. Another view of group work is that it should be used to advocate intercultural co-operation in schools by cultivating equal coexistence and mutual respect for students from different cultural groups. This is termed pluralism [Sharan, 1985].

In order to cater for diversity, the lecturer must make sure that different learning styles are catered for. This means that the process of learning in the classroom should allow for different learning styles. One method of doing this is to include more active learning activities and more group work. Group work helps to find new ways of generating knowledge and the diverse students' conceptions of reality are integrated [Sfeir-Younis, 1993].

Graves and Graves [1985] suggest that one should have getting-acquainted activities and develop events that promote unity and a feeling of group identity. Diversity can be acknowledged by providing opportunities for people to learn and understand about other students' cultural background and family. Students should become aware of their own and other's goals and try to match these to the goals of the group.

6.5.1 Dividing the students into groups

Rosser [1998] warns against allowing students to form their own groups or using the counting method to divide students into groups. She says that these methods may be suitable for students who are mature and have high self esteem, but they fail to enhance learning for the more vulnerable student. When students choose their own groups, they tend to choose people who are like themselves. They do not get a chance to mix with others and learn to know them better. Having the lecturer choose the groups allows the lecturer to take gender, race, abilities and experience into account. Mixed ability groups help to ensure that each group progresses successfully [Rosser, 1998].

Rosser [1998] further suggests that the size of the group should be related to the task. It may be appropriate to work in two's for a laboratory experiment or on a computer, but larger groups can be used for more complex projects.

Lőtter [1998] maintains that group work can be used to put people with homogeneous languages together so that they can explain concepts to one another in their own language. She also suggests that students should be required to participate in activities where they are encouraged to speak English in order to improve their English skills. This would suggest that students should have opportunities to work both within their language groups and separate from them.

Miller and Harrington [1990] argue against having students placed into groups according to the ratios that reflect the composition of the class. They say that if the class is 25% black and 50% male and one makes sure that in every group of four, there is one black student and two males and two females, one makes the in- and out-groups salient. This means that it becomes evident to the students that one is trying to do this. They suggest that assignment based on a students abilities or skills or random assignment is preferable.

Nieto [1992] suggests that practices that create homogeneous groups with respect to

academic ability or language might aggravate prejudice and interethnic hostility. She supports the idea of integrated, heterogeneous groups that allow interaction between diverse students.

Research has shown that it can be harmful to minority students to be placed on their own in a group [Rosser, 1998]. One minority student in a group can lead to that student feeling left out and dropping out of the course or group. The groups should thus have more than one person from any minority, whether it be racial or gender minority. This will lead to less feelings of isolation and fewer student dropping out.

In groups where roles are assigned, one must be careful not to assign roles along stereotypical lines, for example, by assigning a female to be the secretary every time. These roles should be rotated or should be assigned randomly [Miller & Harrington, 1990].

Groups can be more effective if they are able to work together over a long period of time in order to promote group cohesion [Johns, 1994].

6.5.2 Dealing with cultural differences in groups

There can be problems in trying to introduce group work and co-operative learning into a classroom if the students come from a background or culture where they are not expected to ask questions and participate in class [Tomić, 1996]. Students are apprehensive about working in teams, giving presentations and other learning methods where they are required to work with other class members. Tomić [1996] suggests that we need to explain to students the rationale for each activity and describe what the learning objectives are in order to reduce that apprehension.

The co-operative learning literature suggests that students be taught about group dynamics and group functioning [Johnson, Johnson & Smith, 1991]. Miller and Harrington [1990] suggest that, while teaching these skills, one should directly link them

to the team's task goals. The teams must understand that, in order to achieve, they need to work together. They suggest that it is these skills that should be emphasised and that this will lead to better multicultural links and reduced category salience.

In order to achieve pluralism, whereby students recognise each other as being different, but work effectively with one another and without feelings of being left out, Towson [1985] suggests that free and regular association of the students from different cultural groups is necessary. The groups should be given a set of goals whereby positive relations are necessary to achieve those goals.

6.5.3 Functioning of the diverse group

As mentioned in the co-operative learning literature, the task should be structured so that everyone needs to participate in order to complete the assignment. Self-interest on the part of the students with individualistic tendencies forces them to co-operate within the group [Rosser, 1998]. The students must be given a task that is relevant and that they need to solve together. The task need not necessarily have one correct answer but should be central to the concepts, content and assessment criteria for the class [Johns, 1994].

Contact theory suggests that students should get to know one another and each group should cultivate its own sense of identity [Sharan, 1985]. This does not mean that the group should strive for uniformity, but that the group should work towards a common goal and recognise what each student can bring to the group. The group should share authority and control. The group as a whole should decide on the norms for the group. Leadership roles should be rotated in order to give students with perceived lower status a chance to show what they can achieve [Graves & Graves, 1985].

This is supported by Rosser [1998]. She maintains that females bring certain characteristics to the role of leader and males another. She suggests that roles be rotated in order for all students to learn and that students should monitor the roles that

each of their group members play in order to ensure that everyone learns from the experience.

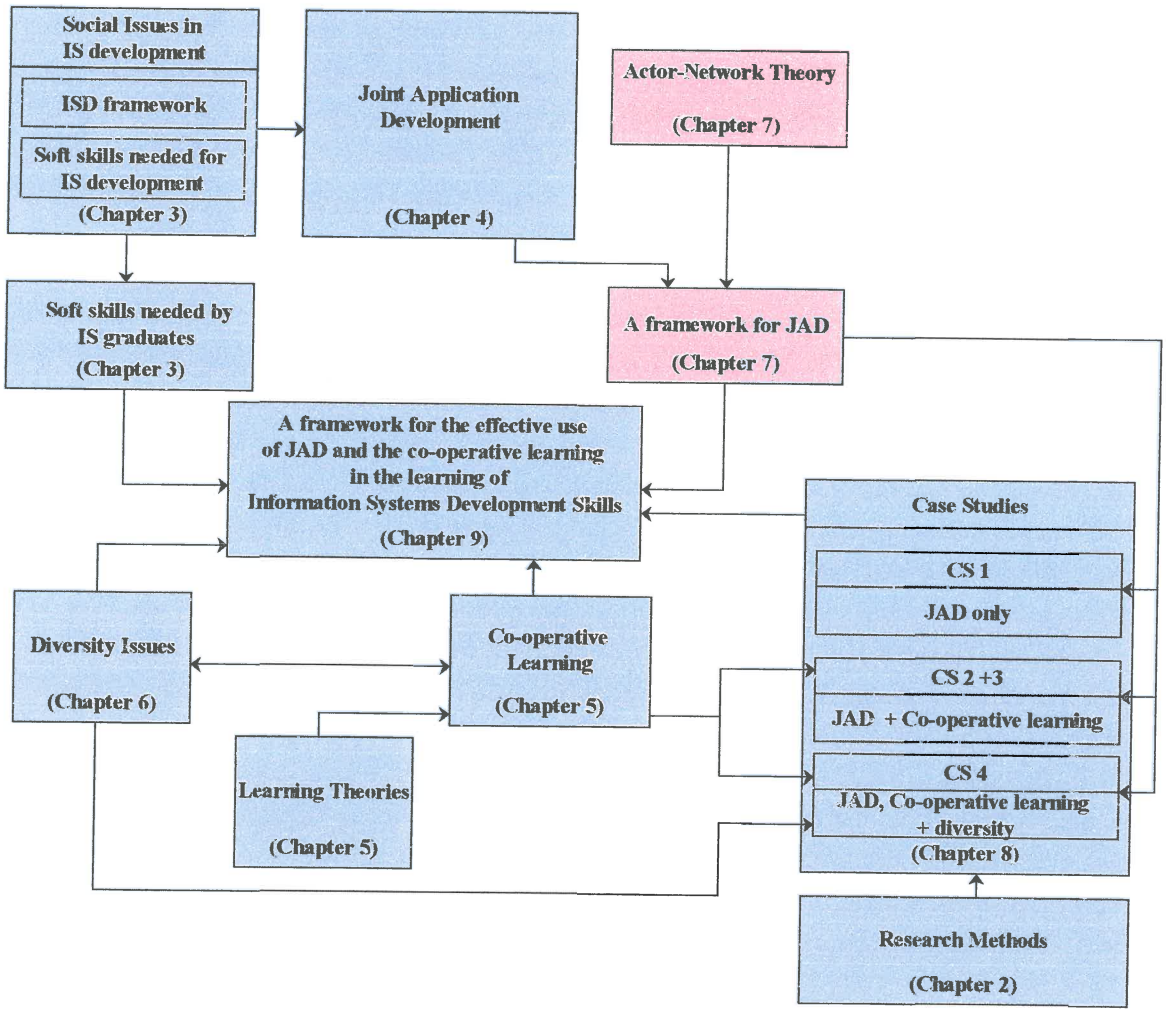
6.6 CONCLUSION

Chapter 6 dealt with the questions: "*What is meant by diversity?*", "*How does a diverse student population affect the classroom?*" and "*How should one deal with diverse students in the classroom and in groups?*" Dealing with diversity is a complex issue and it would be impossible to try to solve all the problems in one part of the curricula or in one class. The challenges and the opportunities offered by the diverse student populations need to be built into all the curricula of an institution in order to be effective. Students, staff and curricula need to be prepared for working in a diverse world.

The issue of diversity was seen to be important during the second and third case studies for this research. Some of the concepts presented in this chapter were added to the framework during Case Study Four. The new framework is presented in Chapter 8, together with the fourth case study where some of these issues were tried out.

Chapter 7

An actor-network framework for the use of JAD



Chapter 7

An actor-network framework for the use of JAD

Computing is now *"intricately tangled up with various streams within the social sciences"* according to Hull [1997, p.214]. Social theory is mainly concerned with illuminating the "*concrete processes of social life"* [Giddens, 1984, p.xxvii]. This means that social scientists have a role to play in the analysis of computing. Social scientists see ISD as an example of human activity that deals with design and with the discovery and elaboration of alternatives that meet some set design goals or standards [Hirscheim et al., 1996].

ISD also deals with changing conditions and changes in social behaviour brought about by the outcomes of the design. Hirschheim et al. [1996] suggest that this means that conceptual frameworks of ISD should be anchored in social action theories. These theories help to clarify the *"conditions, means, contents, constraints and objectives of human behaviour"* that have been organised socially [Hirschheim et al., 1996, p.8]. This is supported by Orlikowski and Robey [1991], who suggest that the underlying theories from sociology and organisational theory will help us to develop coherent theoretical frameworks for ISD.

Social action theories can assist in looking at how humans behave during the development of an Information System and can help us to relate theory and practice [Hirschheim et al., 1996]. In this study we will use the actor-network theory to study the process of JAD in industry and then to develop a framework of how JAD can be used effectively within the classroom.

Actor-network theory was chosen because it allows a researcher to analyse a complex social setting involving both human and non-human actors. An actor network can be used to model a dynamic and complex set of relationships between the actors. This makes it particularly applicable for the study of the JAD in industry as well as for the study of the complex interaction of students, lecturer, environment, methodology and other factors in the classroom.

This chapter first describes actor-network theory and its applicability to IS research. The theory is then applied to study the JAD process in industry. Chapter 8 then develops an actor-network model of the situation where JAD and co-operative learning are used in the classroom.

7.1 ACTOR-NETWORK THEORY

The roots of actor-network theory (ANT) are found in the sociology of science. It has, however, started to be used by IS researchers as it enables one to analyse the complex social, technical and organisational relationships that occur when information systems are designed, developed and applied [Walsham, 1996]. Knowledge is seen, by actor-network theorists, as a social product rather than something that a scientist generated in his or her own mind. This knowledge is seen as a product of a network of heterogeneous materials rather than an individual inspiration [Law, 1992].

One of the basic questions that actor-network theory tries to answer is how a diverse group of actors can reach agreement at all and how social order ever establishes a degree of structure and stability [Monteiro & Hanseth, 1995]. ANT investigates "*the links between identity and power and the techniques by which these links are mediated to produce sociotechnical change*" [Michael, 1996, p59]. ANT thus tries to determine the processes whereby relatively stable networks are created and maintained or why such networks fail to establish themselves [Walsham & Sahay, 1999].

The term actor-network theory is relatively new although the theory was started about two decades ago [Latour, 1999]. Some of the main contributors to the theory were Callon, Law and Latour. Callon [1986] described the sociology of translation in his ground-breaking article in 1986. It was only later that others gave the theory the name actor-network theory [Law, 1999]. The name has been criticised by all three of the authors [Callon, 1999; Law, 1999; Latour, 1999]. Law and Latour argue that the term actor-network leaves out the concept of translation which is one of the main ideas behind the theory. Latour [1999] maintains that it was never meant to be a theory at all but was rather a method of learning from the actors in a situation without imposing on them an *a priori* world-building capacity. The idea was to enable one to find the procedures that help actors in their world-building capacity. Law [1999] says that one cannot convert ANT into a set of rules, a creed or something with fixed attributes. In his opinion, only dead theories can reflect in detail what has gone before.

This section tries to describe some of the principles and characteristics of this theory. The theory is then applied by depicting a JAD workshop.

7.1.1 Principles of ANT

Callon [1986] determined three methodological principles for studying a social situation. These are the principle of agnosticism; the principle of generalized symmetry and the principle of free association. These principles are only the beginning of the theory because as Law [1997] says, ANT is a set of diverse practises rather than a set of principles.

- **Principle of generalized agnosticism**

The principle of generalized agnosticism maintains that the observer must abstain from censoring the actors in the situation when they speak about themselves or the social environment. The observer must refrain from judging the way that the actors analyse

their society. No point of view is seen as being privileged and no-one's interpretation is censored. The observer should also not fix the identity of the actors if this is still being negotiated [Callon, 1986]. Michael [1996] suggests that the researcher must have an analytical impartiality to the actors involved in the situation.

- **Principle of generalized symmetry**

The observer must have a single vocabulary and method of describing and explaining both society and nature. This language should be chosen to be the best for his task and should be applied to the social, natural and the technical aspects of the situation [Callon, 1986]. The language should be abstract and neutral [Michael, 1996]. Humans and non-humans must be analysed with the same conceptual and terminological framework [Somerville, 1999]. This does not mean that humans and non-humans are the same, but rather that they are treated as being similar when being described or traced within the network. Both are seen as having an influence on the other actors in the network and the way in which they interact.

- **Principle of free association**

The principle of free association says that all *a priori* distinctions between natural and social events must be abandoned. There should be no boundary between the two and should be the result of analysis rather than the point of departure. The observer must follow the actors to determine the manner in which they define and associate the different elements of their world, whether it be social or natural [Callon, 1986].

7.1.2 The heterogeneous actor network

ANT maintains that social organisations are not made up solely of people. The theory refuses to privilege the human actors over material matters or technology. The human and non-human actors are seen as a dynamically interacting network and each part of

the network influences the other parts [Parkin, 1996]. The entities in the network take their form and acquire their attributes as a result of their interaction with other entities [Law, 1999].

The social is seen as "*nothing other than patterned networks of heterogeneous materials.*" [Law, 1992, p381]. Society needs the machines, animals, texts, money, architectures and other material things, together with the people, in order to function as it does. The nature of these heterogeneous elements could be technical, human, natural, political or anything else [Murdoch, 1998]. In the classroom, for example, it is not only the lecturer and students who create the society of the classroom, but it is also the overhead projector, the transparencies, the blackboard, desks, stationery and other material things. These things form part of the social and influence the way that we act and interact.

Humans and non-humans are seen within the same conceptual and terminological framework, as are micro- and macro-actors. Micro-actors are individuals, equipment etc. and macro-actors are institutions, corporations etc [Somerville, 1999].

This weaving together of the various elements ensures the durability of the relationships of that social situation. The heterogeneity of the networks allows them to be consolidated and preserved [Murdoch, 1998]. It is the mixing of the human and non-human that allows networks to endure and to remain stable.

An analogy of the interweaving of actors is given in Somerville [1999]. He points out that a cake has many different ingredients but it is impossible to take a slice of cake and observe the impact of one of those ingredients even though one cannot ignore the importance of each. Similarly, the social, technical and natural are intermingled in a single web in an actor network.

7.1.3 Actors in the actor network

An agent is not an actor just because he or she has a body and has certain knowledge, skills and values, according to Law [1992]. The agent is a social agent because of the patterned networks of heterogeneous relations of which they are a part. Law [1992] argues that thinking, acting, writing, loving, earning and all the other attributes that we associate with people are generally generated in networks with other humans or materials both within and beyond the body. The actor or agent is thus always in a network [Law, 1994]. A machine can also be seen as an actor in a network, in that it interacts with the technical materials, operators, users and repair people. It is not the actor's identity that is important but rather its agency, because what matters is not the natural state of the actor, but the actor's relationship to the other actors.

Murdoch [1998] says that, at certain times, a person will be a network - a composition of various entities - but at other times the human will be situated within a network as an entity within a network. This makes it very complicated, however. When we look at a television set, for example, we generally see a single, coherent object with relatively few parts. When that same television breaks down, however, it suddenly turns into a network of electronic components and the human interventions needed to repair it. In practice we cannot cope with seeing everything as a network and we simplify these networks into an actor and the action itself [Law, 1992].

ANT does not focus on an actor because it is human or because of its size, but because of the role that that actor plays in a particular network. Technology and humans are given the same explanatory status in the actor-network [Monteiro & Hanseth, 1995]. There have, however, been some critics of this. Murdoch [1998] suggests that if a human is classified, then they will react to this classification and seek to negotiate with others. Murdoch [1998] also notes that humans can act intentionally and this mobilises them to create new networks or change the one within which they are functioning. This creates a "looping effect". Ignoring this effect could inhibit our

understanding of how new networks are created from the complex interactions of others and how actors move from organisation and stratification to multiplicity and change [Murdoch, 1998]. Actor-network theory does not propose that this looping effect does not take place. They say rather that human actors and non-human actors are both affected by and affect the network.

ANT concentrates on how the networks and the elements of those networks co-evolve. Judgements about which entities will act, which will be intermediaries and how they are spatially composed are not made in advance [Murdoch, 1998]. Humans are not always actors, sometimes they are intermediaries within a network. An intermediary is anything that passes between actors which defines the relationship between them [Michael, 1996]. Machines are also sometimes a primary actor and at other times act as an intermediary [Murdoch, 1998]. Not making a prior distinction allows the analyst to keep his or her focus on the aim of the social arrangement regardless of whether the means of achieving this aim are technical or non-technical [Monteiro & Hanseth, 1995].

A network cannot be equated with a structure. The links and nodes in a network are flexible and cannot be guaranteed. They must be uncovered by the analyst [Law, 1997]. The nodes and links do not remain stable. They are a simplification of a complex situation where the influence and identity of the nodes and links may change as the network evolves [Parkin, 1994]. The emphasis in ANT is on the actor and goal-directed behaviour rather than on conformity to norms [Parkin, 1996].

"*The indeterminacy of the actor naturally entails a number of difficulties. ANT [actor-network theory] is so tolerant that it ends up presenting an actor which is an anonymous, ill-defined and indiscernible entity. Since everything is action, the ANT actor may, alternately and indiscriminately, be a power which enrolls and dominates or, by contrast, an agent with no initiative which allows itself to be enrolled.*" [Callon, 1999, p182]. Callon [1999] goes on to say that actor-network theory has often been criticized for this tendency to make an actor someone who is constantly seeking for power and

for increasing his, her or its influence. An actor gets entangled in the links and relationships of the networks to which he, she or it belongs. This creates the possibility of a diversity of actors and actions which can only be understood in the relation of the actor to both the humans and non-humans in the network.

7.1.4 Translation

Translation is one of the key factors in ANT. It is the method by which one follows actors through their construction and deconstruction of nature and society [Callon, 1986].

Actor-networks are a dynamic and complex set of relationships between the actor nodes in the network [Parkin, 1994]. Actor-network theory does not see that there can be a fixed social structure. It assumes that social structure is a verb rather than a noun. It is a process that can change, that is never complete or final [Law, 1992].

It is this characteristic that causes Latour [1999] to comment that the word network is problematic. He says that when the word was first used, it meant a flexible network which was modified by a series of translations or transformations, but that, with the advent of the world wide web, it has come to mean transport without change or deformation.

Actor-networks can be seen as a means of acting upon a space. Translation is seen as the process of negotiation, representation and displacement that establishes relationships between the actors [Murdoch, 1998]. These phenomena are redefined so that they behave in accordance with the requirements of the network.

"*Translation is the mechanism by which the social and natural worlds progressively take form. The result is a situation in which certain entities control others. Understanding what sociologists generally call power relationships means describing the way in which*

actors are defined, associated and simultaneously obliged to remain faithful to their alliances. The repertoire of translation is not only designed to give a symmetrical and tolerant description of a complex process which constantly mixes together a variety of social and natural entities. It also permits an explanation of how a few obtain the right to express and represent the many silent actors of the social and natural worlds that they have mobilised." [Callon, 1986, p.224]

Translation is a slow mobilisation of the actors across time. This is often done by offering new interpretations and interests to the actors in order to make each indispensable within the network. The idea is to enrol all the heterogeneous actors of the network to willingly participate, believe and disseminate the common goal. This involves an element of control over the actors according to Latour [1987]. The idea is to promote convergence of these heterogeneous actors within the network in order to attain a network which is stable and durable [Michael, 1996]. Callon [1986] describes an obligatory passage point. This is the point that all the actors must reach in order to be bound together and converge to form the stable network. This is depicted in Figure 7.1.

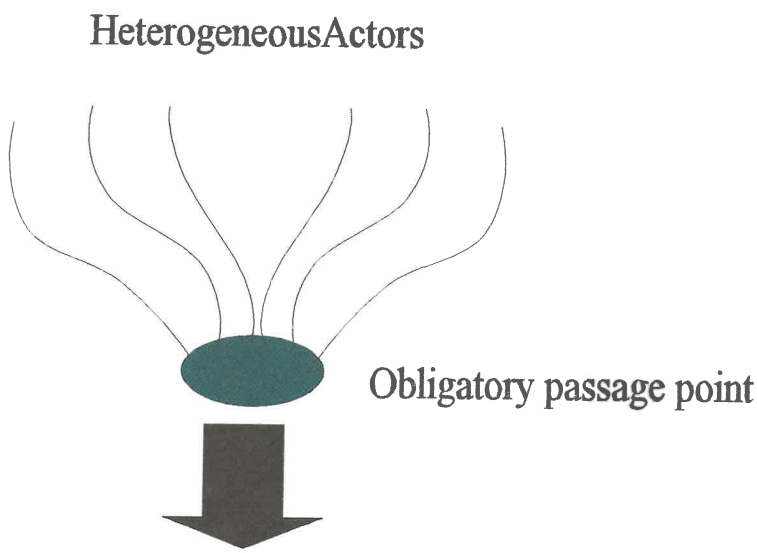


Figure 7.1: Convergence process [Adapted from Latour, 1987]

Some methods by which translation takes place will be described below:

- **Problematization**

Problematization involves identifying the actors in a network and defining their identities in such a way that they are indispensable within the network [Callon, 1986]. All actors are identified, whether they be human or non-human. Each actor's goals are identified.

Problematization describes how the different actors must adjust and the movements and detours that each must accept in order to define an obligatory passage point, which is what binds the different actors together [Callon, 1986].

- **Intressement**

"*Intressement is the group of actions by which an entity attempts to impose and stabilise the identity of the other actors it defines through its problematization.*" [Callon, 1986, p207-208]. In order to do this the identity, goals and inclinations of each of the actors should be defined. This helps to determine the entities to be enrolled, to interrupt any potential competing associations and to construct a system of alliances [Callon, 1986]. The social structures are thus shaped and consolidated.

- **Enrolment**

Intressement does not necessarily lead to alliances and enrolment according to Callon [1986]. Enrolment is the method by which interrelated roles are defined and attributed to actors. These actors must accept the roles. Enrolment thus involves negotiations, seduction, consensus seeking, physical violence and any other method used by the various actors to give others their role. Note that human and non-human actors all need to be enrolled into the actor-network.

The actor nodes are able to define the situation in terms that are favourable to them. They can also enrol the other actors in the network to their point of view and control their reactions by doing this. The actors thus become centres of translation as they control the network, at least temporarily, by channelling, selecting and monitoring the flow of interaction within the network [Parkin, 1996]. The role of the actor nodes can change their identity and their influence within the network over time [Parkin, 1994]. A powerful actor node can define the situation to suit itself, enrol the other actors to his or her point of view and control their reactions to what happens. This actor then becomes a centre of translation or centre of ordering and controls the network temporarily by channelling, selecting and monitoring the processes within the network [Parkin, 1996].

There is usually not only one source of power within the network. Power is generated in a distributed manner and the effects of power can be contested and resisted [Law, 1992]. Lee and Stenner [1999] say that actor-networks are de-centred. They explain this by saying that ANT does not reject the idea of centres of control, but rather shows how control can be temporarily centred but can change. Power is seen as an outcome and not a cause as it does not matter how much power actors have, they can only obtain power by the actions of others. This means that it is always necessary to say who is acting, why it is necessary to act together and how collective responsibility is allocated [Michael, 1996].

- **Irreversibility**

This process of translation can be perfectly accomplished, only if the network is stabilised and the actors in the network work in unison. The network then becomes predictable and standardised [Murdoch, 1998]. The network then becomes a black box which resembles a cohesive, organised whole [Latour, 1987].

The organisation, alignment and coordination within the network need to be made

invisible in order to achieve this black box status and assure the durability of the network [Michael, 1996]. The more interrelationships there are and the more associations there are between the heterogeneous actors, the more tightly coupled the network will be and the more difficult it will be to break [Michael, 1996]. The links and relations cannot hold by themselves, however, and must be constantly maintained by the other links and nodes in the network [Law, 1997]. Any standards that are used in the situation are actors within the network and become one element of the network linked to a number of other elements which may be human or technical [Monteiro & Hanseth, 1995].

When the translations between the elements of the actor-network are made durable, they can resist assaults from outside the network and the network is irreversible. This means that it cannot go back to a point where the translations that happened are undone although there may be subsequent translations that change the state of the network in a different direction [Monteiro & Hanseth, 1995]. Walsham and Sahay [1999] say that "*the degree of irreversibility of a particular element of a network depends on the extent to which it is subsequently impossible to go back to a point where alternative possibilities exist and the extent to which the particular frozen element shapes and determines subsequent inscriptions.*" Note that although the network may be considered stable, the situation can be contested at any time and the network will further evolve and change [Walsham, 1996].

- **Dissidence**

A network is rarely stable for long and is continually changing by bringing in new actors or changing the relationships between actors [Somerville, 1999]. The network can be changed after dissidence, betrayals and controversies. This can be caused by fluctuations in the identity and characteristics of the actors. Dissidence brings into question some of the gains of the previous stages as the identities, roles, displacements and spokesmen are challenged or refused [Callon, 1986].

The networks could be made up of provisional and divergent links between the actors and intermediaries and this means that the various components of the network are continually renegotiating with one another and the network changes all the time [Murdoch, 1998].

7.1.5 An example of using ANT to study group decision making

As an example, Parkin [1994; 1996] describes the translation that can take place within an actor-network for group decision making. Figure 7.2 shows the process variables

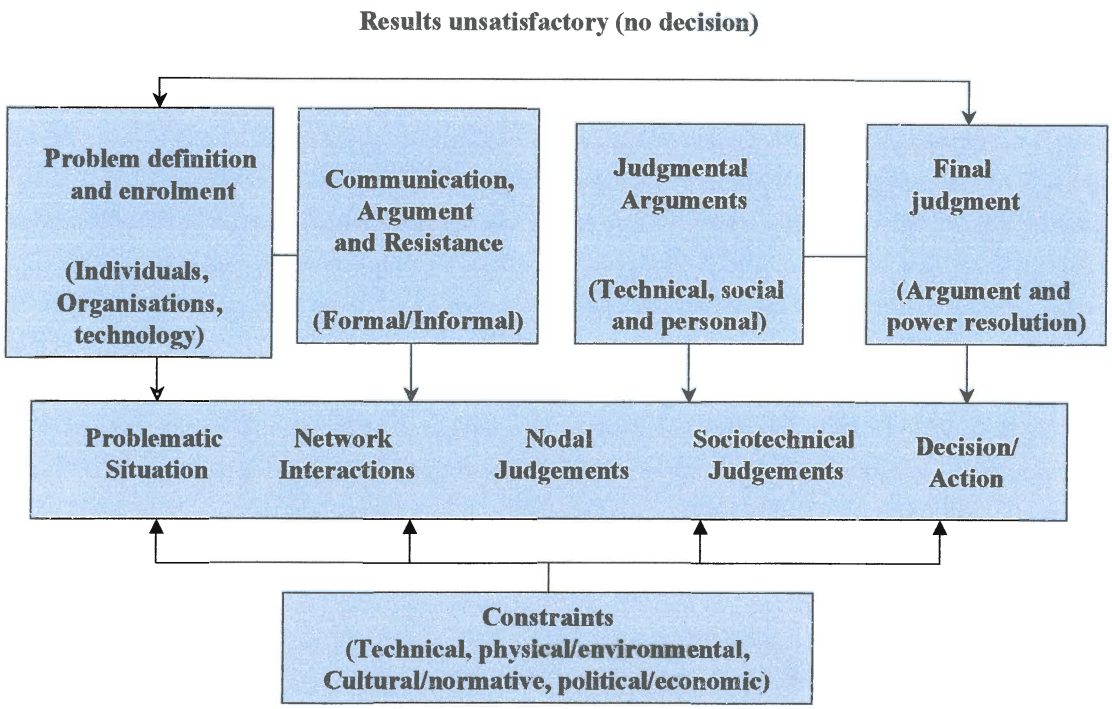


Figure 7.2: Actor-network group decisions - process variables [Parkin, 1996, p.260]

for making group decisions in an actor-network framework. When conceptualising the group decision making using ANT, one should define the actors that take part in that decision making and then show the process of translation that takes place. In the case of group decision making, the actors are considered, by Parkin, to be human agents with technology, politics, culture and economics acting as constraints. Parkin [1996] has bracketed the non-human actors into one node which he has called constraints. This is not in line with ANT which sees the human and non-human actors as equally important. Parkin [1996] defends this by arguing that he has done this as the process of decision making is essentially human and that technology does not have the same power of agency in decision making as humans. Another problem with bracketing these aspects and calling them constraints is that sometimes these factors would act as enabling actors rather than constraints.

The process of translation is described below:

- When working in a group, the actors in the group will try to define the place of the other actors in the network in relation to theirs. This is problematization. Each actor will have his or her own idea of what the decision should be and will see this as the obligatory passage point for the group.
- Enrolment then follows where the actors try to enrol the other actors to their point of view. The other actors will then challenge this. A powerful actor may try to force his or her view on others but will be challenged by the others in the group. Power is what makes a decision possible and necessary when there are no absolute guidelines, according to Parkin [1994]. Manipulation may be needed to maintain control over the other actors in the network, but this is an ongoing process in which different actors take part at different times.
- Communication, argument and resistance are then used to generate the data that is needed for decision making and to develop dialogue within the group. Groups or individuals who resist the arguments of the others may resist or drop out of the network. Those fully enrolled may accept the problem definition of the powerful actor but others may not. This leads to argument which may lead to

redefining the problem [Parkin, 1996].

- Judgmental arguments then occur through this dialogue and the different people's points of view. These judgements are then expressed in the form of arguments for or against some position. Argument can also help to determine how well an idea would be accepted by others. Parkin [1996, p.261] states that *"it is the role of the judgmental arguments to demonstrate how close any particular judgment is to the dominant social values of the actor-network and therefore how much coercive power (and reaction) will be generated by the resulting action."* Judgements are often based on the individual actor's own interests and are legitimised using a selective set of technical and social cues.
- Final judgment then occurs and this is a process whereby the best fit is found between the judgmental arguments (one or more) and the needs of the situation. The dominant social values of the group will help to find this best fit.

This process of enrolment tries to include in the final decision, as many actors as possible in order to reduce the social reaction against the decision.

7.1.6 Concluding remarks on ANT

In ANT, human agents, organisations, material objects, political agendas and other non-human aspects are all treated as actors which interact in the social situation. Law [1992] suggests that if we want to answer "how" questions about structure, power and organisation, then we need to explore all social effects, no matter what their form.

Action is seen as the establishment of links within the network [Murdoch, 1998]. The network is dynamic and involves a process of translation as the actors act and react within the network. Translation is seen as the process of problematization, enrolment, negotiation, representation and displacement that establishes relationships between the actors.

Monteiro and Hanseth [1995] criticise the actor-network theory for its inability to deal with institutions. They say that it cannot deal properly with the idea that institutions show actions at the same time as actions shape institutions. This is one of the main ideas behind structuration theory. Somerville [1999], on the other hand, sees ANT as an ideal way to study organisations as he suggests that it challenges the notion of an organisation being fixed and having an invisible boundary around it. ANT helps us to incorporate all the elements inside and outside the organisation that are part of the organisation's activity.

ANT allows for concrete and specific descriptions of IS situations and the interplay between IT and organisations and a theory like structuration theory is unable to supply this. Monteiro and Hanseth [1995] suggest that actor-network theory offers us a means of being more specific and that it is the more promising theory for the present.

ANT has been shown to be well suited to projects where the technical and non-technical are both actors in the situation and where negotiation, redefining and appropriation of interests are used [Monteiro & Hanseth, 1995]. ANT will thus enable us to build a theoretical framework for JAD and to see how that framework must be modified to work effectively in the learning situation in the classroom. The next section modifies Parkin's ANT network model to develop a framework for the social situation of the JAD workshop, as it was described in Chapter 4.

7.2 AN ACTOR-NETWORK FRAMEWORK FOR THE JAD WORKSHOP

The JAD workshop can be seen as a relatively small network that acts within the larger network of the organisation. It may only be a valid network for a short period of time and many of its actors will have roles to play within other networks within the organisation.

7.2.1 The actors in the JAD workshop

A diagram depicting the actors in a JAD workshop is given in Figure 7.3. The actors are both human and non-human as shown in the diagram. All of these actors interact with each other and influence the development of the network.

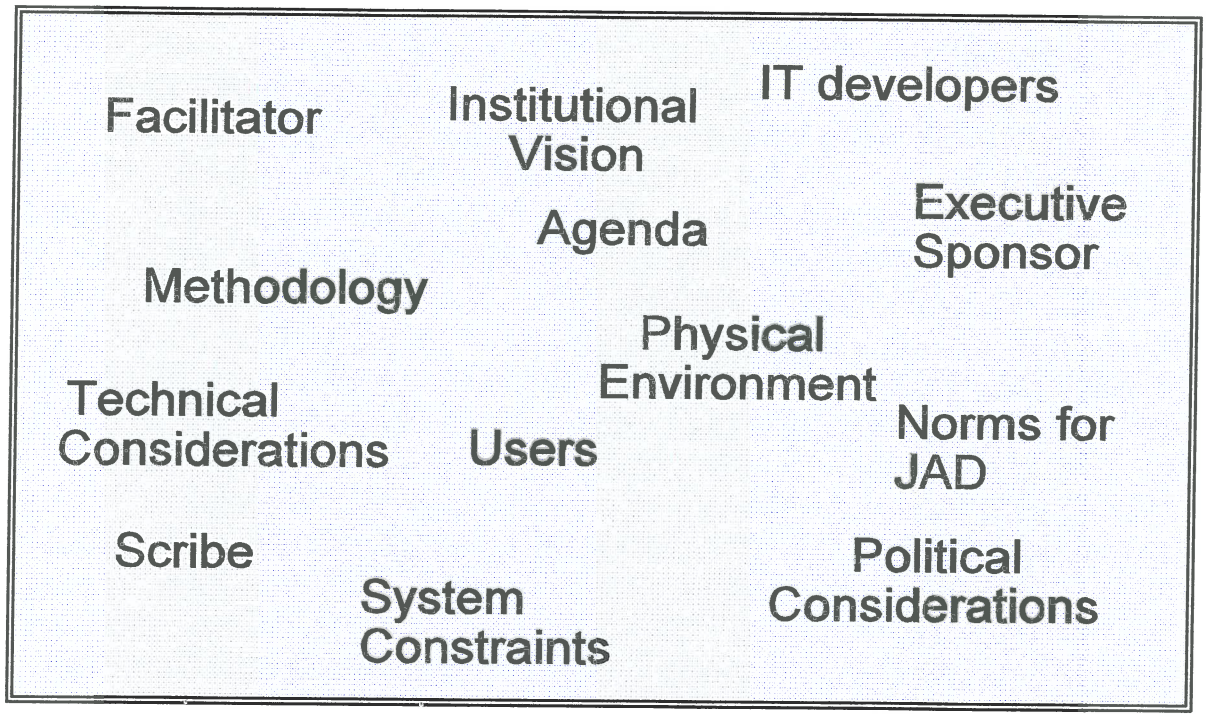


Figure 7.3: The actors in the JAD workshop

The JAD workshop involves **users** from the various departments which have a stake in the development of the IS. These users may be managers or operational staff. The users are thus actors in the JAD workshop actor-network. Each individual user may have his or her own ideas and they will have varying backgrounds which means that they will see things in different ways. Parkin [1996] says that each person in a group that is trying to make a decision, will select different cues and will put different weights to those cues. We perceive "facts" differently and this is why we come up with different judgments. This would be particularly true when taking into account the different users and the IT staff that come together for a JAD session and have to make decisions

together. The inter-departmental **politics** and any conflict between managers and operational staff can also be seen as actors in the actor-network.

The **executive sponsor** is another important actor in the JAD workshop. He or she will play an important part in making sure that the correct people and facilities are made available in order to make the JAD sessions a success. He will also make sure that the actors in the JAD workshop take cognisance of the **institutional vision** which may influence their deliberations.

The next group of actors in the actor-network are the **IT developers**. They will also have their own agendas and there may be some political tension between the IT developers and users which would be another form of an actor in the actor network.

The **facilitator** and **scribe** are both actors. The facilitator can help to play an enabling role in getting the group to come to a decision. If the facilitator is biassed or incompetent, his or her role could be dysfunctional. The scribe is there to record the decisions being made.

The **physical environment** is another actor in the actor-network. We could regard this as one actor, or we could say that it is made up of the white boards, overhead projectors, computers, projection equipment, tables and chairs and other parts of the environment. For the purposes of our formulation, we will use the method of simplification to make this into one node and call it the physical environment node.

Another actor in the JAD workshop would be the **methodology** or modelling technique being used. These will be simplified into an actor called methodology or technique. The methodology may use certain modelling techniques, which may need to be explained and accepted by the other actors within the network. There may be **technical considerations,** like the computer configuration upon which the resulting system will run, which will be another actor in the network as it will affect the actions of

the actors and the decisions that are made.

The **constraints of the system** being developed is another actor. It will influence all the discussions as well as the agenda for the workshop. The JAD facilitator will set up the **agenda** for the JAD workshop. He or she will also discuss with the participants the **norms** or rules that should be applied in the workshop. These will all influence how the decision making occurs.

7.2.2 Translation in the JAD process

Figure 7.4 shows the processes that occur in JAD. Before the workshop, the JAD

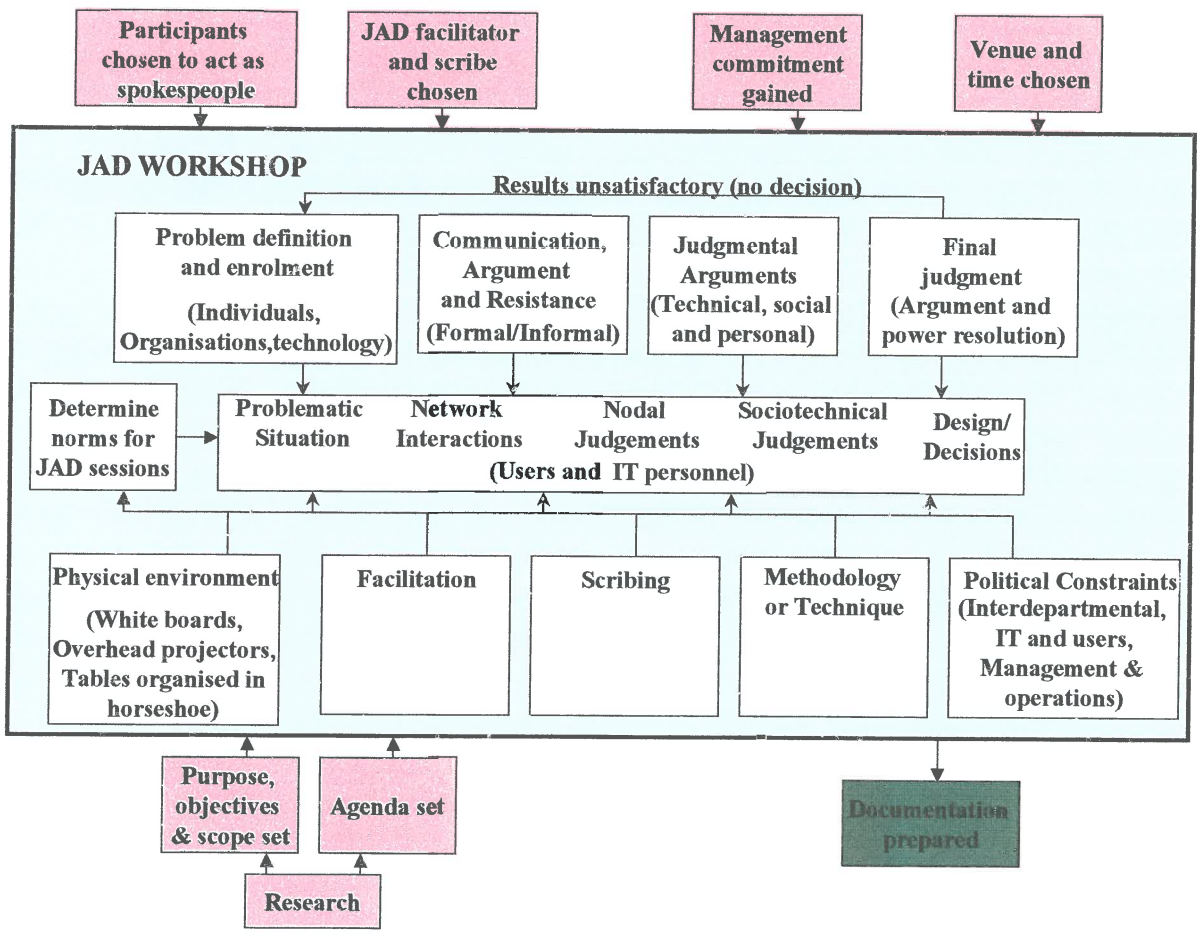


Figure 7.4: An actor-network framework for the use of JAD in industry

facilitator, a scribe and the participants are chosen. Management commitment must be gained. The facilitator, possibly with some of the IT personnel, does some research into the area which helps to determine the purpose, objectives and scope of the JAD session and to set an agenda. The venue and time are also determined. These are all shown in pink in the Figure 7.4.

The processes of translation for the JAD workshop itself are similar to those used by Parkin [1994; 1996] as what happens in a JAD session is essentially a process of group decision making. It is for this reason that the framework in Figure 7.2 has been used as a basis for drawing up the actor-network for the JAD workshop as shown in turquoise in Figure 7.4.

The process of problematization might start before the workshop itself even begins when the various user departments and IT department choose the participants in the workshop, who will act as their spokes-people in the definition of the system. Each of these people will come to the workshop with their own ideas of what the problem is and how the proposed computer system should look in order to solve that problem.

The facilitator will also have his or her own idea of what the problem is. The facilitator might begin the process by trying to define the problem. Any of the users and IT people in the workshop could add to this process. In order to make all these diverse actors part of the JAD network, they need to agree on the goal of their session. This will then be an obligatory passage point that will bind them in the network.

The place of the methodology or technique that will be used to define the system must be determined and the other actors must be convinced of its use in achieving the goal. The norms and methods of JAD must also be described and serve as actors within the network.

The process of enrolment then starts where each of the actors tries to get other people

to see their views. This helps to define the situation. A powerful actor within the group or the facilitator may end up enrolling everyone to his or her point of view, but it is more likely that there will be tension, as not everyone will agree on the proposed solution.

A process of communication, argument and resistance follows. In a JAD workshop this would be structured and controlled by the facilitator. The various actors would interact and explain their views. This would lead to judgmental arguments. Each actor will then make their his or her judgements and will express these to the other members of the network as judgmental arguments. The centre of control may change from the facilitator to any actor within the network at any time.

These possibly competing and contradictory arguments must then be used to come to a final judgment. Some of the alternatives may be discarded due to their infeasibility or some other reason. A perfect fit between an argument and the needs of the community would be ideal but is very unlikely. It is more likely that the group will need to find the best fit that they can between an argument, or set of arguments, and the needs of the organisation. In a JAD session, this may result in a design for a database or the design of the functions needed for the new system being built.

Note that these processes do not necessarily happen in order, but rather form a network whereby the actors may go back and forth between problem definition and enrolment, communication, argument and resistance and making judgments.

After the workshop, the scribe is involved in the preparation of the documentation and the validation thereof. This is shown in green in Figure 7.4.

7.3 CONCLUSION

This chapter has answered the questions: "*What is actor-network theory?*" and "*How can we model JAD in industry using actor-network theory?*" Actor-network theory sees

both humans and non-humans as actors within the social network. Each element of the network affects and is affected by the other elements of the network, whether they be human or non-human. The network is continually changing as translation occurs and the actors and their interactions change.

Parkin's [1994; 1996] framework for decision making in a group was chosen as the basis for building a framework for a JAD workshop as shown in Figure 7.4 and with the actors defined in Figure 7.3. This framework will be developed during the rest of this study to describe how JAD can be used effectively within the classroom.