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Increasing Student Interaction in Learning Activities: Using a Simulation to Learn About Project Failure and Escalation

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ABSTRACT

The paper describes a system development simulation in which failure and escalation are introduced to Information System students. The simulation forms part of a learning methodology that guides the students through the failure and escalating experience and learning from that experience. The learning methodology described and further developed in this paper is the eclectic combination of various aspects of Problem based learning, Interactive multimedia, Experiential learning and Role playing. The learning methodology is called PIER (an acronym for **P**roblem based learning, **I**nteractive learning, **E**xperiential learning and **R**ole play). The methodology places emphasis on genuine interaction and uses interactive multimedia simulation to support group discussions and interaction. Different events are used to simulate real life occurrences that will lead to escalation and ultimately to failure. The paper discusses results of questionnaires and observation from a practical experience of using the methodology and simulation in teaching escalation and failure. We end the paper with the conclusion that the interactive learning approach presented in this paper has potential in rejuvenating parts of information systems education.

Keywords: Simulation, learning, escalation, failure

1. INTRODUCTION

Participation in an unsuccessful or even in a failing project can have a positive learning outcome for the participants. It provides the participants with a chance to learn from their mistakes and thus minimises the risk of making similar mistakes in the future (Ewusi-Mensah and Przasnyski, 1995). In order to be more successful, professionals should learn from experiences and be able to rethink and improve their practice (Senge, 1990). Failing projects are considered a success when the participants learn something that can be applied to future projects (Glass, 1999). But, it should be acknowledged that it is often problematic to learn from mistakes and past experience (Oz, 1994). Learning from a failing project is costly. However, the same learning experience can be gained from a simulated project failure.

The overall aim of the research is to experiment with models and methodologies that will allow genuine interaction in learning activities. A conventional classroom interaction pattern puts the learner in the position of an object of assessment: the instructor initiates, learner respond, and the instructor closes the sequence by either accepting or rejecting the learner's

response (Sinclair and Coulthard, 1975). Hence, with an emphasis on the active part of learning and the experience as the vehicle of learning, this paper describes an interactive multimedia (IMM) simulation and the learning methodology PIER (an acronym for **P**roblem based learning, **I**nteractive learning, **E**xperiential learning and **R**ole play). PIER builds on problem based learning (PBL), interactive multimedia, experiential learning and role-play to guide the learning from the simulation. The question that relates to the problem area addressed in this research is: How can innovative interactive learning be created? More specifically the research question for this paper is: How can interactive learning be applied when teaching about information system projects that are escalating and failing? In the paper, escalation is considered a form of extreme failure in IT systems development.

The remainder of the paper is organised in the following sections: First, a short discussion of points of departure for the research will be given, followed by an outline of the PIER methodology that facilitates the learning from the simulation. Third, a discussion of the implementation of the failure simulation and the use of PIER at a South African and Swedish university will follow. The paper concludes with a discussion of the implications of the use of PIER, and a short conclusion.

2. POINTS OF DEPARTURE

Experience is a powerful medium. In an educational context, there are several organized approaches to learning from experiences that can enhance and complement the learning that takes place in everyday work. PIER is one such approach. To provide the reader with a frame of reference for understanding PIER this section relates PIER to three other approaches for supporting learning from experiences: action learning, case based education, and goal-based scenarios. Then the four building blocks used for the design of PIER are described: problem based learning (PBL), interactive multimedia, experiential learning, and role-playing.

People can find it difficult to learn from their experience through a messy struggle with real challenges. Thus, there are several educational techniques and methods that create a relatively safe laboratory for learning from problematic situations and failures. Action learning is one approach where the focus of the learning is on individuals who play an enhanced role in directing their own learning and, as such, achieve more control over their own destinies (Marsick and O'Neil 1999). Pedler (1997) is often cited in discussion on this field. Pedler (1997) defines action learning as: "an approach to the development of people in organizations which takes the task as the vehicle for learning. It is based on the premise that there is no learning without action and no sober and deliberate action without learning" (Pedler 1997). Action learning activities help people to learn from risk taking and errors (Marsick and O'Neil 1999). However, the very simplicity of the core ideas of action learning leaves it open to many interpretations. Marsick and O'Neil (1999) claim that many proponents of action learning use Kolb's experiential learning cycle as the theoretical base—the experiential school of action learning. In Kolb's (1984) experiential learning cycle, action, reflection, theory and practice are of equal importance. Marsick and O'Neil (1999) continue that proponents of this school of action learning, action is the starting point for learning. Members reflect on experience with the support of others, followed by further action, in order to change—rather than simply repeat—previous patterns.

Case-based teaching is another similar approach with the positive assumption that "the basic human capacity to learn from stories" can guide learning activities (Schank, 1994). Case-based teaching emphasizes situational analysis, including an understanding of the specific context of the case and the relevant boundaries of the issue. It also includes the possibilities of multiple perspectives. It combines analysis with an action orientation, requiring learners to be actively involved and challenged in their decision making (Schank and Kass 1996). Case-based education is used extensively for training and education in fields such as law, medicine, public policy and business. Case-based teaching allows students to acquire knowledge, develop skills and make decisions in risk free and challenging environments. Although case-based teaching has been perceived as an effective teaching method in different fields, little work has been done that thoroughly examines how individual learners respond to case-based teaching. The overall implication in the literature is that learners find cases motivating, but many educators have argued that case-based teaching will not work for everybody (care of Ertmer and Dillon 1998).

Schank (1999) proposes the concept of a goal-based scenario as yet another safe laboratory for active learning. This concept is not defined by length of time, number of lectures or any other passive measure. It is defined by the tasks accomplished. A goal-based scenario contains a clear goal; it helps students to play a role in realistic situations during which they may accomplish that goal; it provides both access to the knowledge required to achieve that goal and instruction from experts at the time it is needed.

The theoretical and practical background underpinning our approach to learning in PIER builds on problem based learning (PBL), interactive multimedia, experiential learning and role-playing. We combine these four and propose the PIER approach. Each of these four are described below.

2.1 Problem based learning

PBL builds on an understanding of learning that is fundamentally different from traditional teaching and is a significant challenge to orthodox beliefs about education and learning (Margretson, 1991). PBL is: "…a way of constructing and teaching courses using problems as the stimulus and focus for student activity. It is not simply the addition of problem-solving activities to otherwise discipline centred curricula, but a way of conceiving of the curriculum which is centred around key problems in professional practice." and "… problem based learning starts with problems rather than with the exposition of disciplinary knowledge" (Boud and Feletti, 1992).

2.2 Interactive multimedia

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We propose three trends in the area of IMM and learning. First, the main channel for distribution of IMM is becoming the World wide web (WWW) rather than CD-ROM. Second, there is a shift from multimedia for individual learners towards multimedia application for teams or groups of learners. Third, the initiated. In experiential learning: "… the learner is directly in touch with the realities being studied … [experiential learning] involves direct encounter with the phenomenon being studied rather than merely thinking about the encounter or only considering the possibility of doing something with it" (Kolb, 1984).

2.4 Role-playing

Role-plays can be described as dramas in which a number of participants are asked to portray a particular character, but no lines are provided for actors (Steinert, 1993). Role-playing helps students view situations from alternative perspectives. Role-plays are frequently used, for example, in medical education where the objective is to simulate and practice different patient-doctor situations. In a higher education context, role-playing is also used to prepare students for their future profession. Besides medical education, other areas in which role-playing are incorporated into training is in law, law enforcement, military service, and management.

3. PIER

The four points of departure briefly discussed in the previous section serve as the foundation for the PIER approach, which is described in this section. PIER consists of four activities summarized in table 1 below.

It should be emphasized that reflection is an important aspect of all activities in PIER. Three types of reflections are incorporated in PIER. First, there is reflection-in-action (Schön, 1983), reflection that is interactivity that is getting the most attention is the interaction among the participants in the group working with the IMM, not the limited individual-computer interactivity.

2.3 Experiential learning

Experiential learning refers to an encounter that the learner experiences. From this encounter, learning is made during the enacting of the scenario. Second is reflection on what happened during activity one, i.e. reflection-on-action (Schön, 1983). This is done during activity two and is discussed at the seminar in activity three. The third type of reflection is reflection-for-action, i.e. thoughts about how to use the knowledge gained by the experience in a future situation. This is initiated during activity three (Cowan, 1998).

Activity one.	**Experience**. The group experiences the case-based simulation or the interactive case. An instructor facilitates the activity. The instructor ensures that the group reaches the end of the scenario and leaves the session with the problem on their mind. Duration two hours.
Activity two.	**Individual reflection**. The individuals reflect on the experience and on the problem presented to them in the previous activity. Duration one week.
Activity three.	**Feedback and discussion**. The group meets together with the instructor and discusses the problem presented in the interactive case. Duration two hours.
Activity four	**Experimentation**. In a purely educational setting, this can take the form of an activity such as an assignment that reflects on the experience of the previous activities. In a corporate training setting this can take the form of experimenting in new situations, or other competence development activities approaching the same problem as experienced in activity 1.

Table 1: Framework and Methodology for PIER

Activity one should mainly be considered as a starting point for the other three activities in the PIER approach. Consequently, the PIER approach as a whole must be thought of as a start of an extensive organizational change and learning process. This is the main difference between PIER and most other similar simulations. Our approach is not aimed to simulate the real world, rather to start a discussion about it. The level of granularity in the simulation is rather large, but this is, according to our evaluations and experience, positive from an interaction purpose.

3.1 Activity One - Experience

In activity one, a group of five to eight learners, called a base-group (adopted from PBL terminology) are engaged in a role-playing activity supported and guided by an interactive multimedia scenario and a facilitator (see figure 1). The activity lasts for two to three hours and during that time the learners experience a problematic situation, which is relevant and realistic, and discuss problematic issues.

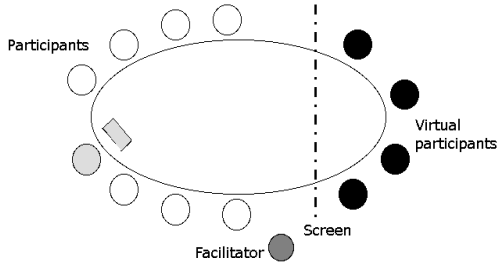

Figure 1: The setting for activity one.

Figure 1 illustrates an overview of the physical setting. The white circles represent the participants seated around the table. The light grey circle is the participant who controls the navigation, according to the base-groups' wishes, through the scenario with a mouse and a keyboard. Navigation is intended to be simple and consists of clicking on hotspots and writing text into forms. At the end of the table, an interactive multimedia scenario is displayed on a large screen. In the scenario, there are virtual participants, represented by black circles, who contribute to the role-play in various ways. They are part of the imagined reality and can take the shape of a video-clip, sound-clip or a piece of text. They could, for instance, be members of the group, managers or others interacting with the base-group. When it is necessary to intervene in the ongoing group-process the facilitator has an opportunity to act as one of the virtual participants. The dark grey circle represents the facilitator, who assumes a peripheral role. The facilitator intervenes in the group-process only when necessary, for instance, when progress is too slow or the navigation alternatives are not obvious.

The scenario lets the learners become part of a fictitious but not improbable world. They are given brief role-descriptions and act according to the role but mainly rely on personal experiences and preferences when participating in discussions. The discussions are the essence of the learning activity and although the participants interact with the scenario, the main interaction is within the base-group. They face different situations where they are required to make decisions, and, to make decisions, they discuss, negotiate and exchange experiences.

Some of the decisions lead to different paths through the scenario. There are a limited number of paths and there is no turning back. We have not tried to create a realistic simulation that allows non-linear navigation. Instead, the realism is embedded in how characteristic the confronted situations are of the real world, i.e. if the participants recognize similarities with their own work situation and the alternatives are believable. By decreasing the complexity, regarding the available paths, the learners are steered into predetermined scenes and thus the scenario ensures that the intended problematic situations are experienced. However, it is difficult to keep the scenario alternatives limited and at the same time maintain the realism; it is a matter of creating a credible story.

We have used web technology to develop the scenes in the scenario. The scenario structure reflects the passing of time, i.e. as the group navigates through the scenario time passes and new events occur. The scenario structure is static in the sense that the narrative is presented as it is stored in the computer as opposed to being dynamically created by a human facilitator.

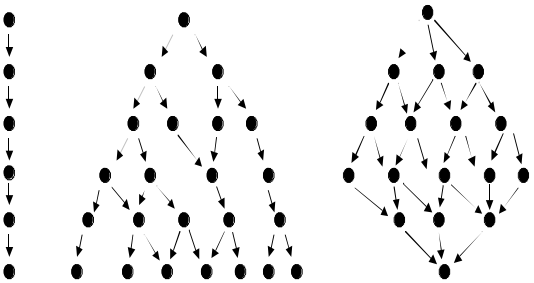

Figure 2: Interactive case (left) and two types of case-based simulation.

The scenario can have different overall structures as shown in figure 2. In the interactive case, navigation and presentation of information is in a linear fashion, while in the two types of case based simulations, the base-group relatively freely navigate their way through the case. The case based simulations differ in the way that one has an open ending of the scenario, and the other has a closed ending.

The terminology of scenarios in PIER is pragmatically adapted from film theory. Like a theatrical performance, a scenario can be divided into acts. Each act consists of one or several scenes, and each scene consists of one or several web pages with embedded objects. Examples of objects are text, graphics, sound and video. Acts, but also scenes, are delimited from each other either by the focus, i.e., the issues presented, or by time, i.e., a series of events or different phases of a process.

The facilitator ensures that the base-group participants reach the end of the scenario and leave the session with the problematic situation on their mind. The ending scene of the scenario is meant to be a cliff hanger since our intention is to leave the base-group with unanswered questions and feelings to reflect upon during activity two. Instead of having an ending that provides closure, we want them to leave activity one asking themselves, "What happened?".

3.2 Activity Two – Individual Reflection

Activity two is individual reflection for about one week. During this period, each of the participants will have a chance to reflect on what happened in the scenario and they will hopefully relate their experiences from the scenario to their daily work, whether it is professional practice or an educational program. It is tempting to support the reflection by handing out material such as relevant questions or pointers but this we believe would interfere with the participants' individual sense-making of the experience and instead, to some extent, turn the activity into a traditional teacher-oriented activity. To further avoid interference, activity one ends sharply without any following discussion and explanation.

3.3 Activity Three – Feedback and Discussion

After a week of reflection the facilitator meets the base-group during a seminar lasting for two to three hours. The purpose is to discuss the experiences the participants encountered during their work with the scenario in activity one and explicitly relate them to their experiences from daily work. An important part of discussing their experience in activity one is the intention to debrief the participants, i.e. make sure they understand that they are not to blame for mistakes and failures in the scenario. The purpose is also to discuss possible ways to approach the issues covered in the scenario. Some time should also be dedicated to a discussion of further activities to be carried out as a part of activity four, since this continuation should build on the participants' own ambitions and ideas.

3.4 Activity Four - Experimentation

The fourth activity is probably the most important, since a central part of PIER is to prepare the participants to deal with similar situations such as covered in activity one. Whereas activity one to three should be understood as a starting point, activity four is meant to be an ongoing and organized learning process. Examples of learning activities could be a series of traditional seminars and lectures, new scenarios, or a net-based continuation. Together with action, an important aspect of the framework is reflection. Reflection is inherent in the PIER methodology that we propose. It forms a key part of experience as well as action (Schön, 1983). As discussed earlier, three types of reflection are represented: "reflection-in-action" (Schön, 1983) , "reflection-on-action." (Schön, 1983) as well as "reflection-for-action." (Cowan, 1998).

4. THE SIMULATION WITH PIER

A description of the implementation of the PIER methodology with the simulation as it took place in South Africa and Sweden is given and we discuss what was learnt from this experience. The students from South Africa and Sweden were chosen because the researchers were employed at institutions in those countries at the time the research was conducted. The experiment with the students in South Africa and Sweden consisted of two sessions coinciding with activities one and three of PIER. Individual students carried out the second and fourth activities.

4.1 The Simulation – Challenger

A case-based simulation of a fictive systems development project about two companies, Challenger and Nuwear, and their efforts in developing a computer-based sale-support system, was designed. Nuwear is a clothing company and Challenger is a software house that develops the software for Nuwear. The fictive information system development project experiences problems, and the problems become more severe (escalate) as the project progress. Decisions are made on a number of occasions. The inevitable end of the scenario is a major failure of the project and a massive economic crisis for Nuwear.

The case-based simulation made use of a standard web browser, with hypertext, text, graphics, video clips and sound. The students had to make three types of decisions during the simulation. To create a sense of personal involvement in the decisions, students were asked to choose which characters they would like to be (thus role play) and to argue in making decisions as if they were those specific characters. Another type of decision that students were asked to make was on an individual level about a specific subject. An example of this type of decision is choosing the three most important characteristics of a project manager from a list of characteristics. The group was then asked to debate these characteristics and to decide as a group which three characteristics they would prefer. The main type of decision that students were asked to make was on an

experience that has been related to the students by means of video or text (look at the left screen in figure 3). The students usually had two or three options that they could choose from (look at the right screen in figure 3). Although, the students did not know beforehand that the project would fail, the effect of these decisions was in all cases that the project would fail, thus creating an experience of an escalation situation with failure. An example of an act in the Challenger simulation is shown in Figure 3.

An example of an act with a number of scenes would be (not represented in Figure 3):

- Scene 1: A screen with the following information will be displayed: The sales representative has new information about one of the largest competitors. They have invested in a new sales support system. The advantages of the competitors new system is that their customers have the possibility to spot their products, when it leaves the production line and at what day it will be delivered. The timeline at the bottom of the screen indicate that the end of the design phase has been reached and that programming is about to start.
- Scene 2: A video clip of a face-to-face discussion between the sales representative from Nuwear and the project leader from Challenger. In this discussion the sales representative describes the advantages of the system as adopted by their competitor and compare that system with the system that has been designed by Challenger. The project manager from Challenger tries to defend the system designed by them.
- Scene 3 is an instruction saying the following: We would like you to discuss and argue according to your role character the alternatives that are provided on the next page. The group has to agree with the alternative chosen.
- Scene 4: A number of alternatives are presented (another example can be seen in figure 3 right hand side). The alternatives in this instance would be: Alternative 1 - proceed according to the initial project plan. The new system of the competitors was not a threat to Nuwear. It is not possible to find a solution within the time/resources schedule of the project plan. Alternative 2: Ask for more resources. Integrate the new application in the new system. The investment will be expensive.

4.2 Subjects

The first group of students comprised of 21 fourth year Informatics students at a South African University. Of the subjects, 11 were female and 10 were male. The average age was 23 years and they had on average a little less than two years of relevant computer industry experience.

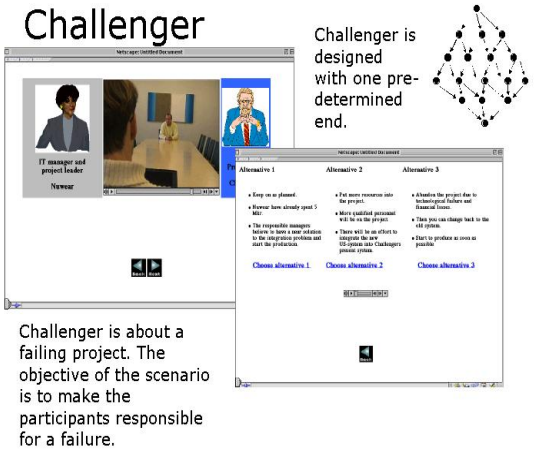

Figure 3: The Challenger multimedia scenario.

The second group of students comprised of second and third year Informatics students at a Swedish University. Ten students attended the first session (activity one of PIER) on a voluntary basis and the second session (activity three) was attended by a group of 28 students (which included the 10 students that attended the first session). The average age of the students that attended the first session was 31 years and they had one year of relevant industry experience. Seven of the subjects were female and 3 were male. No further mention will be made of the 18 students that attended the third activity as the paper discuss the experience of the PIER methodology.

Two sessions (activity one and three of PIE) of two hours each were used for the presentation of the simulation and the discussion about failure and escalation. The South African group consisting of 21 students was divided into three smaller groups in the first session. The 10 Swedish students formed one group. The difference between the South African experiment and the Swedish experiment can be ascribed to practical reasons and the availability of students. The South African group attended the escalation sessions as part of a course whereas the Swedish students did the first session as well as the assignment on a voluntary basis.

4.3 Activity One of PIER - in action

In both the South African and Swedish experiment the students were asked to go through the simulation on the computers provided to them. Before students started with the simulation, they were given a small introduction to PBL and what to expect during the simulation. The students were also asked to role-play certain actors during the simulation. The result of the enactment was that students felt more a part of the simulation, and discussions were very lively. These

sessions were observed and video taped. Each member in the group received a decision sheet on which they recorded their personal decision as well as the decision made by the group. The decision sheet also advised the students on the length of time they should use for discussing each decision.

4.4 Activity Three of PIER - in action

During this activity the South African students were asked to reflect on what they had learned during the first session. They were furthermore asked to identify learning objectives about the situation that they were presented with. They were given an assignment that was handed in 6 weeks after the second session. In this assignment they gathered information about escalation and escalation situations based on the learning objectives they had identified.

In the Swedish experiment, all students were asked to reflect on failure in systems development. They were furthermore asked to identify learning objectives about failing situations. They were given a voluntary assignment that was handed in 6 weeks after the second session. In this assignment they gathered information about escalation and escalation situations based on the learning objectives they had identified.

The students, both Swedish and South African, were given 2 questionnaires. The first questionnaire, called a lecture questionnaire, evaluated three aspects: their experiences with the simulation, the learning methodology and their perceptions about escalation and failure. The second questionnaire was based on a paper-based case study called Medpro and determined their perceptions about failure and escalation. The results of the second questionnaire were compared with those of a base group that did not attend any lectures on failure or escalation. The results of the comparison are not shown, as this paper does not cover failure and escalation specifically, but emphasizes the learning experience (for a detail discussion on the effect this experience has had on the students thoughts on escalation and failure see Scheepers and Nulden, 2000). What is significant is that the comparison between the experimental groups and the base group, made it clear that both groups of students came to the realisation that escalation and failure situations are complex and not one-dimensional.

5. RESULTS OF THE LECTURE QUESTIONNAIRE

The students were asked to fill in a lecture questionnaire that contained questions about their ideas and feelings about the multimedia simulation, their ideas and feelings about PIER, as well as their opinion on escalation situations. The questionnaire consisted of two types of questions. Students identified their opinion on a Likert scale of 1 (negative) to 7 (positive). The Likert scale questions were followed by open-ended questions that motivated their answers to the previous questions. Four of the questions pertaining to PIER are discussed in the following paragraphs.

Question 1: Did you like the simulation on the computer? The students identified their likes or dislikes according to "*did not like at all"* (1) to "*like very much"* (7).

	Mean	SD	Min	Max
Sweden (n=10)	5.3	1.1	3	7
South African (n=21)	5.6	1.3	3	7

Question 2: Did you like the way in which the subject was presented to you? The students identified their likes or dislikes according to "*did not like at all"* (1) to "*like very much"* (7).

	Mean	SD	Min	Max
Sweden (n=10)	5.7	1.2	4	7
South African (n=21)	5.6	1.1	3	7

Question 3: Did you like discussing the decisions in a group? The students identified their likes or dislikes according to "*did not like at all"* (1) to "*like very much"* (7).

	Mean	SD	Min	Max
Sweden (n=10)	5.0	1.5	3	7
South African (n=21)	6.1	1.0	4	7

Question 4: Did you like the feedback about the simulation? The students identified their likes or dislikes according to "*did not like at all"* (1) to "*like very much"* (7).

	Mean	SD	Min	Max
Sweden (n=10)	5.8	0.8	5	7
South African (n=21)	5.6	0.9	4	7

Comments about the simulation in the open ended questions centred on the reality of the simulation and about the failure experience itself. They found the experience valuable and positive. Examples of such comments are: "*an interesting scenario. Reality-based"* and "*In spite of problems, it was a refreshing change from the usual lectures and case studies. Also, it took me out of my usual frame of mind of an outsider and meant more to me since I "was" a role player or stake holder in the situation*" and "*It was interesting, you had to think while the case study was presented, make your own decisions and give your motivations to other group*

members. Facilitated excellent group discussions" and "*It was a visual way of seeing the real problems of companies so you panicked with them*".

In the questionnaires, the students also commented on learning about escalation and failure. Mostly they referred to the fact that they found the experience educational and they mentioned the effectiveness of the learning. The following are examples of comments made by students: "*It was great fun, and I learned a lot. It was easier to get an understanding of the problems and difficulties when you took part in a story, than what it would have been with just a formal presentation of the subject.*" and "*This way of learning is more effective compared to an ordinary lecture. You get more involved and you think and reflect on the subject during the time it's presented to you. "* and "*I liked the way in which I felt I really had a stake in the situation and it forced me to examine my own attitudes about "quitting" and being able to draw the line to know when to "quit while I'm ahead*"".

A special mention was made about the group decision-making that took place. Students felt that this was more realistic and it also helped them in learning about escalation and failure. Comments such as the following were made: "*It is more like reality. No decisions should be made by one person alone*" and "*You are able to hear other people's viewpoints and can reflect on your own viewpoint*" and "*The role-playing was interesting and made you feel more involved and to "take side" in the discussion which made me listen more carefully to what the others had to say.*" and "*It made me think of more alternatives and examine aspects about the case that I would not previously have considered. I had to justify my decisions.*"

A subject that elicited special comments from the students was the feedback and third session of PIE. They felt that this was a learning experience in itself and that it helped them to understand the subject better. The following comments were made: "*When we discussed the simulation again a few days later, we got an even better understanding about the case, because even if you don't think about it all the time, you think about it subconsciously,*" and similarly "*It placed what was depicted into perspective. It brought the relevant issues to light and allowed discussion to flow around matters which are very relevant and important*".

6. DISCUSSION

The use of PIER, as described in a learning environment, introduces the student to the activities that many practitioners face. For example, reflection-in-action is a process that practitioners perform during their activities mostly without thinking (Schon, 1987). In the case of the novice practitioner this is a skill that they either need to learn to do or that they need to practice. The IT industry has an unenviable reputation (e.g., Abdel-Hamid & Madnick, 1990 and Ewusi-Mensah & Przasnyski, 1995) when it comes to reflecting on the actions taken during a project that is directly related to what Schon (1983, 1987) labels reflection-on-action. Introducing novice practitioners to PIER will hopefully instil a habit of reflection by the time they become practitioners.

The use of the PIER framework is not confined solely to a typical education environment, but is applicable to learning for professionals in practice. The use of an earlier version of the PIER framework in a learning environment in practice has been described in Scheepers and Nulden (2000). The PIER approach has also been evaluated in a corporate setting with an organization involved in global business (Hardless. et.al. 2001). The research was carried out in cooperation with a subsidiary based in Göteborg Sweden which had responsibility for the logistics of spare parts and related services. Much of the organization's work is conducted in project form and the projects are characterized by difficulties such as time-to-market pressure, managing cultural differences, communication and cooperation. The organization felt, as do many organizations today, a need to improve their project management practices and thus the PIER based competence development initiative was launched. The intensive part of the initiative was carried out in 6 months during the second half of 1999, and was followed by activity four which we have been able to oversee for the whole of 2000. The purpose was to facilitate experience sharing, discussion, and reflection, with the intention to improve project management practices on both the individual level and organizational level. The outcome of the project was mainly positive.

The problems that should be presented to practitioners should be based on real life experiences that they relate to. The biggest advantage of using this model for learning in practice is that it does not necessarily have to take days out of the practitioner's timetable for learning. It can be a short activity as described in activity one of PIER. The individual reflection does not take much time, as most practitioners will find that they think about the issues discussed in action two without any real effort on their part. Activity three is again a two-hour discussion with brainstorming and reflection by the participants. The final activity (activity four) would mainly be used in an educational setting and corporate setting. This would take the form of experimentation in new situations, or approached in other competence development activities. The total time required in participating in all four activities relates to the learners contribution. However, more time is needed by the

facilitator to prepare PIER supported learning activities than to prepare a conventional classroom activity.

Another major advantage of PIER is that the natural ways of learning by practitioners are used: learning through experience (Kolb, 1984), through reflection (Schon 1983 and 1987) and by facing a problem (Schon, 1987). All of these learning strategies are combined in PIER which takes advantage of their strengths. The combination of the pedagogical and methodological points of departure, as discussed in section 2, move away from a traditional learning environment where the lecturer presents the knowledge to be learnt.

On the other hand there is a need for change in the way in which learning and work is integrated (Torraco, 1999). In the PIER model, specific knowledge issues or problems can be identified and used as learning. As the sessions are done in groups PIER naturally supports the collaborative aspect of the workplace. The members that form part of the group, can be determined by the problem and level of expertise needed.

7. CONCLUSION

The paper describes the use of a simulation to facilitate learning about project failure and the evaluation of the learning experience. The goal for the simulation was to take advantage of interactive multimedia to enhance the experience that initiates learning. The simulation also facilitated group discussion through the use of role-play. In order to facilitate and enhance learning, the PIER methodology was used. The important aspect of PIER is the experience created through the simulation, reflection on the experience and the subsequent building of knowledge based on the reflection and experience. It was found that the combined use of an IMM simulation and PIER methodology was effective for learning about information system project failure and escalation. Therefore, we claim that it is important that we try new ways of teaching, and that we should not continue to show our students only how to complete successful projects, but also how to gain experience from less successful projects. More experimentation with innovative learning activities is needed to take information systems education further.

The PIER approach has also been applied in other learning contexts; for instance, in project management with a focus on global cooperation and the problems related to this. PIER has also been applied to the problem of losing the overall picture of projects. In this case, a group of participants receives too much information and too many tasks from the scenario that the work has to be divided. In a secondary school context a multimedia scenario and PIER were used to initiate discussion about moral and ethics concerning computer and Internet use among students, teachers and parents. The important aspect of PIER is that it combines the idea of learning from problems and the use of experiential learning to facilitate effective learning. The use of PIER is not restricted to an education setting, and can easily be implemented in various settings for learning within professional practice.

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