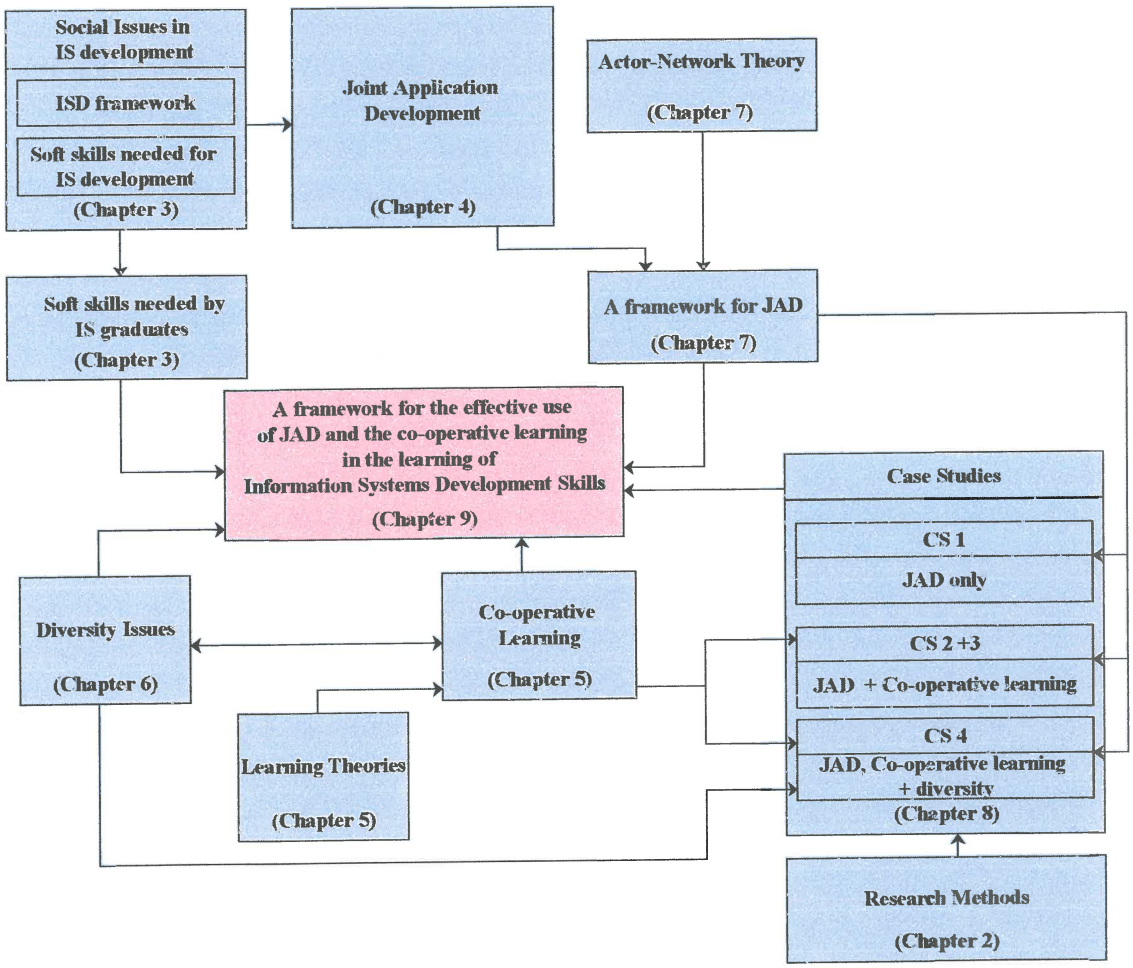
Chapter 9

A Framework for the use of JAD and co-operative learning methods in the classroom



Chapter 9

A Framework for the use of JAD and co-operative learning methods in the classroom

This chapter shows how the information from the literature studies and the case studies has been brought together to get the framework for the effective use of JAD in the classroom.

The framework for the teaching environment is presented first in Figure 9.1. The chapter then goes on to bring together the different factors that were considered in the building of that framework. The parts that each of these different factors played in the framework are depicted in different colours in the framework. The desired learning outcomes for the framework are described, followed by a discussion of how the JAD techniques were used within the classroom. The next section looks at the use of the circles of learning co-operative learning technique and how it was used in the development of the framework. The learning method is then compared to the learning guidelines that are suggested by the social constructivist learning theory. The way in which the diversity issue is handled in the framework is presented. Lastly, the method by which the framework for the learning environment was developed is described.

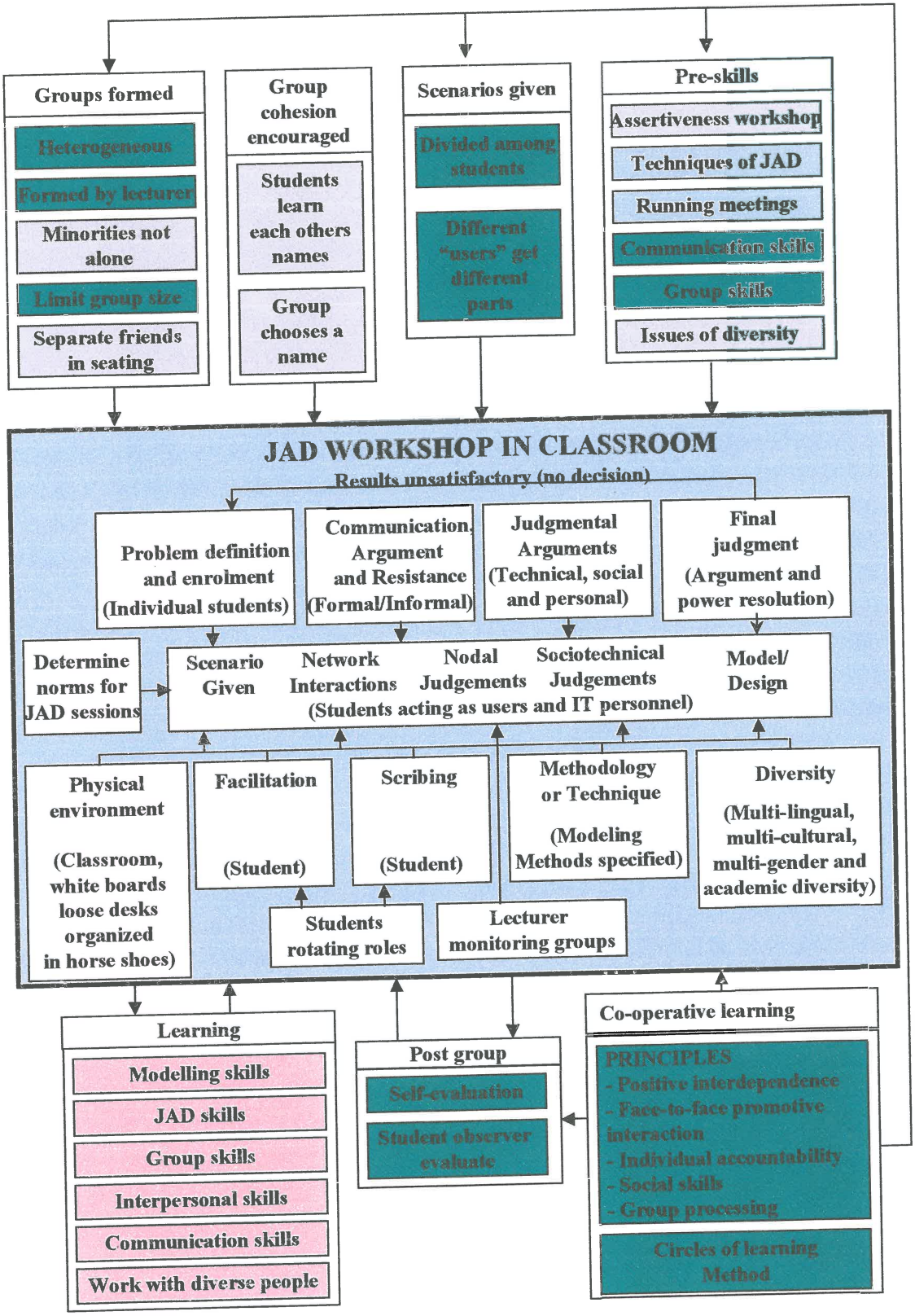


Figure 9.1: A framework for the use of JAD and co-operative learning in the classroom

9.1 DESIRED LEARNING OUTCOMES

Chapter 3 described a framework for IS development which led to a discussion of some of the skills that were needed by IS developers to work in the sense-making and argumentation orientations. A discussion followed of the need for tertiary institutions to foster these skills.

While no method can hope to develop all the social skills needed by an IS graduate, the learning environment, developed in this framework, tries to develop some of these skills while also helping students to develop their modelling skills.

The first skills that are developed through using the JAD activities in the classroom are the skills of modelling systems. These skills are needed by IS professionals and it was shown in Case Studies 2 and 4 that there is a significant improvement in the students' abilities in this regard. In the case studies the modelling skills were Use Case modelling and ER models but other modelling methods could have been used.

On the soft skills side, the workshops helped to develop the students JAD, group, interpersonal and communication skills as well as helping the students to learn to work with diverse people. These soft skills are considered to be important in the field of IS development especially as the field moves into the sense-making and argumentation orientations and away from the control orientations. The research showed that the students felt that they had improved in their ability to work in groups, interact with others and communicate with diverse people. These skills are shown in pink in the model in Figure 9.1.

9.2 THE USE OF JAD IN THE CLASSROOM

The JAD techniques used in industry, and described in Chapter 4, were modified for use in the classroom. The students were taught the techniques of JAD and how to run

meetings before the workshops started.

The students acted as the facilitators, scribes, users and IT personnel. They rotated these roles. A scenario was given to them by the lecturer and they had to use their group decision making skills to get to a final model or design for the scenario.

The classroom was converted into a location suitable for JAD to take place. Whiteboards were placed around the classroom and the students sat in their groups in the horseshoe-shape with the students facilitator at the board. A process of enrolment, communication, argument, evaluation and judgement then occurred until the final judgement was made by the students.

The JAD influences on the model are shown in light blue in Figure 9.1.

9.3 CO-OPERATIVE LEARNING METHODS

Co-operative learning methods were added from Case Study 2. Table 8.4 gives an indication of how the methods of the circles-of-learning co-operative learning method were adapted for use with the JAD workshops. These will not be repeated here.

The principles of positive interdependence, face-to-face interaction, individual accountability, group processing evaluation and skills learning should be adhered to. This implied that the following concepts be added to the framework:

- The students should be put into heterogeneous groups.
- The group size should be limited to six if possible, otherwise not more than eight.
- The students should be taught the skills needed for effective co-operation before the session. This led to the introduction of pre-skills workshops on communication and group dynamics being added to the model.
- The scenario should be divided so that different students have different parts of the information needed by the group.

- The students should monitor their own group processing and should change the way they interact if there are problems.
- The students should act the roles of facilitator, scribe, IT personnel and users as well as being observer. These roles should be rotated.

These concepts are depicted in turquoise in Figure 9.1.

9.4 SOCIAL CONSTRUCTIVIST LEARNING THEORY

The social constructivist theory of learning was described in Section 5.1.3. Constructivism emphasises the active role of learners in constructing their own knowledge. This knowledge will be constructed by building onto their existing knowledge and understanding. Misconceptions that are held by the students will hamper their understanding. Social interaction helps students to internalise from the social to the cognitive. As learners must explain their own understanding and receive feedback from others, it forces them to clarify their own thinking and confront their misconceptions.

This leads to several implications for learning environments that promote learning. The learning environment created for this study is evaluated according to these criteria, which were given in Section 5.1.3.4.

Criteria specified by social constructivist theory of learning	**How this was implemented in the learning environment**
Students should participate actively in their own learning.	Participation was encouraged and even insisted on in the JAD environment where one of the tasks of the facilitator was to stimulate participation.
Students should examine their own ideas.	Students would suggest their ideas to the group and would have to clarify them to others thus forcing them to examine their own ideas.
Students should learn independently using critical thinking skills rather than just remembering or reciting.	The students were learning in groups with their fellow students rather than having the lecturer do the exercises on the board.

Criteria specified by social constructivist theory of learning	How this was implemented in the learning environment
Students should engage in writing, talking, describing, explaining and reflecting.	These skills were all necessary in the JAD sessions as the students had to explain their thinking to others, write on the board and reflect on their own and other's thinking.
Social interaction must be encouraged to help students internalise their knowledge.	The students worked in groups and social interaction among the group members was encouraged.
Students should realise the purpose of the learning activity.	The purpose of working in groups and learning the JAD methods were explained to the students together with the purpose of the modelling techniques that they were learning.
The students should develop ownership of the problem or task.	The groups were encouraged to develop ownership of their models. They accepted responsibility for their answers as a group.
The students should work in an environment that closely matches the one that they will need to function in later.	JAD is a technique used in industry and it served as a motivation factor to the students to learn how to work in this environment in the classroom.
The students should determine the extent to which new experiences make sense in the light of their own ideas.	Students explained to one another and helped one another to understand why they made decisions as a group. This helped the students to make sense of the modelling methods.
The students should consider alternative explanations.	Hearing other people's ideas was considered to be very positive by the students in the JAD groups. This enabled them to consider alternative methods of modelling.
The students should learn how to evaluate a number of perspectives.	With the different students having their own ideas, students had to learn to evaluate those ideas in order to determine the best solution.
The cognitive flexibility theory which is an adaption of the constructivist theory suggests that the same material should be covered at different times, for different purposes and from different conceptual perspectives.	The modelling techniques had been taught to the students previously and this was an opportunity for them to see them again but in different circumstances.

Table 9.1: A comparison of suggestions from social constructivist learning theory and the learning environment developed

As the table suggests, the learning environment developed satisfies all the criteria for a good learning environment as suggested by the social constructivist theory of learning. This would suggest that the environment would promote learning.

9.5 WORKING WITH DIVERSE STUDENTS

The issue of diversity was explored in Chapter 6. From this various suggestions were incorporated into the framework and these are shown in purple in Figure 9.1.

In the formation of groups, it was determined that minorities should not be alone in a group. Sometimes friends would be in a group as a result of not dividing the minorities and this would lead to private conversations. Separating friends in the seating arrangements helped to alleviate this problem. Group cohesion should be encouraged by letting the students choose a name for their group and by learning one another's names. If there is sufficient time, a social event might be arranged for the group.

In the pre-skills workshops, it was decided to include a workshop on assertiveness to help the diverse students learn to respect themselves and other people. Issues of diversity were also included in the other workshops but not as a separate workshop.

9.6 BUILDING THE FRAMEWORK

The JAD sessions were seen as a type of group decision-making activity. Parkin's [1994; 1996] model for the group decision making was thus used as a basis for a framework for the use of JAD in industry. This was described in Chapter 7. This framework was then extended and modified for use in the classroom.

The actor-network theory recognises both human and non-humans as actors in a network. The actors for the learning environment were:

- Students acting in the roles of facilitator, scribe, users and IT personnel;

- the lecturer;
- the classroom environment consisting of the whiteboards, loose desks and chairs, and other classroom needs;
- the modelling techniques being used;
- the scenario given by the lecturer;
- the norms developed for the JAD sessions; and
- the political constraints caused by the diversity in the classroom.

The JAD workshop within the classroom was modelled using the model of how JAD was used in industry as a basis. The students' discussion and argument within the workshop was seen as a process of problem definition and enrolment after being given the scenario. Communication, argument and resistance followed as the students interacted with one another in the network. Various problems occurred during this process where students tried to dominate and others did not participate. Judgemental arguments and the final judgement followed where the students used their knowledge of the business areas and the methodologies and techniques to persuade the others in their group and make their final decisions about the model.

All of the above was influenced by the other aspects shown in the JAD Workshop box. The students rotated the roles of facilitator and scribe. The personality and ability of the facilitator, in particular, played an important role in the group's ability to reach consensus and model the system. The diversity of the students with respect to their culture, gender and academic ability was found to influence the classroom situation. The physical environment, with its white boards, loose desks and method of placing those desks also affected the communication and interaction of the groups. The lecturer monitored the groups interaction and their solution but did not get too involved in helping the groups to reach their decision unless problematic behaviour was encountered. The students were told what modelling techniques to use and the methodology to follow to solve the problem. They set up their own norms for the sessions, however.

9.7 THE EXPANDED FRAMEWORK

The research showed that there were many aspects that the lecturer should set in place before the workshop took place which influenced what happened in the classroom. Most of these have already been discussed in this chapter but an overview is given here. Figure 9.1 can be referred to during the discussion. Co-operative learning principles, in particular those of the circles-of-learning method, were used to adapt the process of JAD for use in the classroom. This influenced the way in which the groups were formed, the creation of the scenarios, the pre-skills training and the post group evaluations.

It was found to be best if the lecturer formed the groups. The groups were chosen to be heterogeneous with respect to language, gender, academic ability and knowledge of the different business areas that would be modelled in the JAD sessions. In order to make minorities in the classroom feel more comfortable, minorities were not placed alone in a group. Friends in the group were asked not to sit next to one another in order to reduce private conversations within the group. A group size of six was found to be ideal, but group sizes of eight were still manageable as the groups were structured.

Group cohesion was encouraged by letting the students choose a name for their group and by encouraging them to learn one another's names. This also helped the students to start their group interaction and learn to know one another. They were urged to learn how to pronounce one another's names in order to help each team member feel accepted within the group.

The lecturer provided the students with the scenario. Participation was encouraged by dividing the scenario among the students and giving different students the roles of the various users in the scenario.

Pre-skills training was found to be particularly useful. An assertiveness workshop allowed the students to learn about having respect for themselves and for others. The students also needed to learn the techniques of JAD and ways of running meetings and taking

minutes. Communication skills including aspects like active listening were considered important. Workshops on group skills and group decision making were held. Diversity issues were not addressed specifically, but were rather discussed during the other workshops, for example while discussing communication, different cultural issues relating to communication were mentioned and discussed. The groups were asked to evaluation their own group interaction and a student observer was used to evaluate and report on the group's interaction. Questionnaires were used for the groups evaluation of their own interaction.

The students perceived that they had improved their learning of the modelling skills while also learning about the group skills, interpersonal skills and communication skills that are so important in an IS developer. Many of them mentioned that they had learnt to work with diverse people. Their marks for the modelling improved from before the JAD sessions to afterwards as was shown by the pre- and post-tests in Case Studies 2 and 4. They obviously also learnt about how JAD sessions work, including the skills needed to facilitate a JAD group.

9.8 CONCLUSION

This chapter described how the different aspects of this study were brought together to get the framework described in Figure 9.1. It must be remembered that while these elements worked in the particular situation that was studied, it may be that with other actors, in other situations different results would be achieved.

The next chapter looks at the whole study and evaluates the research and its contribution. Ideas for future research areas are also presented.

Chapter 10

Evaluation and conclusions

The research for this study determined a method whereby the techniques of JAD could be effectively transferred into the classroom and combined with co-operative learning methods in order to help Information Systems students learn some of the interpersonal and group skills needed in industry, while also learning the modelling techniques. The research approach used was both interpretive and critical. A framework for the use of JAD and co-operative learning in the classroom was developed. A series of case studies was used to get a deep understanding of the students' experiences working in the JAD groups. This understanding was analysed critically and the framework was adapted between each case study.

This chapter firstly looks at how each of the research questions was answered. The chapter then evaluates the research done and tries to determine the contribution that the research has made. Some ideas for future research are presented as well as a conclusion.

10.1 ANSWERING OF THE RESEARCH QUESTIONS

In Chapter 1, a number of research questions were asked. This section will show how each of these questions has been addressed in this study.

10.1.1 What is.....?

A number of what is... questions were answered in this study in order to lay a foundation for the underlying structure of the problem.

- **What is involved in IS development?**

This question was answered in Chapter 3. Information Systems development was seen as a complex, social process that combines technical, business and interpersonal skills. Hirschheim, Klein and Lyytinen's [1996] framework for Information Systems development was presented to show the multiple dimensions of the development process.

- **What social skills are needed by the IS professional?**

This question was answered in Section 3.3. Communication and interpersonal skills were shown to be imperative for the IS professional as IS development moves into the sense-making and argumentation orientations of the IS development framework. This implies that these skills need to be developed within tertiary education and this was proposed in Section 3.4. The specific skills needed were defined by the IS Curriculum '97 [Davis et al., 1997].

- **What is JAD?**

JAD is an acronym for both Joint Application Development and Joint Application Design. This question was answered in Chapter 4. JAD is a method that uses a structured workshop to get all the stakeholders together in order to reach consensus on what a proposed system should do. A facilitator is used to control the meeting and a scribe to document decisions that are made. Group dynamics plays an important part in the running of JAD workshops.

- **What is the social constructivist learning theory?**

Section 5.1.3 described what the social constructivist learning theory is. Constructivism emphasizes that people learn by constructing their own knowledge and that this construction process will depend, to a large extent, on their prior knowledge. Social

constructivism recognises that there can be a collaborative construction of knowledge that occurs when groups of people interact as they hear other people's ideas and have to explain their own to others.

- **What is co-operative learning?**

Co-operative learning was defined in Section 5.2.1 and expanded on throughout Chapter 5. Co-operative learning occurs when students work in organised groups towards a common goal. The students should be dependent upon one another and yet still be individually accountable.

- **What is meant by diversity?**

Diversity of students includes a variety of aspects as shown in Chapter 6. Students can be diverse with respect to their intelligence, gender, culture, race, age, physical abilities and sexual orientation. They can also be diverse because of their learning style, religious beliefs, geographic location, income, work background or marital status. Each learner has unique gifts and unique needs and these should be taken into consideration when designing learning environments.

- **What is actor-network theory?**

Actor-network theory (ANT) was discussed in Chapter 7. ANT uses the same terminology and explanatory status for both human and non-human actors within a network. The network becomes stable as the actors interact and links are established within the network. This is done through a process of translation. ANT tries to answer the question of how a diverse group of actors can reach agreement at all and how social order ever establishes a degree of structure and stability. The main concern of ANT is how the elements of a network co-evolve.

10.1.2 Why .....?

- **Why should tertiary institutions help IS students develop interpersonal and group skills?**

Various research projects were mentioned in Section 3.3. These showed that industry required communication and interpersonal skills in Information Systems graduates. Many of these researchers found that these skills were considered more important than the technical skills that tertiary institutions tend to focus on. While some countries might have programmes in place to ensure that students learn these skills in primary and secondary education, this is not the case in South Africa, as was described in Chapter 6. This means that tertiary institutions must help students to develop these skills.

- **Why do people use JAD in industry?**

JAD is a technique that can be used very effectively within the sense-making and argumentation orientations of IS development in order to promote understanding and structured conflict resolution between team members. There does not seem to be much research on the effectiveness of JAD as it is used in industry. Section 4.3 gives some of the claims that advocates of JAD have for its effectiveness. Two research projects were also described in this section which showed under what circumstances JAD proved to be effective.

10.1.3 How does.....?

The How does..... question allows the researcher to determine how the problem has been manifested in real life.

- **How does JAD work in industry according to the literature?**

This question was answered in Chapter 4. Details were given of how the JAD teams

should be chosen and also how the JAD workshops should be run in order to work effectively in industry.

- **How does a diverse student population affect the classroom?**

This question was added during the research when it was determined that the issue of diversity of the student population could not be ignored - in South Africa at any event. The second case study showed that the Xhosa-speaking students tended to feel left out in their groups and therefore did not participate. This did not happen in the classroom with only Xhosa-speakers in Case Study 3. There were also a few problems with gender difficulties in the groups. The problems and opportunities offered by diversity were discussed in Chapter 6.

10.1.4 How should.....?

The answers to these questions allow the researcher to explain the new insights obtained during the research and the conclusions that can be drawn.

- **How can we model JAD in industry?**

Section 7.2 modelled the process of JAD in industry. The actors were identified and the processes described that enabled consensus to be reached within the JAD workshop.

- **How should one deal with diverse students in the classroom and in groups?**

This question was investigated in Chapter 6 of the dissertation. Group work is seen to be an effective way of promoting interaction between the diverse students. The groups need to be carefully chosen and monitored, however, in order to make sure that that interaction is effective. Some of the ideas were implemented during the case studies and their effectiveness was noted.

- **How should lecturers combine the methods of JAD and the methods of co-operative learning in their classrooms?**

Chapter 8 described how this question was investigated. Four case studies were done which showed how the JAD techniques and co-operative learning techniques could be used in the classroom. The circles-of-learning co-operative learning method was combined with the techniques of JAD. A framework was developed to describe the processes and actors that are involved in the classroom.

- **How should a framework be designed in order to promote the learning of group, interaction and modelling skills in a classroom with diverse students?**

The framework was developed in Chapter 8 and described again in Chapter 9. The case studies showed how the students' perceptions of their learning improved as the method was refined and the framework developed. Chapter 9 put all of this together to give a final version of the framework.

10.2 EVALUATION OF RESEARCH

This section evaluates the research according to Klein and Myers's [1999] seven principles for interpretive field studies as described briefly in Section 2.2.2.2. This is followed by an evaluation of the research according to its authenticity, plausibility and criticality as suggested by Walsham and Sahay [1999].

10.2.1 Evaluation according to seven principles of interpretive field studies

Klein and Myers [1999] describe seven principles for interpretive field study research using case studies or ethnographic research. These principles are interdependent and should be used as a guide, but researchers themselves must decide how the principles should be applied.

- **Principle of hermeneutic circle**

This principle suggests that human understanding is only achieved by moving in a cyclical fashion between the interdependent meanings of the parts and the whole. The complex whole is understood from the shared meanings of the parts and their interrelationships.

The researcher firstly looked at the different skills that were needed by an IS developer. The JAD process was also investigated to see how it could be used in the classroom. This was then used to determine a framework for using JAD within the classroom, thus getting a more holistic, interrelated view from these parts.

The students' experiences were then sought and the details of their experiences helped to determine what problems were experienced. This led to the incorporation of co-operative learning techniques with the JAD techniques. Once again specific changes were made which were then built into the framework and into the classroom practice. The parts studied were thus once again built into a whole.

A second case study was done which led us to believe that the issue of diversity was causing problems in the classroom. This was substantiated by the third case study in a classroom without cultural diversity. The issue of diversity was then studied and adjustments made to the framework and the classroom practice, thus once again going from the parts to the whole. This integrated framework was then tested again in the fourth case study and the students' individual experiences sought. This led to a deeper understanding and the framework showing this is found in Chapter 9.

- **Principle of contextualisation**

This principle requires that the researcher takes into account the social and historical background of the research setting. These contexts should be explored and discussed

rather than hidden.

This was done in great detail in this study. It is acknowledge that South Africa has some special problems in their post-apartheid era, that might not be applicable in other areas of the world. The context of the South African situation and the situation in the two tertiary institutions where this research was done, was described in detail so that the readers might decide for themselves whether the research would be applicable to them or not. The context and different types of students involved in each case study were also described.

- **Principles of interaction between the researchers and the subjects**

The principle of interaction requires critical reflection on how the research materials were constructed and what the interaction was between the researcher and the subjects. The results of the research may be partly as a result of the social interaction between the participants and the researcher. Both the participants and the researcher interpret as they interact. This relationship should thus be spelt out.

The researcher was also the students' lecturer. This meant that the researcher was closely involved with the research and the participants in the research. During the third case study the researcher visited the Border Technikon for one week and did not know the students very well but was still involved in the monitoring of the JAD sessions.

- **Principle of abstraction and generalisation**

Interpretive studies do not need to remain relevant only within a particular context. Theoretical abstractions and generalizations should be carefully related to the context-specific situation being studied. Giving rich insight helps readers to know if they can abstract and generalise to their situation. This enables the researcher to show how he or she arrived at the theoretical findings.

This is closely linked to the principle of contextualisation. Case study research has a weakness with regard to abstraction and generalisation, but Smith [1990] argues that logical inferencing can allow us to draw inferences based on systematic explanation or theoretical propositions.

This study used the case studies to get insight into the diverse students' experiences of the way in which the JAD and co-operative learning techniques were used in the classroom. Both quantitative and qualitative results were used to get the deep understanding of the situation. The studies were only done at two technikons in the Eastern Cape in South Africa, therefore it is difficult to say if the results obtained would be applicable in general.

The results of getting this deeper understanding were, however, compiled into a model which could be used by other people and adapted to their own situation. The framework models some of the factors that a person needs to consider when trying to implement JAD modelling techniques in a classroom with diverse students.

- **Principle of dialogical reasoning**

This principle suggests that the researcher must be sensitive to possible contradictions between the theoretical preconceptions and the actual findings. Any preconceptions or prejudices of the researcher should be confronted and related to the results achieved. Improved understanding of one stage of the research can be become a prejudice for the next. This should be spelt out in the research.

The researcher was involved in the process being researched. This means that her subjectivity was present from the creation of the research questions through to the development of the final framework. The researcher was convinced that it was important for students to learn the social skills needed for information systems development and this was supported by the literature. One could also consider that the problems that the observer noted with the culturally diverse students, could be a result of the observer and

the researcher's own cultural heritage in an apartheid South Africa. The observations were, however, substantiated by the answers to the open-ended questions of the students involved.

The dissertation shows clearly in Chapter 8, how the framework was developed and how the method was refined. The research results show why the framework was developed as it was.

- **Principle of multiple interpretations**

Human actions occur in social context and involve multiple agents. As the research is done, the researcher must be sensitive to the differences in interpretations among the participants. Conflicts due to power, economics and values may need to be analysed.

One of the factors that was of interest in this research was the experiences of the different actors within the research situation. When contradictions were found, the researcher tried to determine why this happened. Multiple viewpoints were needed to get a more complete picture of what was happening in the classroom. Students from different gender groups or racial groups sometimes experienced things in different ways. An example of this was in the second case study where eight Xhosa-speaking students said, in answer to one of the open-ended questions, that the other people in the group did not listen to them even though they tried to participate.

- **Principle of suspicion**

The researcher must be aware of possible biases and distortions in the stories told by the participants. The social world of belief of the participants may need to be understood in order to understand their experiences within the research situation.

Although the students could answer the questionnaires anonymously, one must consider that they might feel that they should answer positively in order to please the lecturer.

This was especially true in Case Study 3 where the results were very favourable. One might consider that as the lecturer was visiting Border Technikon, the students felt 'obliged' to answer in a positive way. Both the observer and the researcher felt that the atmosphere in the classroom was very positive, however.

The cultural differences among the students and the background of an apartheid South African did seem to influence the students' answers, however. An example is the student in the third case study who commented that they disliked being the JAD facilitator at first as he disliked all the eyes following him. As Xhosa speakers tend to look down in order to show respect, rather than looking someone in the eye, this remark was particularly interesting. The background of the students' secondary school experiences also played a role in their answers. Some of the students had never before been given an opportunity to act as the leader of a group or to interact with people of other cultures or gender. This came through in their answers to the questions.

10.2.2 Authenticity, plausibility and criticality

Walsham and Sahay (1999) suggest that researchers should show that their research is authentic, plausible and critical in order to prove the merit of the research. They base their criteria on the work of Golden-Biddle and Locke.

- **Authenticity**

Authenticity is shown by proving that the researcher has been there in the field. This has been done by the observations of the author as well as by the direct quoting of the students from their open-ended questionnaires. The place of the researcher in the research process and as lecturer has been described and her motivation in doing the research discussed.

The author also showed how the theory was developed by analysing the data from the four case studies. Personal biasses were also mentioned in the previous subsection.

- **Plausibility**

Plausibility is a way of ensuring the text makes sense to the reader as well as showing that the text offers something distinctive to the field. The first step in plausibility, according to Walsham and Sahay (1999), is in normalising unorthodox methodologies. Tables and graphs were used to show the quantitative findings of the case studies although most of the conclusions drawn were based on the reasons and comments made by the students in their open-ended questions. These comments were categorized in Appendix B and the discussion included direct comments from some of the students.

The actor-network theory was used to lend plausibility to the analysis of the interactions that took place within the classroom.

In order to be plausible, another factor that should be catered for is that of drafting the reader and the smoothing of the contestable. As the research was developed, the reader was brought into the written work by specifying when there might be cause for contention as to the interpretation of a particular aspect. An example of this was in the fourth case study where the students' perceptions of the contribution by others did not improve although other factors, like their own feelings of acceptance and contribution did. It was speculated at that stage that, as 18% of the students had not covered the work in Information Systems 2 with regard to the modelling techniques, that had influenced this result and that, if everyone had been doing Information Systems 2 as they had in the previous years, this result would have improved. This was substantiated by the fact that ten students commented that people did not participate because they did not know as much as the others. This was not presented as fact but was given as one possible interpretation of the results.

This research also offers something distinctive. The idea of combining the co-operative learning techniques and dealing with diversity with the JAD techniques in order to enhance the learning environment for all, is new. The group dynamics and group decision making issues involved in JAD help to motivate students to learn these methods

while working in a co-operative learning environment.

Walsham and Sahay (1999) suggest that the text should build dramatic anticipation through good writing. It is difficult for an author to determine if this has been done. The text in the literature study chapters, Chapters 3 to 7, builds up to the case studies and the development of the model presented in Chapters 8 and 9. The problems experienced in each of the case studies were then addressed in the development of the model in the subsequent case studies.

- **Criticality**

The research should stimulate the reader to reflect, according to Walsham and Sahay (1999). The researcher applied a critical action research approach to study the use of JAD and co-operative learning in the classroom. The research hopes to stimulate readers to reflect on how they can use active learning methods of all sorts to improve learning of both the technical and social skills needed by IS students. It also hopes that the reader would consider trying out the method of using JAD in the classroom to see if it would work in their circumstances.

Another aspect of stimulating criticality is imagining new possibilities. This would involve using metaphors and imagery to achieve this. Some new possibilities for further research are explored later in this chapter, but the imagery and metaphors implied by this dimension have probably not been achieved in this research.

10.3 CONTRIBUTION OF THE RESEARCH

Introna [1992] proposes a set of principles whereby contribution of research can be evaluated. The evaluation should assess whether progress has been made in the area in the light of the historical or traditional knowledge.

- **Does the theory raise problems previously not perceived, for example problems of increased depth, and does it display an ever-increasing fertility in suggesting new problems?**

There was no previous theory for incorporating JAD and co-operative learning techniques in the classroom. Methods of facilitating a JAD workshop in industry were available from the literature as were studies on co-operative learning methods. This research showed how these methods could be combined within the classroom to create a learning environment where the students learnt some of the social skills needed in IS development while also learning the modelling techniques. Inputs from computer science, education and psychology were used. The framework was developed by an iterative process as new problems were discovered and catered for in the learning environment.

New problems and ideas for further research are given later in this chapter.

- **Does the theory anticipate novel facts and auxiliary theories?**

The actor-network theory was used to analyse the learning environment. The social constructivist theory of learning was used to show that this type of environment should promote learning. The circles-of-learning co-operative learning method was adapted for use with the JAD techniques. Contact theory and social identity theory were used to help modify the environment for the diverse student population.

Many of the social skills needed to interact effectively in JAD sessions, are also those identified as being necessary for an IS graduate. The model specified some of these communication and interpersonal skills that need to be learnt by the students. Added to these skills were those associated with acting assertively and having respect for themselves and others. The JAD sessions then offered the students a chance to practise those skills.

It is important to promote active learning in IS students and it would be interesting to see if the model of the skills input into the JAD sessions would be relevant for other active learning situations.

- **Is the theory more precise in its assertions and in the facts it explains than previous theories?**

There were no previous theories for using JAD and co-operative learning in the classroom. The theory is more precise than previous theories of JAD, used in industry, or general co-operative learning theories.

- **Has the theory unified or connected various hitherto unrelated problems or concepts?**

The theory has unified concepts from computer science and information systems with theories from education and psychology. These concepts were tested and then used to propose a model for the effective combination of these theories in using JAD in the classroom.

- **Has the theory produced a new perspective on existing problems and thus created a new understanding of these existing problems?**

A new theoretical perspective for learning both social and modelling techniques using JAD and co-operative learning techniques was proposed in this research. Problems of promoting participation, developing interpersonal and communication skills and working with diverse students in the groups were addressed.

The groups should be chosen carefully and should be heterogeneous if one wants to promote the learning of working with different types of people. Minorities should not be alone in a group, however. The size and composition of the group plays an important part in the effectiveness of the group and the interaction within the group. Even the

position where the students sit in the group can hamper or promote group cohesion. Group cohesion should be further encouraged by letting the groups give themselves an identity by naming their group. They should also be encouraged to learn one another's names and the pronunciation thereof.

The model suggests that in order for students to work effectively in JAD groups, the students need to learn how to be assertive, how to communicate effectively, how to handle group dynamics, how to come to consensus within a group, how to work in a problem-solving meeting and how JAD workshops should be run. They should also be aware of cultural diversity and how it affects these issues.

The students should also be required to monitor their own group processing and to address any problems that they might have. As they learn more about working in groups this will affect their group processing and decision making ability within those groups. A student can also act as an observer of the group interaction and give feedback to the group as to how the members are interacting.

The students should not all be given the same material to model. The scenario should be divided into different parts with the students being given different parts. This will "force" them to participate as only they will have the information needed by the group.

Many of the above factors are as a result of applying the five principles of co-operative learning, namely promoting positive interdependence, face-to-face promotive interaction, individual accountability, practising and learning social skills and monitoring group processing. Some of the specific behaviours are suggested by the eighteen steps of the circles-of-learning co-operative learning method.

All of these factors lead into the workshop itself. This is seen as a complex network of actors, both human and non-human, that interact through problem definition, enrolment, communication, making judgements, facilitation, etc. in order to create a design for the scenario given by the lecturer. While the students are the controllers of the situation,

the lecturer must monitor and facilitate the process.

It is difficult to say if the ideas produced radically challenge any current conceptions. The theory suggests that:

- JAD techniques, with their strong emphasis on group dynamics, can be used effectively to promote learning within the classroom.
- The JAD techniques become more effective when combined with the techniques of co-operative learning, and in particular the circles-of-learning co-operative learning method.
- The students need to learn the social skills of assertiveness, communication, group dynamics, group decision making and handling both problem-solving and JAD meetings in order for the method to be effective.
- The needs of the diverse student groups need to be catered for in the method and this can be done through careful choice of students within groups. The groups should be heterogeneous in order to promote students learning to work with people who are different from themselves but minority students should not be alone in a group.

10.4 FUTURE RESEARCH

This section gives some ideas for future research that could flow from this project.

10.4.1. Applying the framework in different cultural environments

The framework was developed by solving problems using the experiences of Xhosa, English and Afrikaans students in the Eastern Cape in post-apartheid South Africa. One would probably find that students in different parts of the world and with diverse backgrounds would have varying experiences which would alter the model.

The co-operative learning literature has examples of studies where the results achieved in one country could not be replicated in another. Just the difference between what

happened at the Port Elizabeth Technikon and the Border Technikon would tend to suggest that this might be the case with this research as well.

10.4.2 Applying the framework in non-IS subjects

The techniques used in the JAD groups could be used in other subjects. At the Port Elizabeth Technikon, some of the lecturers have used it to help the students learn about program design in JAD-type groups. The greatest advantage of using JAD with computer science and IS students is that one can motivate the issues in group dynamics and group decision making from the point of view that these would be used in industry. If one used the method with students from other disciplines then that motivation might be lost. It would be interesting to see if, for example, engineering students could use it to learn about design issues.

10.4.3 Co-operative learning techniques in JAD in industry

There have been some problems with getting JAD to work effectively in industry. The question arises as to whether or not one could use some of the techniques of co-operative learning to improve the use of JAD in industry. The idea of organizations being "learning organisations" has become quite important lately [Janz, 1999]

JAD has not always proved to be as effective as one would have supposed that it could be in industry. This was discussed in Chapter 4. Studies by Purvis and Sambamurthy [1997] and by Davidson [1999] have shown that although JAD does have a positive effect overall, there are some instances where it is not effective.

Co-operative learning has been shown to improve work outcomes in self-directed teams [Janz, 1999]. In his study of self-directed teams, he found a greater positive correlation between co-operative learning and work outcomes than between autonomy and work outcomes. Co-operative learning within the teams improved job satisfaction, growth satisfaction, levels of motivation, self-perception of performance and perceptions of

performance from external people.

This also gives some support to the idea that if one could try to introduce some co-operative learning techniques into the JAD sessions that one would be able to improve them. Some suggestions as to how to do this are:

- The participants should be taught some group skills and JAD skills before they get into the sessions.
- The diversity of the participants should be recognised and it is possible that having more than one person from a department or from a particular minority group might help improve participation.
- The idea of positive interdependence should be there as the different members of the group will have different skills and knowledge. This needs to be explicitly pointed out to the members so that they realise their reliance on one another.
- The group as a whole should be made aware that they are responsible for what happens and that each member is accountable for the result. Group cohesion must be fostered within the group.
- The group should be encouraged to evaluate their sessions to see where their group processing was successful and where it could be improved.
- The idea that the group members are there to learn from one another as well as to give their input should be fostered as this will improve the learning environment.

10.5 CONCLUDING REMARKS

This chapter evaluated the research and its contribution. The research methods used were in line with an interpretive and critical approach. The theory was shown to have made a contribution to the area of IS education. Ideas for future research were described.

There is a need for learning methods that help students to develop the interpersonal and communication skills that they will need to work in an IS development arena in the

sense-making and argumentation orientations. As JAD facilitator, the students learn about taking leadership in a small group, facilitating and speaking in front of small groups of people. As group members and as facilitators, they learn about listening actively to other people, negotiating, being assertive, communicating in small groups, group decision making and reaching consensus, and working with people from diverse backgrounds. As scribe they learn about observation, taking notes and documenting events. These skills are all learnt and practised while also learning about modelling techniques which many students find difficult to master.

This research showed how the JAD methods needed to be adapted to help the students feel accepted in their groups, participate better and thus learn more effectively. This adaption was done using co-operative learning techniques and methods of dealing with diversity.

The challenge to IS educators is to find interesting and appropriate methods of developing these skills in IS students so that they can be productive and useful when they get into industry.