

## Communications of the IIMA

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Volume 10 | Issue 2

Article 6

---

2010

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### Recommended Citation

Akram, Anza (2010) "Semi-Virtual Knowledge Engineering: Development of Semi-Virtual Knowledge Learning Process to Improve the Semi-Virtual Individual learning," *Communications of the IIMA*: Vol. 10: Iss. 2, Article 6.

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## **Semi-Virtual Knowledge Engineering: Development of Semi-Virtual Knowledge Learning Process to Improve the Semi-Virtual Individual learning**

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### **ABSTRACT**

*The study introduce a semi-virtual learning process to improve the team learning abilities. The learning goals are achieved by combining both virtual and face-to-face interactions (activities). The semi-virtual learning process facilitates the team to develop and complete the project by sharing and transferring their knowledge (skills) between each other. The research study explores implementation of a semi-virtual learning practice in semi-virtual teams to assure that each member of the team has hands-on-training on the creation and development of the database application. The sample of the study is students registered in advance database management course offered by the School of Management, University of California, Riverside.*

*The hypothetical application they developed was for the service department of the car dealer. Each member activities were monitored by introducing a project session during a class time in which they interact with each other and with the instructor to discuss their project deliverables, issues, and software and hardware limitations. The results show that learning is more effective between semi virtual teams; and the team size plays a major role in individual learning process as their social interactions both face to face and virtual (email) were personal (limited space diversity) and professional (category identification). They were able to transfer their expertise to other member on one on one basis. Each one of them was involved in the development and implementation stages though their roles and deliverables were distributed. The final project presentation covered the development, implementation and execution of application and provided positive and successful learning outcome in semi-virtual environment.*

### **INTRODUCTION**

Previous researchers have found that in virtual teams the problem of sharing information reluctantly and inefficiently have affected the outcomes and benefits of cutting costs and meeting goals strategically. Whenever possible, organizations have promoted face to face interaction between the team members to build more meaningful relationships (Igarria & Tan, 1998). The case study introduces an approach to address the issues related to virtual teams, and need further new inquiries to develop a tested process for the semi-virtual teams (Hybrid teams) to improve their knowledge learning and transferring skills. The study explores semi-virtual team learning and recommends a monitored environment which facilitates in creating a learning for an individual. The process introduces a facilitator as a control factor to facilitate and improve individual learning. Semi-virtual teams share and transfer knowledge by distributing work assignments among each other, finding issues and coaching to overcome the performance issue. The performance is monitored by practicing various power sharing or control techniques the instructor and the teams use to achieve their learning goals.

## **Motivation behind the Case Study**

The primary motivation of the study is to understand the role semi-virtual team plays in efficient exchange of information, individual learning and knowledge transfer effectiveness against the virtual teams. It addresses the management concern on virtual sharing of information reluctantly. It introduces a model to facilitate a monitored environment that encourages trust, learning and knowledge transfer between the team members.

## **Research Questions**

- 1. How monitored learning process helps semi-virtual teams to successfully complete collaborated projects and to enhance their skills?**
- 2. How semi virtual learning environment facilitates this process and help in transferring knowledge?**

## **REVIEW OF THE LITERATURE**

Studies have found that dissemination of knowledge through information technology across virtual team may be a better way than a face to face. Conversely, the information technology may act as a “jealous mistress” in the absence of proper management and may harm the relationship between the employees and organizations while in the development, transfer and ownership of valuable knowledge (Griffith, Sawyer, & Neale, 2003). The success of virtual world (VW) depends upon the platform capability of integration between the special purpose and the common purpose, and incorporation of few with many knowledge resources. “Matching these capabilities with a framework for characterizing instructional approach and learning objectives provides a basis for selecting, piloting, and advocating use of particular VW platforms in specific educational context” (Robbins & Butler, 2009). An empirical study on team reflexivity in developing innovative project concluded that effectiveness (in the context of team), social skills (determinant of reflexivity) and project management skills (determinant of reflexivity) are positively related to team reflexivity (Hoegl & Parboteeah, 2004). On the other hand, the same study found that efficiency has no positive relationship with reflexivity.

Research in the area of team learning postulated, “Team learning beliefs, behaviors and outcomes are proposed as being both conceptually and empirically valid measures at the team level. Team learning behaviors are found to moderate between beliefs and outcomes” (Kayes & Pescosolido, 2003). On the other hand, research on virtual learning environments has shown that “the users” ability and motivation to learn . . . in different configurations of form and content variables such as those associated with active (self-driven, interactive activities) versus didactic (reading or lecture) learning may, however, influence how presence operates and on what content it operates . . . Educational delivery mode and environment complexity may influence the impact of presence on engagement” (Persky, Kaphingst, McCall, Lachance, Beall, & Blascovich, 2009). Organizations have introduced e-learning environments to provide educational and collaborative learning among their employees. “In the new L3 system we realized that the simple re-design of a traditional e-learning system was too limited with respect to the needs, especially concerning users' active participation in a more "social" sense” (Colazzo,

Molinari, & Villa, 2009). Team learning is essential to bring innovation and higher results within the organization and also to build effective teams. “Effective teams set standards for which a team can identify a problem, determine the appropriate solutions, and implement them” (Moran, 2005).

On distributed learning, researchers are finding answers on the participants’ ability to reach the higher level of educational learning through working on common task and interaction. Häkkinen (2004) came to the conclusion that research needs to consider a complex group of variables, such as, cognitive, social, emotional, motivational, and contextual variables interacting with each other in a systematic manner (Häkkinen, 2004). Globally email is most commonly used communication system between virtual team members and help in developing interaction and building bridges. But the ease of usage makes it more vulnerable to ineffective results where information integrity remains questionable.

Transfer of Knowledge is made possible by creating knowledge-based systems, such as, knowledge management systems, websites with interactive features, and intelligent agents. Studies have shown that the most successful transfer of knowledge happened between informal teams where the identity of individual was known and the interactions were more personal (Davenport & Prusak, 1998; Drucker, 1999). Drucker (1999) also emphasized that development have been based on applying the exact copy of expert’s strategy to achieve the proved and known outcomes of productivity. Likewise, usage of Knowledge Management Systems is dependent on the complexity involved; individual’s cognitive styles and gender (Taylor, 2003).

### ***Assumptions***

To conduct the study the following assumptions were made for the advance level subject and class to control the learning process:

- 1. All students have an access and knowledge of usage of class website, “iLearn”, for their class assignments and projects.**
- 2. All students are updating and downloading class related documentation on regular basis.**
- 3. All students have knowledge of building introductory level database and other applications.**

### ***Conceptualization***

The semi-learning process model is based on theory developed by Drucker (1999) on knowledge worker productivity (tasks, responsibility, learning, quality, etc.), experts or knowledge worker (who apply knowledge of the highest order) and knowledge work system (technology based on advance standards) (Drucker, 1999). Drucker (1999) argued, “Productivity of the knowledge worker will almost always require that the work itself be restructured and be made part of a system”. The conceptualization of semi-virtual control is based on Stinchcombe’s (1968) structural phenomena: “which determine the form and substance of such systems of interactions”. Figure 1 describes a pedagogical model of semi virtual learning environment. The factors and the measurements involved are discussed in Appendix I.

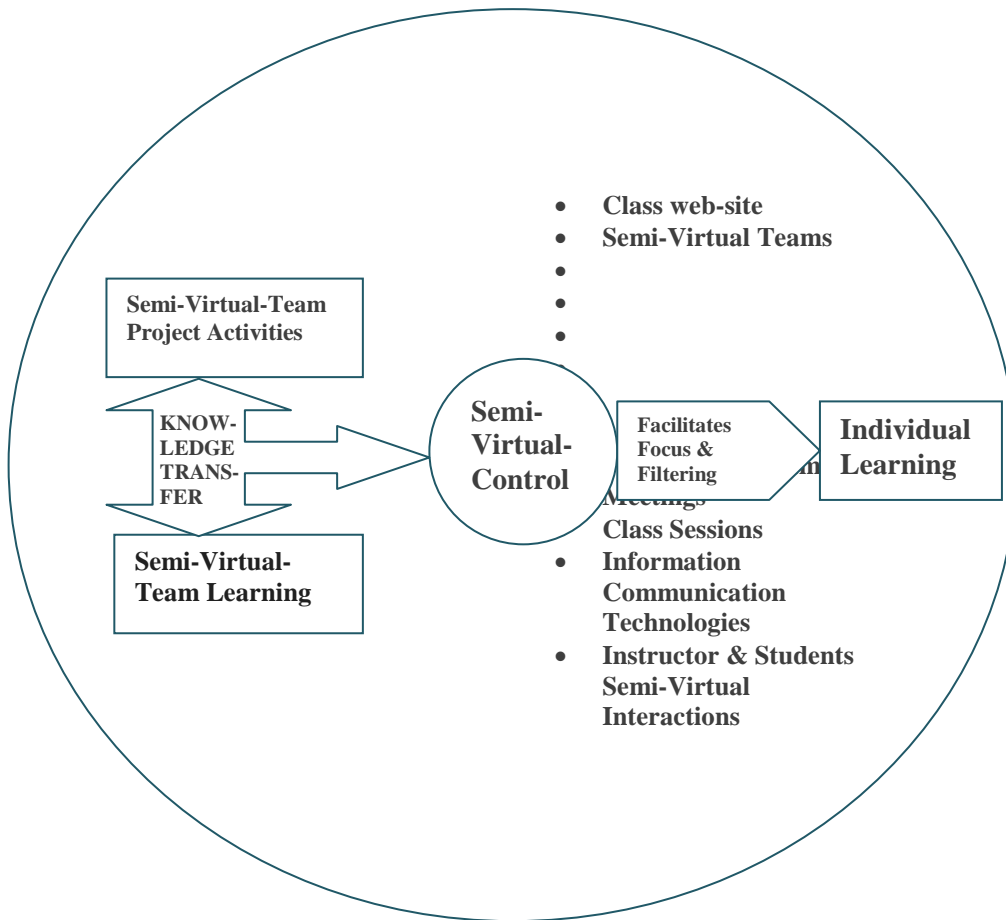


Figure 1: Conceptual model of semi-virtual learning environment.

**Semi- Virtual Team**

Semi- Virtual team also known as hybrid teams, collaborates using both face to face and virtual interactions. The learning environment is based upon both virtual and face-to-face sharing, learning, mentoring and monitoring. Team meets to avoid uncertainties, to exercise motivation and to reduce ambiguities (Fiol & O’Connor, 2005).

**Semi- Virtual Learning Process**

Knowledge Management Systems create a virtual environment that facilitates virtual team learning. “By implementing this concept, virtual organizations and all its members evolve in a form known as learning organizations.....virtual organizations have capability of development based on organizational learning.....(Stefanović & Radević, 2009). Practitioners participation in developing virtual learning teams and creating learning environments is increasing. To overcome the limitations of virtual interactions, leaders are adopting project management principles; using team inventory tools to access strengths and weaknesses; using technology for virtual

collaborator work environment; enhancing openness and trust; and encouraging professional development (Hall, 2008).

In distance learning research, psychological variables may consistently affect performance in virtual classroom situations as the learning climate in the virtual classroom are related to the friendliness, the cooperation degree, the creativity, the capability to promote learning, and learners' participation (Spedaletti, Papa, & Perugini, 1998). Even in the presence of multimedia technology the performance could not meet the learning standards as there was no evidence found in their usage and adoption (Spedaletti et al., 1998).

### ***Semi Virtual Learning***

Term "virtual working team" is a buzz word within the world of academia and practitioners as some of the benefits associated are lower costs and increasing enrollment by adjusting with the needs of the students and the employees (Igbaria & Tan, 1998). Various studies have been conducted in this area to analyze the performance of the team work and to suggest improvement in the area of context and content. Studies have found that the complex work can be achieved in virtual team environment and control mechanisms are helpful to influence others in a context (Magid & Tan, 1998). "Findings indicate that individuals' productivity in developing a system is positively affected by their prior experience with that system as well as their prior experience working on other systems. This provides evidence of individual level learning and of individuals' ability to effectively implement their learning across systems. Further findings support the existence of group level learning, indicating that groups' productivity in developing a system is affected by the group members' experience of working with one another in past" (Boh, Slaughter, & Espinosa, 2003).

### ***Knowledge Transfer***

Knowledge transfer promotes iterative learning (Gorelick & April, 2004) that results in producing enhanced results in learning organizations. Creation of effective virtual teams is more challenging for the organization due to their time consuming decision making process and cost challenging environments while solving conflicts among the team members (Zakaria, Amelinckx, & Wilemon, 2004). Knowledge Transfer (KT) in this complex and virtual environment is threatened (Davenport & Prusak, 1998) and opaque process is hard to facilitate, analyze and evaluate. A study done by Hong and Vai (2009) on knowledge sharing and transfer revealed four mechanisms in cross-functional virtual teams: shared understanding, learning environment, job rotation and coaching. Job rotation and coaching was effective to transfer knowledge and to contribute competently in the project. Davenport and Prusak (1998), also emphasized the importance of knowledge capital and introduced various ways of transferring it, like, "mentoring or apprenticeship."

### ***Semi Virtual Team Project Activities***

Project activities are the assigned roles and tasks distributed among the team members. The completion of the project is highly dependent on interrelated communication between the teams and their members. Team interaction comes from building interrelationship between the team members. "To structure team interaction, design interdependence across locations into the

project in multiple ways—through tasks, assignments, team naming, and other strategies” (Starke-Meyerring & Andrews, 2006). The semi-virtual team environment provides a positive linking of design interdependency. A significant shortcoming of e-learning technologies has been poor support for group-oriented learning (Franceschi, Lee, Zanakis, & Hinds, 2009).

### ***Semi Virtual Control***

Pedagogical models help to create collaboration structure between the learning teams (Häkkinen, 2004). Häkkinen (2004) concluded that one way to structure interactions was to design predefined collaboration environments by providing set-of- instructions before hand on how to form a group; how to work and how to interact with group; and how to solve a problem. In advance level class, professor entails proactive learning of class material, completing class projects and meeting other expectations; and of using available tools and technology provided to control and achieve their personal and group goals. George (2006) reviewed a book on e-learning and virtual teams and suggested, “Students are responsible for their learning and that the instructor’s role is to guide them along the way.....that active learning is essential in an electronic setting and that it needs to be thoroughly considered and well planned” (George, 2006). Triumphant semi virtual learning like virtual learning demands an environment of shared power and control. Tightly controlled (shared power & control) virtual team has better performance (productivity & quality) over loosely controlled virtual team (George, 2006; Workman, 2005). Research on enhancing face-to-face and virtual team learning through interactive marketing simulation have shown that “the formal peer evaluation can be a valuable component for assessing a student's contribution if the team members spend a substantial amount of time working together” (Lamont, 2001).

### ***Semi Virtual Individual Learning***

Within virtual business teams where technology facilitates functional collaboration, “Learners tend to concentrate on project work and neglect their learning tasks” (Kirschner & Van Bruggen, 2004). Whereas, in semi-virtual teams, where instructor is a monitor/facilitator, the team members work together on completing the project tasks as well on their individual learning goals. Complexity like cultural diversity (Staples & Zhao, 2006) may easily be translated to others in goal oriented monitored environment. The virtual brainstorming and interaction is not preferred where the complexity of expertise is involved (Majchrzak, Malhotra, Stamps, & Lipnack, 2004). Face-to-face interaction to make critical decisions is still preferred to avoid ambiguities of higher costs and inefficiency of learning processes.

## **METHODOLOGY**

Empirical case study approach was used to explore the learning process by integrating virtual and face to face interactions among the students. MBA students of University of Riverside registered in advance database management course participated in the study. Questionnaire, group discussion, meetings, and electronic website “iLearn” (Appendix II) was used to disseminate and collect the information. The study was conducted over the duration of the class semester.

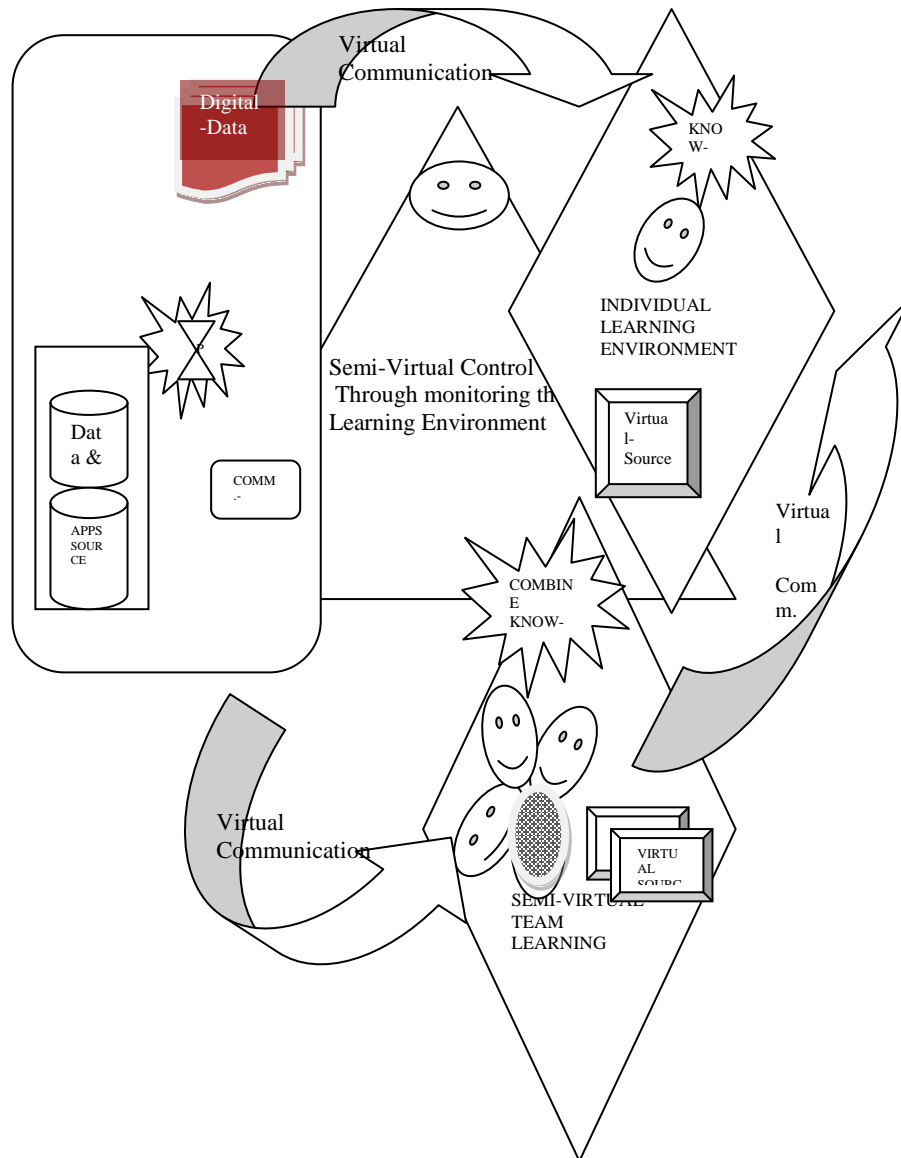
### ***Operationalization***

The operationalized model of semi virtual learning environment illustrated below in Figure 2, is discussed as follows:

#### ***Semi Virtual Environment***

To interact and enhance the electronic learning process, an electronic site was developed by the department of School of Management of University of Riverside California for the faculty and the students. The similar site, Space and Place Model, developed by a program at the Fuqua School of Business at Duke University for professional management development (Gallagher, 2006) to facilitate learning process. MBA senior students, taking advance database management class, were selected to participate in the study. The class sessions were carried out as required. The students were provided the course outline that included scope, the objective and other mandatory requirements for the class to receive a higher grade. The team project objectives, requirements and expected results were included with the project guidelines. The question answer sessions during the class, and meetings outside the class on individual basis were incorporated with the sessions to increase the interactions between the students and the professor. A project management technique was used in controlling the learning process and in guiding the students directly and indirectly on focusing on their personal and group goals (asking questions on personal contribution, communication strategies, individual learning, etc.). Feedback, on individual and team level, was collected recurrently from the teams regarding accomplishing their project goals and their participation level in the decision making process.





**Figure 2: Knowledge Transfer & Interaction Environment.**

*Semi Virtual Team Learning and Knowledge Transfer Structure*

There were two teams and all team members were professionals working with companies. Both teams had few members who had experience with building database applications. Both teams have project leaders who were managing team activities and tasks assigned; and have outlines and guidelines on the team project to focus on team-set-expectations. The guidelines followed the same structure the professor posted on the website in the beginning of the semester. Team leaders collected feedback regarding accomplishing their project tasks, issues and other input and electronically communicated between each other.

Each team was leading their own project organization and management. They assigned tasks depending upon their experiences and set up meetings to coach each other. Due to their space diversity each team chose one member from their team to collect information in-person on the target business and disseminate the information to the rest electronically. After the initial guidelines to define the semantics of the application, the process of building the business rule was done both electronically and face-to-face. Before submitting their final projects, both teams met with each other in the end of the semester to discuss their projects, address problems with the application development, share suggestions and approaches they used to design the database application.

### ***Control Structure***

The overall control of learning process was implemented using guidelines, open-ended questionnaire, project meeting during the class, facilitating learning environment, project and class grading. The control of personal and groups learning was distributed between the members, the team leader and the professor. The team leader managed their team by setting weekly project goals; assigning tasks, setting deadlines for the deliverables, distributing meeting minutes to the team members and to the professor; including proactive decision power; obligating virtual and face to face interactions; attending class sessions; complementing e-reading; sharing information and grading each other. Semi-virtual teams followed the strategy of naming their team to personalize the interaction, and to help them staying motivated, interested and focused.

## **FINDINGS**

### ***Team Learning***

I-Learn, interactive electronic class-site provided an effective learning platform. Students were more proactive in using bulletin board, e-mail, downloading material and referring to e-version of the material. But none of the team kept electronic record of their project activities, exchanging notes, meeting minutes, project deliverables and other activities using the site, iLearn. Their interaction with the website was limited to reading the instruction or downloading additional material from the instructor. The resource was under utilized by the teams and was not included in the team budget. In the end, professor enforced class meeting was found effective interaction as one organization (class) for sharing and monitoring the project performance, and for suggesting any changes as a whole. “Instructors should guide and facilitate learning and not force the learning by sometimes stepping aside from the center of classroom activities and empowering students to discover knowledge and to learn from each other in an encouraging but controlled learning environment” (Schiller, 2009). I found this technique very effective in social face-to-face setting where they shared what they learnt individually through virtual-team interaction, internet and other project related resources (such as, solution from internet on software issues to develop application, gathering business rules & other requirements from the car service department, developing user-interfaces, & application activities charts).

The conceptual semi-virtual environment model (Figure 1) discussed above, helped in decreasing a gap between the instructor and students, and promoted effective interaction in developing better control and meeting the learning goals. The face to face interactions helped in solving

differences in schedule, outside the class commitment and arranging alternative solutions which are hard to contain in virtual teams as miscommunication is found to be a major problematic factor in accelerating the issues and increasing a learning gap between the instructor and students. “Collaborative learning can occur when virtual instructors are used in a blended approach that allows the learning session to be tailored to the work environment” (Young, 2009).

***Individual Learning***

The individual decision making process was pragmatic module of their learning and was controlled through their own willingness to proactively explore the available effective sources. The decision to accept the challenges of learning helped them to find the resources to meet the ultimate goal. The knowledge resources they used to create a competitive application were both explicit and implicit. Table A discussed the explicit and implicit elements of decision making. The decision effectiveness was measured by analyzing their class participation, project grade, assignments, and overall class grade.

Explicit	Lectures, Set-of-Instructions, Electronic Data-Resources, Printed Resources, Knowledge, Software, Hardware, Presentation, Goals, Petty Cash, Class-Website, Peer Grading.
Implicit	Process of creating interactions, Peer Assessment Process, Process of Social & Professional Communication, Trust, Brainstorming, Discussions, Mentoring, Guiding, Delivery of Information, Knowledge Sharing

**Table A: Knowledge Worker’s Decision-Making Process.**

***Individual and team Control & Knowledge Transfer***

Individual learning process was highly correlated with the semi-virtual control of the class. Individuals were able to concentrate on their goals as they were informed frequently by the professor to address their own goals and deliverables to get a high(er) grade. The outcomes showed that students who received a higher grade in their project were able to receive a higher grade in the class and their individual performance was directly related to the class project (see Table B).

<b>Knowledge Transfer</b>	<b>Individual Learning</b>	<b>Team Learning</b>
<b>Individual Learning</b>	Class Grade	Class Grade

<b>Team Learning</b>	Project Grade	Project Grade
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**Table B: Knowledge Transfer Matrix.**

Hence, individuals were able to manage their own performance by benchmarking it against the project activities. Individual were motivated, interactive, proactive in finding the issues and solutions and thus, each one of them were able to deliver their assigned tasks to the Professor on projected time. Even in-case-of virtual team, researchers have found that virtual team leaders can achieve better outcomes if they concentrate on building relationships (Pauleen, 2003; Gatlin-Watts, Carson, Horton, Maxwell, & Maltby, 2007) with their team members by building trust, introducing motivational strategies, supporting, monitoring and coordinating their activities (Pauleen, 2003).

Findings showed that in virtual team, learning was effective in large classes (50 & more students), whereas, in semi virtual team, learning was effective in small teams. Learning happened when each member completed each aspects of the project. Coaching and apprenticeship was most effective in completing and implementing project development. Teams had experienced software application developers who had hands on training in developing the applications and thus, were able to transfer their expertise to other members. In this study, email was found most effective in exchanging information and sharing documentation and acted as an enabler (Rafaeli & Ravid, 2003) between the semi-virtual team to improve their performance and augment their productivity.

The complexity due to cultural diversity was latent variable and played no significant role to effect the learning process. The homogenous team shared the common cultural set of qualities as language, ethnicity and understanding, whereas, the other heterogeneous team shared just a common language (as they were fluent in English) and were able to create an effective understanding due to the common birth place (USA). Thus, the cultural differences of both team was transparent. The interesting observation was that both teams were not able to complete complex part of the project. The reason could be that project's final deliverable was too technical and time consuming. The final inference of the study on semi-virtual homogenous and heterogeneous teams is that the specialized projects' demand competitive skills; and competitive or common cultures play no significant role in the development and learning process.

Overall the class was run, controlled and assessed by the professor; however, the students were accountable for their team assessment which represented 70 percent of the project grade. They were responsible for making sure the team project goals were well defined and understood by each team members. Team members graded each other on the basis of their contribution towards completing the class project, such as, attending meetings, sharing information, completing tasks, and coaching each other. I found that the team members evaluated each other on the bases of their participation in learning the development and implementation of application and the individual task/tasks assigned to them (both redundant and specialized). Each member has their own individual goal of learning the application development process and each accomplish their

individual goal by continually iterating their tasks. The subjective data from the distributed questionnaire depicted that to evaluate their goals, some students included final grade in their parameter to meet the learning objective and were not able to answer the question on achieving personal goals beforehand regardless of receiving their project grade.

Eventually, the semi-virtual individual learning increased the awareness of making effective decisions on individual productivity. Helped in decreasing the gap between the instructor and student by interacting efficiently and controlling the learning goals. Findings confirmed that semi virtual teams were less diverse than pure virtual teams and thus, required members with high tolerance for ambiguity to override subgroup proximity and diversity split effects (Fiol & O'Conner, 2005).

### **LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH**

The findings of the study cannot be generalized as the study is based upon a small group of students that presented less complexities. However, the duration of the study makes a considerable contribution in collecting reliable and viable data and thus, confirms the observed findings on semi-virtual team learning process. A case study or empirical research involving more than one University on national or international level can predict more prolific outcomes for generalization purposes and can produce more complex outcomes. Also, to make virtual interaction more effective, it is recommended to include the environment like iLearn (Class website) as a tool necessary to use by the students and if necessary, training on using the website should be required before taking any class. Future research is needed in the area of developing a knowledge-based semi-virtual platform. The research focus should include virtual application development platform for the virtual learning teams to implement the e-learning process across the Universities. The project schematic development should be done using semi virtual approach. The facilitator should define the pedagogic platforms for all different types of interactions and communications.

### **CONCLUSION**

A case study argues that semi-virtual learning process is effective and interactive way of promoting and controlling a learning process. Findings showed that knowledge transfer was best achieved by coaching and monitoring. Moreover, the environment of semi- virtual teams shape to accommodate project ambiguities, complexities and duration. Overall, the facilitator driven learning process created an iterative learning (Gorelick & April, 2004) environment that was necessary to share and develop a goal oriented attitude critical to enhance learning.

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## APPENDIX I

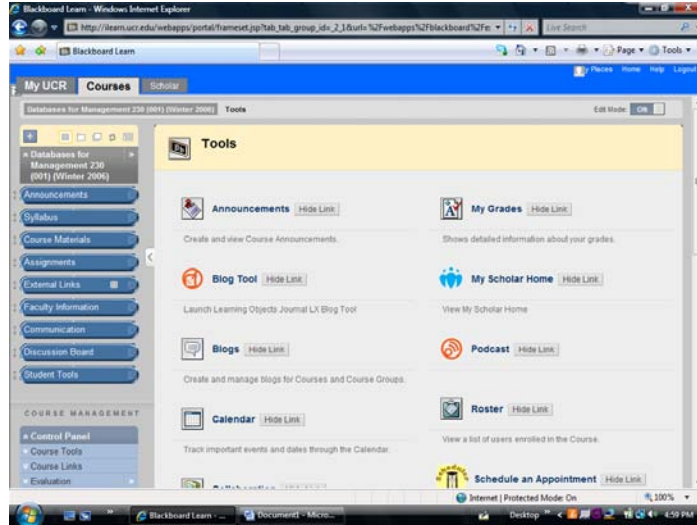
## SEMI-VIRTUAL LEARNING PROCESS

Factors	Measures
Semi-Virtual Project Activities	Project deliverables, Virtual Interactions, Face-2-Face Meetings, Field Visits, Assessment of Team Members, Presentation, Project Executable Application.
Semi-Virtual Learning Team (Team Goals)	Developed Social & Professional Positive Relationships; Knowledge of Application's Components; Knowledge of Access Database, Project Management Application, Case Tool; Knowledge of Available Resources.
Semi-Virtual Control	<ul style="list-style-type: none"> <li>• Set of Instructions on how to: <ul style="list-style-type: none"> <li>-develop a team</li> <li>-develop a project</li> <li>-assess team members</li> </ul> </li> <li>• Peer Assessment</li> <li>• Facilitate Interactions</li> <li>• Project Control by setting measurable goals</li> <li>• Team Control by setting measurable goals</li> <li>• Class Control by setting standards for performance</li> <li>• Student Assessment (Final grades)</li> </ul>
Semi-Virtual Individual Learning (Individual Goals)	Developed Social & Professional Positive Relationships; Knowledge of Application's Components; Knowledge of Access Database, Project Management Application, Case Tool; Knowledge of Available Resources.

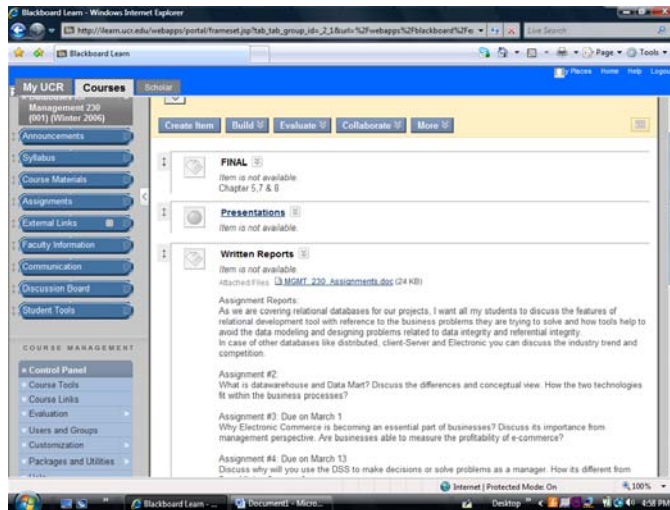
## APPENDIX II

**ilearn Environment:** <http://iLearn.ucr.edu>

### **Professor & Students Class Management Tool**



### **Class Information Distribution Package Link**



## Information Dissemination Link

