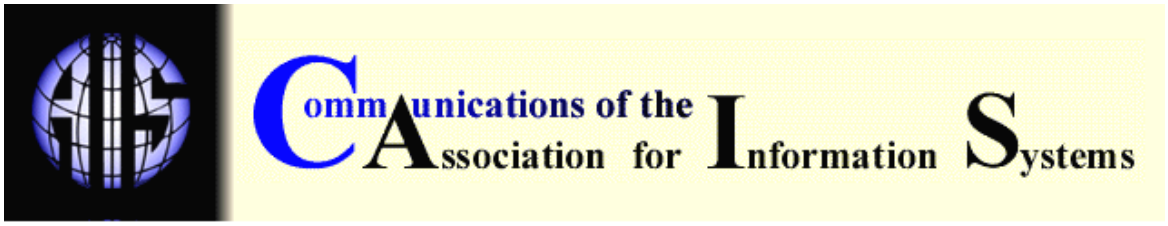

INNOVATION IN INFORMATION SYSTEMS EDUCATION-VI HKNET: INSTILLING REALISM INTO THE STUDY OF EMERGING TRENDS

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ABSTRACT

In this paper we describe

- explicit materials that were generated in an ongoing effort to help undergraduate and Masters-level students learn about off-shore outsourcing and radical technical changes in Information Technology development, and
- the environment in which these materials were developed and continue to be distributed.

The environment provides a realistic, effective way for students to learn about emerging trends. Over the last seven years, we tried to bring realism into Information Systems education through a joint project between universities in Hong Kong, Orlando, Tilburg, Eindhoven, Grenoble, and more recently, Beijing. The HKNET project offers an integrated learning activity across multiple international institutions and brings Information Systems reality into educational contexts. It allows students to focus on organizational trends.

Keywords: culture, learning, educational technology, virtual teams

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I. INTRODUCTION

A typical Information Systems (IS) curriculum addresses a range of technical and behavioural areas through a set of core courses, plus some electives based on suggested guidelines [e.g., Couger et al., 1995]. Efforts are made to address issues of practice and include both IS practitioners, and educators [e.g., Lee et al., 1995]. For the most part, present-day courses[1] (and instructors) are relatively independent, and student learning is typically focused on the individual, albeit with some attention placed on group projects. IS development, for example, is usually taught through courses on analysis and design, programming, and database. Project management is often treated in the context of a separate course, frequently as an elective.

Group projects are a common occurrence in many IS courses. Sadly, most group projects tend to be somewhat simplistic in order to keep them within the scope of a single course. This approach can lead to overconfidence or boredom on the part of students who do not understand or appreciate real-world complexities. Little, if any, attention is given to integrating projects within a program and building on the efforts of others (e.g., in prior courses or from multiple disciplines), a process that is more typical of that which students encounter when they enter the job market. Rare are projects that span multiple institutions, particularly those that span multiple time zones on several continents. The end result is often frustration on the part of faculty, students, and employers, as the need for on-the-job learning emerges which, to some extent, could have been addressed in the educational process.

In this paper, we explain how our approach instilled realism into emerging trends in an IS learning environment. Special attention is given to application of educational technology in multi-cultural learning environments.

II. BACKGROUND

In industry, many changes took place in IS development over the past decades. A few typical characteristics of today's projects might include:

- Almost all projects start from an existing infrastructure. The systems need to be integrated with existing legacy systems and run on existing infrastructure that is shared with other information systems (IS).
- Creating new IS involves a lot more than development. It is a combination of buying off-the-shelf, borrowing from the open source community and building something new.
- IS projects involve working with people from many other professional, organisational and national cultures. Examples of the professional cultures involved are computer scientists, software engineers, human factors specialists, content experts and safety specialists. Thus, many parts of an organization are affected. In addition, IS development is increasingly distributed around the world. Although significant development activities have taken place in the Far East (India and China), the major customer activities are still in the West.
- We can be certain that requirements will change during the IS development process. Frozen requirements are and will remain an illusion. Negotiating, planning and specifying requirements is important not only at the start of the project, but throughout.

It is unlikely that students can solve a real-life business problem by going down the traditional process of development only once during a typical course. HKNET encourages students to anticipate problems in the real world by experiencing the challenges and learning opportunities of a major project.

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[1] For more recent detail (and debate) on IS curriculum, readers should access CAIS Volume 12, article 42 (2003) at http://cais.isworld.org/articles/default.asp?vol=12&art=42.

TEACHING REAL LIFE DEVELOPMENT

How can real life IS development be taught to students? The ancient Chinese philosopher Lao Tzu noted that if you tell me, I will listen; if you show me, I will see; but if you let me experience, I will learn. We think there are two ways to provide students with a real life experience in IS development. One is to scale down a real project to a size that can be handled in the context of a 100 hour workload. The second is to combine the 100 hour workload of 100 or more students to create a 10,000 hour project in which the students are more likely to experience real-life problems. There is no silver bullet in bringing realism into IS education. Both approaches summarised here (and also reported by many others) are meritorious and either approach could be applied in an IS curriculum.

An example of the first approach is given by Watts Humphrey in the area of software engineering. Humphrey is famous for his pioneering work on software processes, resulting in the Capability Maturity Model (CMM) [Humphrey, 1989; 1995]. In the early 1990's he developed the Personal Software Process (PSP) and the Team Software Process (TSP).

The PSP is a level 5 software process scaled down to the individual. The PSP shows key processes in software development and allows a student to practice these in 10 programming exercises. The principles that are learned can, of course, be scaled to real life software engineering since that is where they originated in the first place. The TSP can also be applied at the team level [Humphrey, 2000]. The work on PSP / TSP is an excellent example of education approaching real life engineering practices.

We took the second approach and combined the efforts of 100 or more students into a worldwide project with over 10,000 accumulated hours spent on the project. This approach enables students to experience what it means to work in a virtual team, to plan a project, and then to deliver a website. Some topics, such as component-based development and CMM, can really only be understood and appreciated in large-scale development projects.

III. THE HKNET PROJECT

In this section, we outline the objectives of the HKNET project and provide an overview of the project and its evolution during the past seven years. Examples of project output are provided together with assessment guidelines.

OBJECTIVES

The goal of the HKNET project is to let students experience a real project --- not just learning theory about working in virtual teams, but actually experiencing working together on a project related to an emerging trend. In the initial years of the project, emphasis was placed more on working in virtual teams; in recent years the experience of being part of an IS project and delivering a product with a timely focus became more important. In 2004, specific educational objectives, as stated in the course documents page on the learning management system, were:

- Let the students gain insight into the current situation of IT-developments in Europe and Asia and increase the understanding of the global differences and similarities.
- Let the students experience the pros and cons of cooperating in a distributed team, with members from different cultures and backgrounds.
- Let the students experience the advantages and disadvantages of using a remote Group Support System.
- Let the students become familiar with several applications of ICT (Information and Communication Technologies), which can be valuable to their study and (future) work.
- Let the students become more sensitive to the cultural richness of international co-operation.

OVERVIEW

Over seven years, more than 600 students participated in the HKNET project. The number of students grew from 65 in the first year to 163 in the seventh year. About half of the students in this project are part-time from business, while the other half are full-time university students. The project started with universities in Eindhoven and Hong Kong. The number of universities over the years expanded to include the universities in Tilburg (The Netherlands), Grenoble (France) and Orlando (USA). In 2004, students from Beijing participated for the first time.

Typically, HKNET teams consist of 8 to 10 students from 2 to 4 cultures. The team assignment encompasses an IT-related topic (e.g., 'offshore outsourcing', 'extreme programming' or 'mobile devices') from different cultural and geographical perspectives in a structured process consisting of multiple divergent and convergent activities over a six-week timeframe. The teams define a number of research questions to focus their study of the subject. Three research questions are selected to reflect important and/or emerging IS trends and a collection of material follows. Vogel et al. [2001a] and Rutkowski et al. [2002a, 2002b] provide additional process detail and explore a range of issues with special focus on cultural dynamics.

Initially, the team effort resulted in 10 page reports in 1998, 1999 and 2000. since then, websites were developed. For example, in 2002 the results of each of the 17 teams were combined in a website that formed an electronic book of the software industry, found at http://hknet.tm.tue.nl. The 2003 results can be found at http://www.ohknet.com and the 2004 results at http://www.bohknet.com.

The technologies used included videoconferencing, e-mail, and an off-the-shelf learning management system (Blackboard) that supports both chat and forums under the control of the students within structure provided by the instructors. Videoconferencing is used at the start of the project, halfway through the 6 weeks to track progress, and once again towards the end to celebrate completion. To familiarize students with Blackboard and with the different communication technologies that are available, an animated tutorial is available at the course web site http://blackboard.cityu.edu.hk. Faculty communicate frequently on the discussion forum, over the phone, and via e-mail. Approximately two or three times a year subsets of the faculty meet face-to-face.

One project objective is that students thoroughly research their selected topic. To start them off, we provide at least two references. The end product, however, should provide a list of references and resource material. Figure 1 illustrates a topic description and suggested readings from one of this year's projects. The topic descriptions are available on the Blackboard course learning management system.

1.3 Cultural issues in offshore outsourcing
Companies are increasingly turning to offshore outsourcing as a means of reducing software development costs or filling gaps in technical expertise. These companies are finding that the advantages of offshore outsourcing are sometimes offset by difficulties in completing global projects. In particular, communications among users, IS management and offshore developers are often problematic. Although communications are often executed at a cultural level as well as on an individual level, communicators frequently fail to take into account differences in culture. In addition, cultural differences arising from religious influences, modes of dress, and social activities create risks for offshore outsourcing projects. Often overlooked are benefits that differences in cultures may offer in offshore outsourcing projects.
Sponsor: Carol Saunders
References: Olson, J.S. and Olson, G.M**.** Culture Surprises in Remote Software Development Teams**,"** *ACM Queue* vol. 1, no. 9 - December/January 2003-2004 http://www.acmqueue.com/modules.php?name=Content&pa=showpage&pid=105 Kaiser, K.M., and Hawk, S. "Evolution of Offshore Software Development: From Outsourcing to Cosourcing," *MIS Quarterly Executive,* June, 2004, vol. 3, no.2, 69-81.

Figure 1. Sample Topic Description

The schedule and deadlines for the 2004 six week project may be found in Appendix I. This material is accessible to the students from the Blackboard course learning management system. During the project the students enact (approximately) the deliverable creation process demonstrated in Figure 2. An especially important aspect of the process is to enable the students to discover and assume the various roles necessary for working successfully in virtual teams [Rutkowski et al., 2002a]. The students experience the pleasures (and frustrations) of working in real teams on real projects in a genuinely multi-cultural context that eliminates the need to induce role-playing.

HKNET EVOLUTION

Like its name, this project (the HKNET1-4 predecessors, OHKNET1-2, and BOHKNET) evolved over time. HKNET went through six iterations since 1998 with the realism increasing every year. Many topics on emerging trends are now discussed frequently among IS managers. The main changes of the past seven years are listed below.

1998 – 2000 (HKNET1-3) The first trial commenced in October, 1998, linking teams consisting of part-time MBA accountancy students from the City University of Hong Kong and full-time business engineering students from Eindhoven University of Technology in the Netherlands. Preceding the project initiation, the students attended lectures related to the team assignments. Because of the different backgrounds of the students, the lectures were not identical at both locations. For example, the Dutch lectures were given from a software-engineering point of view, while the Hong Kong lectures focused on aspects of the impact and implications of IS from a management perspective.

A second trial between the same institutions was launched in November 1999, building upon knowledge gained from the first year. Elements of professional and national culture, prevailed. Feedback from HKNET1 was used to further modify technology, processes, and materials. In particular, the need to orient the students better and better familiarize them with the material and with each other became especially apparent. Efforts were extended in HKNET2 to create a more common base: e.g., a Hong Kong session focused specifically on software engineering since this topic dominated the Dutch lectures.

Class web sites gave students at both locations access to common materials. These cross-cultural teams had the opportunity to introduce themselves at the start of the project during a kick-off session, for which a high bandwidth videoconference link between the two universities was established. After the introduction, all participants gained access to GroupSystems[2] via the Internet. GroupSystems was the main collaborative tool for students to work on their projects in a structured way. They could also use e-mail and desktop videoconferencing via NetMeeting to communicate with their team-mates as the project progressed.

The third trial (HKNET3) commenced in October 2000 where more time was dedicated to topic pre-planning to fit student interests better. In HKNET3 additional attention was given to orienting students culturally and to make them more familiar with the material. As such, a session conducted by a cross-cultural facilitator via videoconference exposed students to issues in cross-cultural collaboration [Dustdar and Hofstede, 1999]. For example, the facilitator demonstrated how different use of the hands could be easily misinterpreted. A hand sign for “OK” by a US teammate was interpreted as meaning “0” and insulting to some of the Europeans. Further, in HKNET3 attention shifted toward cross-cultural dynamics and better understanding of determinants of successful interaction. Towards that end, special attention was given to antecedents that might enable prediction of successful interaction and/or particular areas to focus attention upon in facilitating cross-cultural interaction on critical, emerging topics.

[2] GroupSystems is group decision support system software developed at the University of Arizona and now marketed by GroupSystems of Bloomfield, Colorado (www.groupsystems.com)..

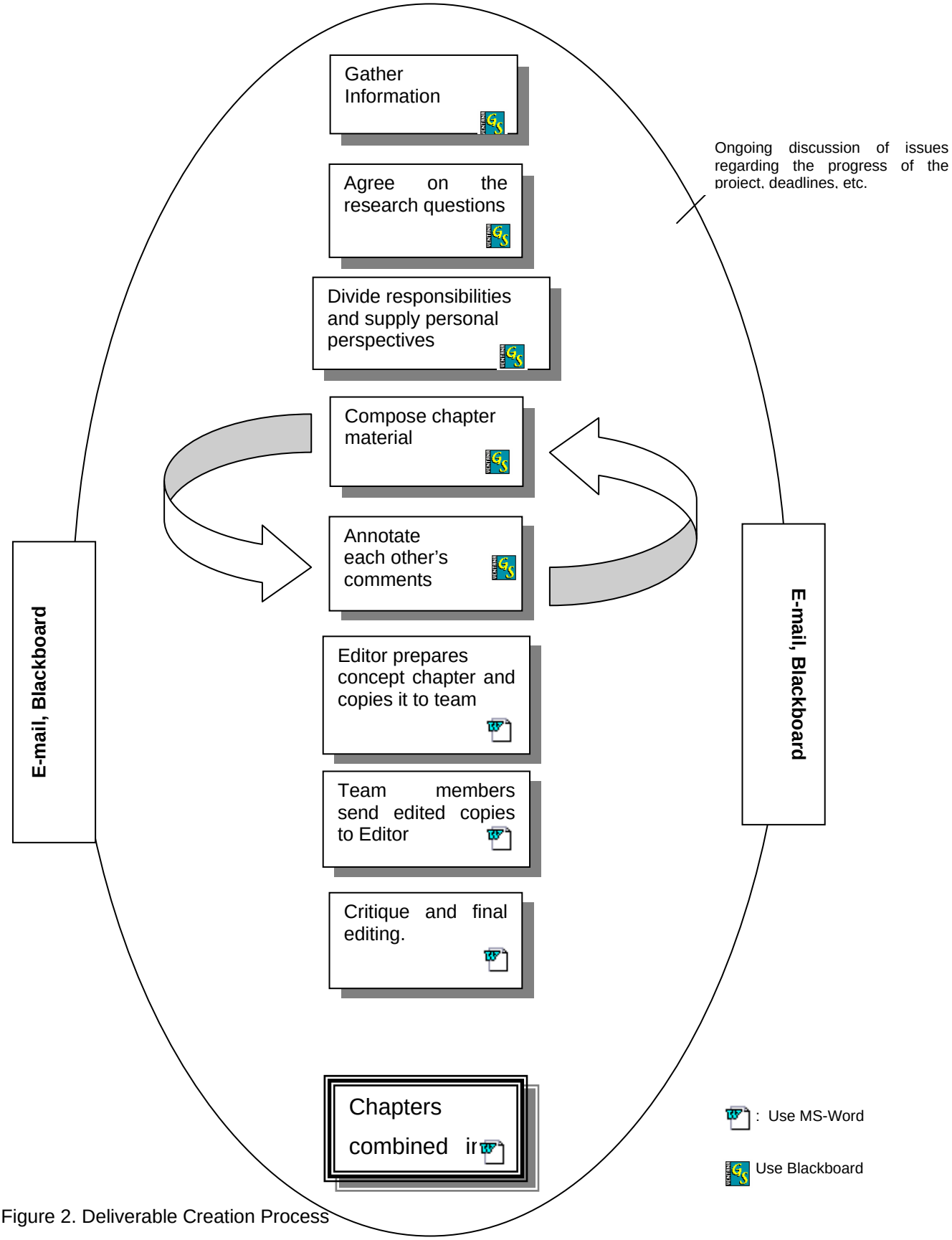

Figure 2. Deliverable Creation Process

2001(HKNET4) The fourth project started in October 2001 and involved the participation of the Ecole Superieure d'Administration (ESA) of Grenoble, France. Teams were bi-cultural (e.g., composed of Dutch and Chinese participants) or tri-cultural (e.g., Dutch, Chinese and French participants). Blackboard again served as the backbone of the project. The participants were asked to build a website composed of different layers, not just a flat document. Realism was provided in that the product of the work was an IS that could and would be used by a number of people. The students applied skills that they had heard about in lectures. One example was a group of students who had been through a number of courses on e-commerce and hypermedia without ever building a website. The feedback from one student after the HKNET project was, 'Building a website was interesting and not as difficult as imagined after the lectures.'

2002 (OHKNET1) The fifth project, OHKNET1, started in October 2002 and offered bi- and tri-cultural learning experiences. A team of MBA students from the University of Central Florida (USA) participated in the project on tri-cultural virtual teams. The participants were now distributed across 13 time zones making it quite difficult to meet synchronously. The role of the United States students was altered to a peripheral one of advisor and reviewer of the output of core team members. They were not able to participate in the teleconferences, since they worked during the day and attended other classes at night when the teleconferences were held. However, they could communicate asynchronously with the other OHKNET participants.

More emphasis was put on reviewing the result from a customer perspective by including US students in that role. This additional requirement allowed the students to learn about the importance of issues such as integration testing. The result of the team project was not an isolated piece of work (e.g. a report or a single website) but rather an integrated electronic book. The separate sections in the book were required to refer to other sections. The results of the previous year's teams were used as starting points and teams were encouraged to build on prior work.

2003 (OHKNET2) During 2003 the students of the University of Central Florida played a full role as core team members in the project. Participation was made possible by scheduling the class, an undergraduate, senior-level course on technology management, at 7:30 in the morning. The University of Groningen (The Netherlands) joined the project. Thus, three types of teams were built:

- Mono-zone teams with students from three Dutch universities. In these teams exchange students from various countries provided the international perspective of the teams.
- Bi-zone teams with representatives from a Dutch and the Hong Kong (HK) university.
- Tri-zone teams with representatives from the Dutch, the HK and the American university.

This project put more emphasis on milestones and intermediate deliverables. In previous years a version of the so-called big bang approach was used: students worked for 8 weeks and then the product was suddenly delivered.The phased approach brought more realism into the project. As facilitators, we learned the hard way that large student projects without intermediate deliverables are a recipe for disaster, just as in industry. The students were exposed to realistic temporal challenges by establishing more milestones and intermediate deliverables such as schedules, documented research questions, and separately-delivered team sections that were integrated into the e-book.

More alignment was also achieved between lectures and project. For example: lectures about the CMM and project planning were given two weeks before the group needed to supply the project plan. The planning lecture provided the students with templates to create a plan and assess risks, as well as develop metrics, based on the HKNET project of the previous year. Each student evaluated another section of the e-book and provided constructive remarks to the other teams, thus increasing the level of integration amongst sections within the chapter of the e-book. Another novelty in 2003 was a plagiarism check of all sites. An automated tool compared the content of

the sites produced with the rest of the world wide web[3]. This test was a useful addition to the project from the instructor's point of view.

2004 (BOHKNET) In our seventh year we invited student participation from Beijing. To allow more time for student participation in the teleconferences and differing start times at the participating universities, we created two batches of student teams. This way, twelve, instead of twenty-four, teams communicated synchronously on teleconferencing days. Further, the two batches of teams reflected the real-life approach of taking advantage of team members who could start a project even though the participation of others was delayed because of assignments on other teams or projects. In the case of BOHKNET, the second batch was created because classes at the Beijing Institute of Technology started later than the other Universities.

Two other innovations were implemented in BOHKNET. First, to ensure that all students were aware of the various capabilities of the course learning management system, we developed two animated flash tutorials:

1. an introduction to the system (http://stuwww.uvt.nl/~s338923/), and
2. a description of communication technologies available with the system under course documents (http://stuwww.uvt.nl/~s338923/).

Second, to heighten the commonality of the learning experience, we videotaped lectures and made them available to students at all participating universities. Some examples included an introductory lecture and the lecture on CMM was posted to the lecture section of the Blackboard course learning management system.

PROJECT OUTPUT: CHAPTERS

Although several deliverables are required throughout the semester, the main tangible output of the student project teams is a project chapter in an electronic book (e-book). The topic of the chapter focuses on an emerging trend. We include intermediary deliverables, such as project plans, risk management documents and research questions, to add realism to the project and assist students in pacing team efforts. Examples of outputs include:

2002 (OHKNET1)

Chapter 1: Software economics - http://hknet.tm.tue.nl/chapter1.html

1.3 Emerging offshore software suppliers-http://hknet.tm.tue.nl/section11/introduction.asp

Chapter 3: Software engineering - http://hknet.tm.tue.nl/chapter3.html

3.1 Component-based development - http://hknet.tm.tue.nl/section31/

3.2 Open source trends - http://hknet.tm.tue.nl/section32/

3.3 Application Programmer Interfaces (APIs) – http://hknet.tm.tue.nl/section33/

2003 (OHKNET2)

Chapter 1: Cultural issues

1.3 Cultural issues in offshore outsourcing – http://hknet.tm.tue.nl/section11/

[3] The automated plagiarism detection tool used was Turnitin, a product whose web address is http://turnitin.com

Chapter 2: Outsourcing

2.3 Emerging offshore suppliers - http://ohknet.tm.tue.nl/section2.3/

Chapter 4: Software Engineering

4.1 Extreme programming - http://ohknet.tm.tue.nl/section4.1/

4.2 Distributed software development – http://ohknet.tm.tue.nl/section4.2/

Chapter 6: Open Source

6.1 Open source trends - http://ohknet.tm.tue.nl/section6.1/

6.2 Open source liability - http://ohknet.tm.tue.nl/section6.2/

These chapters serve as a starting point for students who are researching related topics. Note that the topics often reflect elaboration of topics from the projects of earlier years, as exemplified by the 2003 topics on open source in Chapter 6. The e-book is accessible to students around the globe who want to learn more about the topics. All chapters include references.

ASSESSMENT

The projects are evaluated on the basis of the quality of the information they provide, the aesthetic appeal of the website, and the creativity of the way in which the topic was studied. All teachers evaluate each project individually and then discuss their rationales via the special instructor discussion forum and in a conference telephone call. In addition, up to three prizes are awarded to recognize outstanding projects: best overall, most creative, and most aesthetically pleasing.

The individual student grades are assigned by each student's instructor. The grades reflect the joint assessment of faculty members, peer evaluations, and the percentage of the grade attributed to the HKNET project. All students are expected to work at least 40 hours on the project. The faculty members agreed to assign a heavy percentage of the grade to the project to encourage student participation, but the exact percentage varies across instructors.

IV. EVIDENCE OF SUCCESSFUL USE

Realism in IS education can be increased. Realism should be integrated into the learning process without making it a rollercoaster adventure where students enjoy themselves without really learning. Students appreciate the realism, as is shown by positive student evaluations and reflections. For example, students note, “During this project, we not only learn about the academic topic but also gain valuable experience in working with people in different culture” and “It was a valuable experience to have the chances to use up-to-date technology such as video conferencing and virtual team tools.” Other students report more reflectively, “These experiences help me to develop myself, to be more considerate and creative” or “Continuous communication can usually avoid confrontation and resolve conflicts.” Overall, an example of student evaluation is “This is a good experience and training on tackling a business case both in real and virtual world.”

In recognizing HKNET for its contributions with the Philips Innovation Award 2002, Philips director Harry Hendriks (http://www.philips.nl/about/news/section-13064/article-3232.html) said:

> *"The course brings together students of 6 nationalities from four different universities. In addition to Tilburg University, the Eindhoven University of Technology, the City University of Hong Kong and the University of Grenoble also take part in this course. Group Support Systems has developed a form of e-collaboration that focuses on cross-cultural communication, a type of work that is*

> *becoming increasingly important to multinationals. The course therefore has a high practical content. It includes internationalisation as a topic. This is a topic that relates to the typical situation of a multinational that is seeking possibilities for expansion. True innovation lies in the application of the technology, not within the technology itself. That is precisely what this course is all about. Group Support Systems is more than just a bright idea, it has been developed into a project and implemented in the reality of today. That is a mark of true innovation."*

Lessons that we learned from the project have been applied in industry. Large scale virtual team projects in companies such as Rabo Bank [Arkesteijn 2004], the Catharina Hospital [Spanjers, Rutkowski and Martens, 2004], and Philips applied some of the lessons learned. The appreciation of the importance of asynchronous work has improved design of virtual team processes in industry. Further, and very importantly, graduating students who participated in HKNET are more familiar with emerging technologies and became successful practitioners of virtual teamwork in practice in various parts of the world.

V. DISCUSSION

Keeping current in a dynamic discipline like IS is a challenge. HKNET offers a framework for focusing on emerging trends. Each year, HKNET faculty decide on critical IS topics that warrant further investigation. For example, 2004 was the second year that students placed offshore outsourcing under the microscope. Topics also included such radical changes in Information Technology development as extreme programming, component-based development, open source, and distributed software development.

Thus, HKNET facilitates the learning process; however, it is the projects, with their focus on emerging trends, that provide the content. The process and content are actually commingled in the learning experience, making the relationship more complex. For example, when working on a topic such as offshore outsourcing, working in cross-cultural teams to complete a project helps to reinforce for the students some of the benefits and challenges faced by business organizations involved in offshore outsourcing. Further, the team members can see outsourcing from the perspectives in multiple countries. Finally, the division of course tasks (i.e., maintaining the course learning management system, supervising the design and building of electronic book, arranging teleconferences, and creating animated tutorials) among faculty members around the world can be viewed as a form of offshore outsourcing that leverages the talents of the participating faculty members.

From a research perspective, HKNET provides a fertile environment within which to study the nature of multi-cultural teams in globally distributed contexts. The realism created in the project is mirrored in the research and is discussed in many publications [e.g., Vogel et al., 2001b; Rutkowski et al., 2002a, 2002b; Saunders et al., 2004]. The research draws on theoretical foundations of social-cultural learning [e.g., Vygotsky, 1978; Wertsch, 1985; Vogel et al., 2001a] as well as culture [e.g., Triandis, 1995] and the socio-technical literature [e.g., Qureshi and Vogel, 2000, 2001]. A number of issues relevant for both research and practice emerge. For example:

- Culture is much more malleable and subject to contextual variations than we initially anticipated. Given sufficient technological support, students from widely varying cultures adapt and find a way to work together to solve the problems at hand. Time pressure and technological deficiencies can, however, hinder the rate of cultural convergence.
- Project coordination benefits from both structure and flexibility. It is useful to introduce (and enforce) “minimal critical structure” so that progress is sustained and chaos minimized. However, too much structure can also stifle creativity and may not sit well with cultures that are used to high degrees of personal freedom. A careful balance and constant monitoring with adjustments as warranted are advisable.
- Students (and instructors) in HKNET experience the realism associated with expanding requirements. This includes following through on promises coupled with the reality of the

need to adjust continually as circumstances change. Distributed work settings are useful in creating an "around the clock" working environment but also require discipline and agreed upon protocols to succeed.

- Roles emerge in globally distributed groups that are not typically seen in more traditional teams. For example, a "shepherd" role is often a trademark of successful teams. In this instance, the shepherd's job is to make sure everyone is staying engaged, which can be especially difficult when team members never see each other face-to-face. Online comments from the shepherd are many, just "pinging" the system typically without any special content contribution, e.g., "how about a beer? or "what's the weather like today?"
- As noted in the "evolution" section of this document, we learned much about being better prepared and communicating effectively over the seven years of the HKNET project. We continue to learn and evolve as new technology becomes readily available. The Internet is especially important as a multi-media (text, audio and video) carrier for both synchronous and asynchronous communication and coordination.

Overall, HKNET provides an opportunity for continued research into the nature of multi-cultural teams in globally distributed contexts that we expect to be as rewarding in the coming years as it has been in the past. Much remains to be studied and learned.

VI. CONCLUSION

The HKNET project is a rewarding learning experience, both for instructors and students. Over the last seven years, the initial lack of experience in working in globally distributed contexts and widely differentiated backgrounds, both personally and disciplinary, has been erased. We were able to demonstrate that information technology can make global teams more effective and that teams can help fulfill the promise of new information technology. We suggest that, together, teams and new information technology can catalyze significant improvements in organizations. The lessons learned in this study have been put to use in business environments in Europe, North America and Asia, where virtual meetings are now being hosted. regularly

The HKNET program created a win-win situation. Both universities (and students) are able to test educational technologies, observe user behavior and gain experience in multi-cultural virtual teamwork in education. We witnessed a much more flexible, dynamic and accommodating nature of culture than we initially expected. On the whole, the ability to recognize and agree on cultural characteristics without meeting face-to-face is noteworthy and supportive of the viability and longevity of virtual teams. Virtual teams burst on the scene and bring with them a variety of technological and organizational issues. This area is of special concern to multi-national organizations increasingly launching distributed multi-cultural team projects. We feel that our HKNET project experiences bode well for virtual team success in supportive organizational contexts.

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REFERENCES

Arkesteijn, H. et al. (2004) "Virtual Meetings with Hundreds of Managers"*, Group Decision and Negotiation*, 13(3), pp. 211-221.

Couger, J. D. et al. (1995) "IS 95: Guideline for Undergraduate IS Curriculum", *MIS Quarterly, 19*(3), pp. 341-359.

Dustdar, S. and G.J. Hofstede (1999) "Videoconferencing Across Cultures - A Conceptual Framework for Floor Control Issues", *Journal of Information Technology*, (14), pp. 161-169.

Humphrey, W.S. (1989) *Managing the Software Process*, Reading, MA: Addison Wesley.

Humphrey, W.S. (1995) *A Discipline for Software Engineering*, Reading, MA: Addison Wesley.

Humphrey, W. S. (2000) *Introduction to the Team Software Process,* Reading, MA: Addison-Wesley.

Lee, D. M. S., E. M. Trauth, and D. Farwell (1995) "Critical Skills and Knowledge Requirements of IS Professionals: A Joint Academic/Industry Investigation", *MIS Quarterly, 19*(3), pp. 313-340.

Qureshi, S. and D. Vogel (2000) "Adaptive Processes for Achieving Socio-Technical Fit in CSCW Groups", in: Coakes, E., R. Lloyd-Jones, and D. Willis (eds.) *The New Sociotech Graffiti on the Long Wall*, London: Springer Verlag.

Qureshi, S. and D. Vogel (2001) "Adaptiveness in Virtual Teams: Organisational Challenges and Research Directions", *Group Decision and Negotiation*, 10(1), pp. 27-46.

Rutkowski, A. et al. (2002a) "E-Collaboration: The Reality of Virtuality", *IEEE Transactions on Professional Communication*, 45(4), pp. 219-230.

Rutkowski, A. et al. (2002b) "Group Support Systems and Virtual Collaboration: The HKNET Project", *Group Decision and Negotiation*, 11(2), pp. 101-125.

Saunders, C.; C. van Slyke, and D. Vogel (2004) "My Time or Yours? Managing Time Visions in Global Virtual Teams", *Academy of Management Executive*, 18(1), pp. 19-31.

Spanjers, R., A. Rutkowski, and R. Martens, (2004) "Teleleren: Implementation and Acceptation of E-learning in a Hospital Environment", presented at AMCIS, New York City.

Triandis, H. (1995) *Individualism & Collectivism*, Boulder, Colorado: Westview Press.

Vygotsky, L. (1978) *Thought and Language*, Cambridge, Massachussets: The MIT Press.

Vogel, D. R. Davison, and R. Shroff (2001a) "Sociocultural Learning: A Perspective on GSS Enabled Global Education", *Communications of AIS*, 7(9), pp. 1-4, http://cais.isworld.org/contents.asp current Feb. 11, 2005).

Vogel, D. et al. (2001b) "Exploratory Research on the Role of National and Professional Cultures in a Distributed Learning Project", *IEEE Transactions on Professional Communication*, 44(2), June, pp. 114-125.

Wertsch, J. (1985) *Vygotsky and the Social Formation of Mind*, Cambridge, Massachusetts: Harvard University Press.

APPENDIX I. SCHEDULE AND DEADLINES

This Appendix lists the schedule and deadlines for Batch I (1.4.1) and Batch II (1.4.2) and the instructors that are involved in each batch.

Batch I

Students: TU/e (Eindhoven) and CityU (Hong Kong)
Instructors: Doug Vogel (CityU), Michiel van Genuchten (TU/e), Carol Saunders (TU/e)
Guests: Anne Rutkowski (UvT), Bartel Van de Walle (UvT), Jingsha He (BJUT)

September 13: Selection of the topics, first interactions project teams
September 20: Team interaction on selected topic to develop research questions
September 27: **Videoconference**
- Introduction to the BOHKNET project
- Discuss research questions with team and plan the project

October 1: **Deadline for first deliverable** (plan, risk assessment, research questions)
October 4: Exams at TU/e
October 11: Working in Blackboard (synchronous meeting using chat / forum)
October 18: Working in Blackboard (synchronous meeting using chat / forum)
October 22: **Deadline for second deliverable** (separate section finished and ready for review by other students)
October 25: Synchronous meeting using chat / forum and second videoconference
November 1: Working in Blackboard (synchronous meeting using chat / forum)
November 5: **Deadline for third deliverable** (delivery of integrated electronic book)
November 8: **Deadline for fourth deliverable** (individual evaluation of the project)
November 29: **Videoconference**: Virtual party to celebrate end of project

Batch II

Students: CityU (Hong Kong), BJUT (Beijing), UvT (Tilburg)
Instructors: Doug Vogel (CityU), Anne Rutkowski (UvT), Bartel Van de Walle (UvT), Jingsha He (BJUT)
Guests: Michiel van Genuchten (TU/e), Carol Saunders (guest TU/e)

October 4: Presentation and selection of the topics
October 11: Team interaction on selected topic to develop research questions
October 18: **Videoconference**
- Introduction to the BOHKNET project
- Discuss research questions with team and plan the project

October 22: **Deadline for first deliverable** (plan, risk assessment, research questions)
October 25: UvT students on holidays (1 person per UvT-team has to be on the Bb)
Working in Blackboard (synchronous meeting using chat / forum)
November 1: Working in Blackboard (synchronous meeting using chat / forum)
November 5: **Deadline for second deliverable** (separate section finished and ready for review by other students)
November 8: Synchronous meeting using chat / forum and second videoconference
November 15: Working in Blackboard (synchronous meeting using chat / forum)
November 19: **Deadline for third deliverable** (delivery of integrated electronic book)
November 22: **Deadline for fourth deliverable** (individual evaluation of the project)
November 29: **Videoconference**: Virtual party to celebrate end of project

ABOUT THE AUTHORS

Michiel van Genuchten is Product Marketing Director at Philips Software. He is also Professor of Software Management at Eindhoven University of Technology. He worked in industry since 1987, among others at Philips Electronics and GroupSupport, a software company he founded. His focus of attention is software as a technology, software as business and group support systems. Results of his research work are published in such journals as *IEEE Software, Journal of MIS, IEEE Transactions on Software Engineering* and *IEEE Transactions on Professional Communications.*

Anne-F. Rutkowski is Assistant Professor of Information Systems at the Tilburg University (The Netherlands). She received her Ph.D. in Cognitive and Social Psychology. Since 1994, she specialized in education and research activities in fundamental psychology (i.e., cognitive dissonance, causal attribution processes, post-modernist theories, fuzzy logic and processes of leadership and negotiation; method of research in human sciences). Since 1999, her research interests and publications have been oriented toward GSS and bridge IS and human sciences in addressing topics such as group decision making, problem solving, virtual and multi-cultural collaboration and pattern of interpersonal communication modeling.

Carol Stoak Saunders is Professor of MIS at the University of Central Florida in Orlando, FL. She served as General Conference Chair of ICIS'99 and Telecommuting '96. She was the Chair of the Executive Committee of ICIS in 2000. She is a Fellow of AIS. Currently she is Editor-in-Chief of the MIS Quarterly. Her research appears in *MIS Quarterly, Information Systems Research, Information Resources Management Journal, Journal of MIS, Communications of the ACM, Communications of AIS, Academy of Management Journal, Academy of Management Review,* and *Organization Science.*

Douglas R. Vogel is Professor (Chair) of Information Systems at the City University of Hong Kong and an AIS Fellow. He received his Ph.D. in Business Administration from the University of Minnesota in 1986 where he was also research coordinator for the MIS Research Center. His research interests bridge the business and academic communities in addressing questions of the impact of Management Information Systems on aspects of interpersonal communication, group problem solving, collaborative learning, and multi-cultural team productivity. He is especially active in introducing group support technology into enterprises and educational systems.