

**The Proceedings  
of the  
6th International  
Conference on  
e-Learning**

**University of British Columbia  
Okanagan, Kelowna  
British Columbia  
Canada**

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Edited by  
Phil Balcaen  
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# Preface

This book represents the Proceedings of the 6th International Conference on e-Learning.

The host university this year is the University of British Columbia Okanagan, and it is my pleasure to have the role of Programme Chair, with colleague Peter Arthur, as Conference Chair.

The opening keynote address is given by Susan Crichton, University of Calgary, Alberta, Canada, on the topic of “Small Technologies with Big Potential: Lessons Learned from Colleagues in Challenging Contexts”. The second day will be opened by David M. Kaufman, from the Simon Fraser University, British Columbia, Canada, on the topic of “New Methods for Enhancing Student Engagement in e-Learning”.

This Conference is now a well-established platform for bringing together a wide range of stakeholders involved with the challenges of e-Learning in a rapidly changing global society, including academics, innovators and practitioners interested in benefitting from, using and contributing to current research as well as professionals working in the private and public sector.

ICEL provides a space for the rigorous and stimulating sharing of ideas about e-Learning today. It is an opportunity for the broader e-Learning community to meet, and for overlapping communities of practitioners to join the lively e-Learning conversations. The range of papers will ensure an interesting two days.

With an initial submission of 171 abstracts, after the double blind, peer review process there are 60 papers published in these Conference Proceedings. These papers represent research from Argentina, Australia, Canada, China, Colombia, Cuba, Denmark, Estonia, Germany, Hong Kong, India Indonesia, Iran, Malaysia, New Zealand, Philippines, Portugal, RSA, Russia, Saudi Arabia, Serbia, Slovenia, South Africa, Spain, Switzerland, Thailand, Trinidad and Tobago, UK, USA and Zimbabwe.

I hope that you have a stimulating and enjoyable conference.

Phil Balcaen  
University of British Columbia Okanagan Kelowna  
Programme Chair  
July 2011

# Biographies of Conference Chairs, Programme Chairs and Keynote Speakers

## Conference Chairs



**Peter Arthur** is currently the Director for the Centre for Teaching and Learning at the University of British Columbia Okanagan. He is also a member of the Faculty of Education, where he teaches instructional design at the graduate level and learning technology classes at the undergraduate level. Peter also supervises a number of graduate students in the area of educational technology. He received his doctoral degree in Education from the University of British Columbia in Vancouver, Canada.

## Programme Chair

**Dr. Philip Balcaen** received his doctoral degree in Curriculum Theory from Simon Fraser University and is currently an Assistant Professor at The University of British Columbia. He is also the Senior Science and Mathematics Editor for The Critical Thinking Consortium. Philip's general research focus is critical thinking in mathematics and science education. His educational technology interests include embedding critical thinking pedagogy within learning object design, supporting critically thoughtful dialogue within courses and video production involving teaching "tools for thought".



## Keynote Speakers



**Susan Crichton** is an associate professor at the University of Calgary - Faculty of Education and a fellow of the Centre for Commonwealth Education at Cambridge University. Her research explores the design and development of ICT enhanced learning environments and the use of digital approaches for qualitative research as well as the use of one-to-one technologies (laptops, iPod Touch, iPad, and tablet devices) for teachers and students. Internationally, she has worked for the Canadian International Development Agency (CIDA) and the Asian Development Bank in western China – providing expertise on ICT enhanced basic education and professional development.

She has been invited to work in Bhutan, Chile, and Tanzania, principally in the area of ICT enhanced teaching and professional development.

**David Kaufman** has been a faculty member at Concordia, Saint Mary's, Dalhousie and Simon Fraser Universities, in Engineering, Computer Science, and Education. He also served as Director of Course Design for the BC Open Learning Agency, and was Professor and Director of Medical Education in Dalhousie's Faculty of Medicine. He is the 1998 recipient of Dalhousie University's Instructional Leadership Award. Dr. Kaufman has presented more than 200 lectures and workshops at universities in North America, Europe, Asia, Africa, Middle East and South America. He has published extensively with approximately 100 published articles and three books to his credit, serves as a reviewer for many journals, granting agencies and professional associations, and has received more than \$3 million in funding. From 2001 to 2008, he served as Director, Learning & Instructional Development Centre at Simon Fraser University and currently is a Professor in the Faculty of Education.



## Mini Track Chairs



**Dick Ng'ambi** is an associate Professor and the leading researcher in mobile learning for developing contexts. He is the Programme Coordinator of a postgraduate programme in Educational Technology at the University of Cape Town. He has published widely on uses of mobile devices as tools to empower learners to become co-producers of knowledge especially in environments of marginalised learners

**Tahirih Matthee** of the University of the Western Cape co-ordinates Digital Academic Literacy across all departments within the institution to ensure that all students gain the basic e-learning skills as required in various academic programmes. The course she delivers has empowered many students from under-resourced schooling environments with the necessary e-learning skills.



## Biographies of contributing authors (in alphabetical order)

**Najma Agherdien** is an Instructional Designer at the University of Johannesburg. She has worked in a variety of academic as well as corporate settings. Her research interests include technology enhanced pedagogy, adult learning, academic development and support, amongst others. Her current passion is building communities of practice.

**Kamal Aghigh** gained a PhD in Mathematics from the Punjab University of India. He is currently Assistant Professor of Mathematics and Head of the E-Learning Center at K. N. Toosi University of Technology from 2004. He is one of the first founders of E-learning in Iran and the first initiator of E-learning in K.N.Toosi University of Technology.

**Hamid Ashraf**, PhD in ELT has been a member of faculty at English Dept., Islamic Azad University, Torbat-e Heydarieh, Iran since 1996. He is presently the Head of English Department. He has worked on language learning skills, testing, critical thinking, language learners' characteristics and e-learning through doing research, presenting papers in national and international conferences and authoring a book.

**Cecilia Avila Garzón**: is a Systems Technologist and student of Telematic Engineering from Distrital University Francisco José de Caldas, Her research interest include the use of semantic web and intelligent agents in the development of educational software and researches in different ways to improve the application performance of educational tools. Member of METIS research group.

**Tamara Jayne Bahr** (MScCH) is Manager of Instructional Design for Postgraduate Medical Education, University of Toronto. She facilitates many of the educational technology initiatives within postgraduate medical education. Her interests are in simulation technology, digital literacy, electronic resources development, mobile learning, and educational informatics for the health sciences.

**Zwelijongile Baleni Gaylard** graduated M.Ed in 2000 at Free State University. He is currently registered for PhD with topic on "use of e assessment to improve feedback to student". Research interest is on assessment and e- learning strategies. Currently acting as Deputy Director Continuous Professional Development, Centre for Learning and Teaching Development.

**Ricardo Barcelos** of the IFF, Campos, Brazil, has a Graduate Degree in Mathematics, Bachelor degree in Engineering, Graduated in mechanical maintenance and Master in Production Engineering. He has experience in Computer Science, acting on the following topics: using mobile learning, learning styles, developing for mobile devices, information technology, computing and education. He is currently a PhD student at the Programa Information Technology and Education.

**Yongmei Bentley** is Senior Lecturer of the University of Bedfordshire UK. Currently she teaches Level-1 Business and Management, MBA Operations Management (a global e-learning module), MSc Logistics Management, and MSc Operations for Logistics and Supply Chain Management. Her current research interests include: e-learning, research-led curriculum design, and logistics strategies. She has published papers in all these areas.

**Marco Bettoni** Director of Research & Consulting at the Swiss Distance University of Applied Sciences (FFHS) focusing on Knowledge Cooperation. Since 1981 research in Knowledge Theory (Radical Constructivism). From 1977 to 2005 researcher, engineer and lecturer with industrial and academic organisations in the domains of machine design, engineering education, IT development, knowledge engineering and knowledge management.

**Sandra Birrell's** career as an educator spans teaching at the high school level to designing and delivering courses to University and private sector clients on a range of subjects. This complements her current dissertation work for Simon Fraser University on the metacognitive and exploratory nature of student reflection captured in blogs during work term placements.

**Maria Buda** joined the Faculty of Dentistry Library in 2008. She received a Bachelor of Arts in Classical Studies (2004) from the University of Waterloo and a Masters of Information Studies (2007) from the University of Toronto. Her current interests include curriculum embedded information literacy and access to e-collections.

**Lillian Buus** is a Parttime PhD Candidate in E-learning Lab, AAU Center for User Driven Innovation Learning and Design ([www.ell.aau.dk](http://www.ell.aau.dk)). She is looking at the learning potentials within the use of Web 2.0, trying to develop a learning methodology for the use of Web 2.0 in education.

**Ines Casanovas** is an Engineer in Information Systems, Master in Higher Education and Master in Informatics. At present she is professor and researcher at UTN (National Technological University), Argentina, and at Jönköping University, Sweden, where she is also performing her Doctoral studies in Informatics. She is member of the Academic Committee of the Master in IS at UTN.

**Rupak Chakravarty**, PHD, Assistant Professor, Department of Library and Information Science, Panjab University, Chandigarh, India. Area of Specialization:- Application of ICT in libraries, Open Access, Institutional Repositories, Digital Libraries, Library Automation, Open Source Software, Web Designing.

**Sergei Chernov** is a Professor, Dean of the Faculty of Law of Petrozavodsk State University; member of the Presiding Committee of the Russian Association of Law Schools. In 1979 graduated from Petrozavodsk State University with honors. In 1987 defended candidate thesis, and in 1999, Doctoral thesis in History. In 2005 defended Doctoral thesis in Law.

**Glenn Cockerline**, Ph.D., Assistant Professor of Teacher Education, Brandon University. Glenn teaches Math and Science methods courses. His research interests center on the improvement of instruction and on how teacher education candidates integrate technology into their teaching practice. He draws experience acquired through two decades of diverse classroom teaching assignments in the public school system.

**Zlatko Čović** defended his Master's thesis in 2009 at the University of Novi Sad. After working as an assistant at Subotica Tech, he was promoted to lecturer in 2009 in the scientific field of Computer Engineering. So far he has published more than 40 scientific papers in Serbia and abroad. Currently, he is working on his PhD thesis.

**Stephen Dalley** completed a substantial part of his undergraduate studies as a distance and on-line student. His time is divided between University and College lecturing, Secondary T.E. teaching, research and academic writing. Research areas include issues of equity and access in elearning, developing ecologically, appropriate curriculums and connecting with students tacit knowledge.

**Iain Doherty** is Director of the Learning Technology Unit, Faculty of Medical and Health Sciences, University of Auckland. His unit is responsible for meeting the flexible and distance learning needs of the Faculty. As Director, Iain is responsible for faculty development, research, strategic planning, relationship building and project management.

**Valindawo Dwayi** is a Director of the Centre for Learning and Teaching Development, Walter Sisulu University, Republic of South Africa. He holds a Master of Commerce in Organisational and Management Systems, a Higher Diploma in Education, and a number of Management Development programmes. His research interests are academic development, strategic planning and implementation, and change management.

**Margaret Edwards** is a Professor and Associate Dean in the Faculty of Health Disciplines at Athabasca University in Canada. Her research interests focus around exemplary online education.

**Cláudia Fernandes** has a degree in Psychology with specialization in Organizational Psychology, a Master Degree in Information Management, and at the present is a Phd student researching in neuropsychology and psychosocial factors applied to industrial settings. Works at CATIM, a technological center in the areas of training, R&D, and SME's development (technologies and methodologies).

**Grisel Garcia Perez** professional career has been focused on questions regarding language teaching and learning, text analysis, teacher training, and most recently, the nature and impact of intercultural experiences in language learning. She is passionately committed to providing students with teaching that supports the development of their second language competence and their ability to perform in different environments.

**Mercé Gisbert** has a Phd in Education and is a professor in the Department of Pedagogy at Rovira i Virgili University, Tarragona, Spain. Teaches the Masters program Educational Technology: e-learning and knowledge management and is a director of the Education & Technology Phd program. Research areas are: Teacher training, Design and implementation of training e-materials, design online and blended-learning training programs.

**Judy Gnarpe**, is a clinical microbiologist turned teacher with the Faculty of Medicine & Dentistry, University of Alberta. She has a PhD in clinical microbiology, is interested in medical education and improving the quality of the educational experience, in particular for large classes, for which she developed Brainspan, a multiplayer asynchronous learning game generator.

**Colin Gray** started life as an Astrophysicist, but soon drowned in Maths and escaped to web design. A move to education followed and Colin currently works as an Academic Development Advisor and eLearning Lecturer at Edinburgh Napier University, helping lecturers to enhance their blended and online teaching and learning practise.

**Melissa Mix Hart** is a graduate student at the University of British Columbia Okanagan. She is completing a Masters of Arts degree in Education. Ms. Hart's research looks at the evolution of fiction through digital media. She is particularly interested in the reasons one becomes phenomenologically immersed in story.

**Emmanuel Howe** is a part-time lecturer in the Informatics Department Faculty of ICT in Tshwane University of Technology. He has a Master's degree in Business Information Systems and his research interests are Web 2.0 technologies and mobile learning. Recently he has been transferred to Limkokwing University of Creative Technology as a full time lecturer.

**Thandokazi Euthodora Ikedinobi**, currently an MSc: Computing degree with Merit holder from Coventry University in UK. Working at Walter Sisulu University in South Africa as an E-learning Specialist. Also very keen and interested in research of which they are applying to further their studies to PhD in E-learning.

**Eunice Ivala** is the coordinator of the Educational Technology Unit, at the Cape Peninsula University of Technology (CPUT). Previously a project manager at the Media in Education Trust Africa, an educational specialist at SAIDE and a lecture at the University of KwaZulu Natal. She is interested in promoting and researching ICT –mediated teaching and learning in developing contexts.

**Miodrag Ivkovic** is the President of the board of the Information Society of Serbia and Professor at the University of Novi Sad, in the subject of e-business, and Project Management. Professor Ivkovic was a Manager in Telekom Serbia from 2003 to 2008. Assistant Minister in the Ministry of Science and Technology and also a member of the High Level Group for EU Eureka Program.

**David Kaufman** is the former Director of the Teaching Centre at Simon Fraser University and currently is a Professor in the Faculty of Education. He has given more than 200 presentations at universities worldwide and has published three books and more than 100 articles and chapters.

**Vani Kalloo** is currently pursuing an M.Phil. in Computer Science at the University of the West Indies, St. Augustine, Trinidad and Tobago, doing research work in mobile learning for mathematics with secondary school students, game-based learning and personalization. She was a secondary school teacher for four years and is currently a Teaching Assistant at the University of the West Indies.

**Pankaj Kamthan** has been teaching in academia and industry for several years. His research interests include conceptual modeling, software quality, and Web Engineering. He serves on the editorial board of the Journal of Information Systems Education, International Journal of Technology Enhanced Learning, and the International Journal of Teaching and Case Studies.

**Puvanart Keoplang** is Managing Director of a training and consultancy firm in Thailand. His current research focuses on knowledge management and innovation management. He has conducted training courses for public and private organizations. He is currently a PhD student of Technopreneurship and Innovation Management Program at Chulalongkorn University, and holds MBA degree from WIU, USA.

**Brant Knutzen** is an Educational Designer based in Hong Kong. Currently working on his doctorate in Education, his research areas are virtual learning environments and online discussions. He has set up and designed instruction for several private educational spaces using Second Life, and is currently working on a project to build 16 islands using OpenSim.

**Özlem Korkmaz** is a doctoral student in Mathematics Education and a graduate assistant for the Science and Mathematics Teaching Center at the University of Wyoming. She has a M.S. in computer-based instruction and didactics of mathematics from University Joseph Fourier, Grenoble, France. Her research interests include technology and probability, online pedagogy, and preservice teacher education.

# Convergence of Mobile Learning Technology and Knowledge Management System Innovation for SME Clustering

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**Abstract:** With the emerging of new features of smart phone e.g. interactive multi-touch display and the popularity of social network sites, mobile learning technologies are more user-friendly than ever before. We found the opportunity for innovation to develop mobile Knowledge Management System (mKMS). The innovation will facilitate the flow of information/knowledge across actors in the cluster to create competitive capability for Small and Medium Enterprise (SME) cluster based on new findings and implications policy (Porter, 2008). This is accomplished with the help of cluster development process. Key success factors of the SME cluster development process are knowledge sharing and collaboration. Mobile learning and mobile knowledge management are similar in nature as they are merging as E-learning and KM does and they often use the same technology and tools (Bajpai, 2011). We will explore theoretical fundamentals of mobile learning technology and social network to exploit all constituents and advocates from academia, experts, and practitioners of orchid industrial clusters in Thailand. This paper proposes the mKMS architecture, which embedded an innovative blended training system (BTS) as the result of study. The study aims to establish a holistic strategic framework that will enhance effective communication and relationship among actors in the orchid demand-supply chain. The convergence of technologies, knowledge management, and collaboration in life-long learning will serve as an operating platform to propel the Thai orchid industry to be the world leader. It is also a sustainable tool for knowledge acquisition, repository and creation for SME cluster. As we are in the beginning of the study, this paper presents the finding of the perceptions of using the smartphone technology and the benefits it affords in the industry from a small group of growers. The benefit of this research work is a capstone mKMS of SME cluster for the ever-growing Thai orchid industry. In the next stage, we will conduct ethnography and exploratory research including an extensive literature review, cluster data analysis, survey, observation, and participation to discover unmet need and requirements for developing mKMS prototype.

**Keywords:** mobile learning technology, knowledge management system, blended training system, social network, SME clustering

## 1. Introduction

Knowledge sharing is one of the most important key success factors of cluster management to gain collaboration among SMEs since there are abundant of explicit and tacit knowledge within each group in a cluster (Sureephong *et al.*, 2006). In 2010, new and emerging mobile technology becomes widely accepted around the world. Convergence of mobile learning and social network is introduced in knowledge management domain. New smartphone such as Apple's iPhone, Samsung's Galaxy Tab, and social network such as Facebook and Twitter, are well known new generation supporting social media. In Thailand's orchid industrial context, the cluster framework provides a better understanding of effective communication among actors in the orchid demand-supply chain. In lieu of our study, we have established an analytical framework which takes into account the interplay and interrelationships of some key elements, namely, mobile learning technology, social network technology, knowledge management, and collaboration in life-long learning, as the principal building blocks of our proposed KMS. The findings of this study will be used to develop mKMS that serves as an operating platform to sustain knowledge management of SME cluster development process.

This paper is organized as follows. Section 2 recounts some related prior works. Section 3 describes the constituent infrastructure of Thailand's orchid industrial clusters. The proposed approach is elucidated in Section 4. Potential benefits to be obtained from the proposed approach are discussed in Section 5. Some final thoughts and future work to be pursued are given in Section 6.

## 2. Related work

Some related prior works to be recounted are mobile learning technology, social network technology, and knowledge management system.

## **2.1 Mobile learning technology**

Mobile learning technology is strongly emphasized as the key driver for KM activities. With the advantages of mobility, mobile wireless technologies help improve efficiency and effectiveness in teaching and learning (Maginnis, White, and McKenna, 2000). To effectively present and illustrate the materials, the Graphical User Interface technique is employed to bridge the digital divide. Darroch and McNaughton (2002) exemplified advent of these technologies which enable and stimulate fruitful communications among cluster members who often do not have adequate background in information technology. The immediate discernable benefits offered by mobile computing devices are portability and accessibility for learning, information exchange, and all relevant trade activities. The Horizon Report 2011 reveal a recent report from mobile manufacturer Ericsson, studies show that by 2015, 80% of people accessing the Internet will be doing so from mobile devices. Perhaps more important for education, Internet capable mobile devices will outnumber computers within the next year. This shift in the means of connecting to the Internet is being enabled by the convergence of three trends: the growing number of Internet-capable mobile devices, increasingly flexible web content, and continued development of the networks that support connectivity (Johnson *et al.*, 2011) Cloud Computing, Mobile Applications and Media Tablets are becoming trends for 2011 (The Gartner, 2011).

## **2.2 Social network technology**

The proliferation of social network has induced a rapid explosion in strategic and influential technologies in the development of Cloud Computing, Mobile Applications and Media Tablets, Social Communications and Collaboration (Johnson *et al.*, 2011). One issue precipitated from the above cluster dichotomy is information confidentiality that must be addressed to establish the ground rules upfront for encouraging more open and honest participation and reduce the resistance to ongoing relationship monitoring. In the meantime, dissemination and exchange of information among peer groups can exploit the social network. Faux, *et al.* (2006) have pointed out some emerging new tools and services such as Web 2.0 to be employed as a social software for knowledge creation, management, sharing, and dissemination (Owen *et al.*, 2006), provided a well-accepted e-learning 2.0 for an effective means in acquisition, organization, creation, and assessment. Based on interview with members in the orchid cluster, affordability, ease of use, and benefit are most concerns, so we limit our research on social network technology to free community software.

## **2.3 Knowledge management system**

Awad *et al.* (2004) has defined KM in the context of knowledge archival and dissemination. Various research endeavors (Marquardt, 1996; Davenport and Prusak, 1998; Scarborough *et al.*, 1999; Brown and Duguid, 2000; Boyett and Boyett, 2001; Gloet and Terziovski, 2004) have substantiated three perspectives of KM, namely, process, organization, and management. The principal objective is to develop a learning process from personal level to organizational level in order to establish competitive capability and efficiency. Darroch & McNaughton (2002) emphasized the importance of different supporting functions such as organizational structure, culture, and information technology to arrive at a knowledge bank for all KM operations. The management perspective based on organization setting (Marquardt, 1996; Andrew *et al.*, 2001; Lundvall and Nielson, 2007) focuses on knowledge asset management for both tacit knowledge and explicit knowledge.

Further finding of Panich (Panich, 2004; Parlbly and Taylor, 2000) elaborated on how to categorize, examine, store, screen, and prepare for subsequent use based on 3 principles, that is, being applied, improved, and elevated (Sveiby, 1997; Henrie and Hedgepeth, 2003) at personal level, team level, and organizational level (Nonaka, 1991; Plessis and Boon, 2004). Their KM combines 4 views, i.e., (1) the process of collection, systemization, storage, and access; (2) knowledge sharing activities; (3) knowledge expert; and (4) KM indicators for organizational improvement evident by Panich (Panich, 2003). Information and communication technology is seen as effective supporting tool for distribution of the kept knowledge, especially internet and groupware like online discussion board. Emerging concept like community of practice, E-learning or E-training are also strongly supportive on knowledge sharing, knowledge transferring, and knowledge dissemination. It is therefore imperative to design a KMS covering all views for sustaining organizational efficient operation and competitive capability. Aujirapongpan (2010) pointed out the needs for organization in the cluster to create innovative development encompassing structure, culture, and technology in order to access, transfer, and knowledge assimilation.

### **3. Making of Thailand orchid industrial clusters**

The orchid industry has been established in Thailand for more than 40 Years. We selected to study a group of orchid growers in Orchid cluster that is classified as a high potential cluster from 322 production and service groups in Thailand, ranking in top 15 based on the criteria following Porter's Diamond model (Kenan Institute Asia, 2006). The core business of this group is producing and exporting special quality cut flower orchids that constitute the highest share of tropical orchid cut flowers in more than 75 countries around the world (Thai Custom Department, 2011). However, due to economic crisis since 2008, many solutions are proposed to sustain the growth of orchid exporting including innovation in Knowledge Management. We have conducted the background and rudimentary building blocks of Thailand orchid industrial clusters. Our preliminary findings can be summarized in three categories, namely, SME Clustering, knowledge sharing and collaboration in the clusters, communication in the demand-supply chain.

#### **3.1 SME clustering**

Since the introduction of industry cluster by Professor Porter in his book named "Competitive Advantages of Nations" was popularized, many countries around the world have adopted this concept for economic development planning (Porter, 1998). In a developing country such as Thailand, the industrial cluster concept was introduced to SMEs by the government in 1999 to promote both high-tech and medium-tech manufacturing clusters, service clusters, and community-based clusters at the grass-root level.

The starting point of SME clustering within the Thai orchid industry was in 1998, when the Ministry of Agriculture, via its Department of Agricultural Extension initiated a project to systematically register Thai orchid farmers, helping them to develop their networks and capabilities, improve farm productivity, and solve problem of Thrips palmi. The formation of the Ratchaburi orchid growers group was the first step in the Thai orchid cluster development. Ratchaburi is a province in the western region of Thailand. Furthermore, with cooperation of the office of the National Economic and Social Development, the Porter's cluster concept was initiated to incorporate approximately 150 stakeholders in the orchid industry (Onoparatvibun, 2010). Cluster Development Agent (CDA) of this cluster has played important role in creating cluster culture that builds trust and relationship among actors in the cluster.

We have selected orchid cluster Ratchaburi group for its most outstanding cluster as a case study for the design and development of innovation, which will enhance effective communication among actors in exporting orchid demand-supply chain. The rationale is due to their uniqueness in many aspects. First, they already develop and sustain the collaboration to connect SMEs together. Second, they have experiences on implementing Porter's Diamond model. Third, they are open to adopt formal KM model since the current operational process relies solely on knowledge sharing and learning (from interviewing Cluster Development Agent: CDA, 2011). Moreover, they demonstrate a visionary and strategic private sector leadership that enables a cluster development process to emerge, progress, and sustain as the Thai orchid cluster is notable for its strong leadership and is fervently driven to make itself globally competitive (Onoparatvibool, 2010).

Porter (2008) emphasize that Innovation is the key for competitive advantage. Innovation among small holders in developing countries requires the existence and development of individual capabilities among farmers as well as the deployment of learning process among variety of actors, including knowledge (Hartwich *et al.*, 2007). Having real time knowledge is important not only for doing the job right but also to make right decision about the job right since knowledge and information play important role in factor condition and demand condition (from interviewing CDA, 2011) as shown in figure 1.

In the core business of domestic orchid clusters, the actors involved are (1) Orchid growers, (2) Supporting industries (Suppliers), (3) Related Industries (Service providers), (4) Institutions that leverage industries, and (5) Market as shown in figure 2.

The key player in orchid business is orchid growers. Cluster development can improve the organizations' capability by combining each organization's capability to produce synergized outcome. Collaboration in the cluster will improve knowledge and information sharing between partners in the demand-supply chain. CDA serves as the demand-supply chain facilitator which assists information sharing in the demand-supply chain context. The top three competitive challenges identified by key players in the Thai orchid clusters are (1) quality and standard upgrading, (2) human resource development, and (3) logistics management.

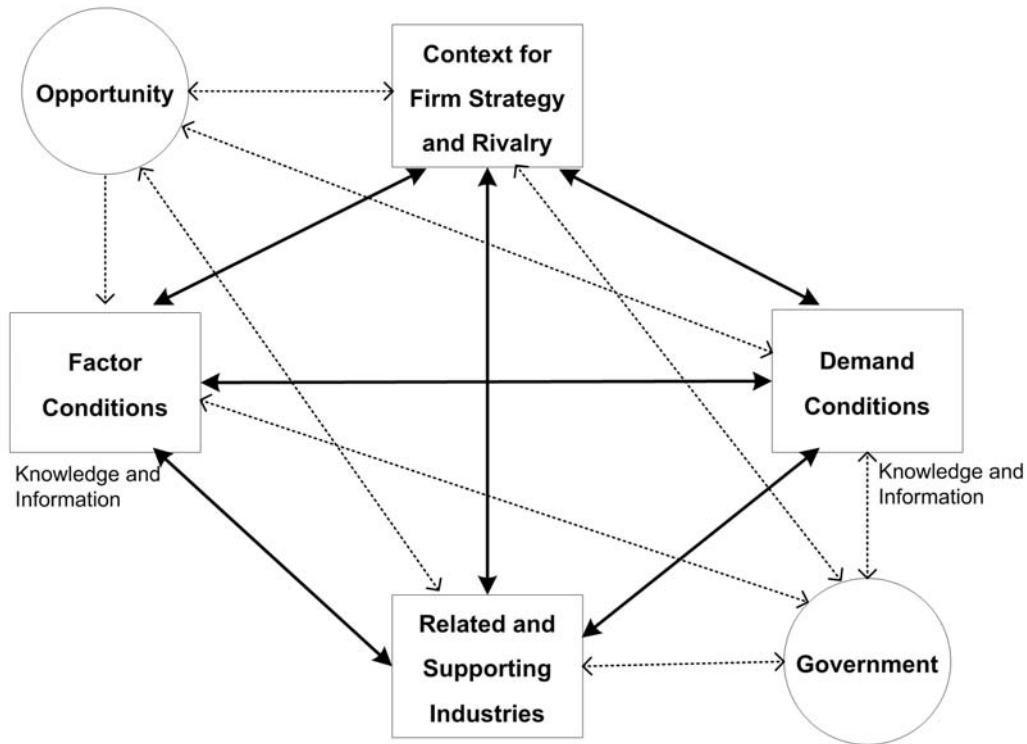


Figure 1: Role of knowledge and information in Porter's Diamond model

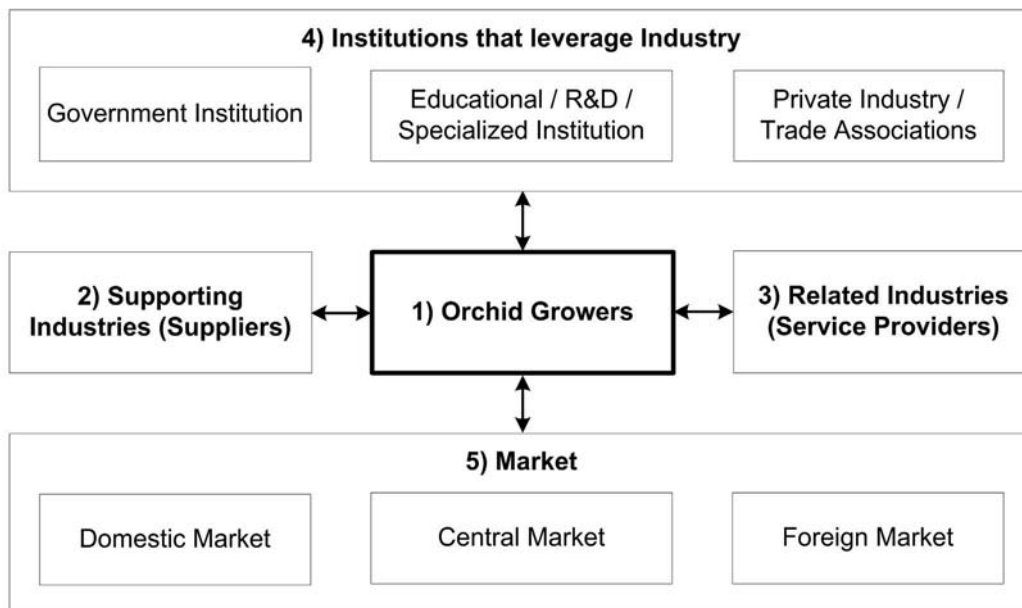


Figure 2: Thai orchid cluster map (Keoplang, 2011)

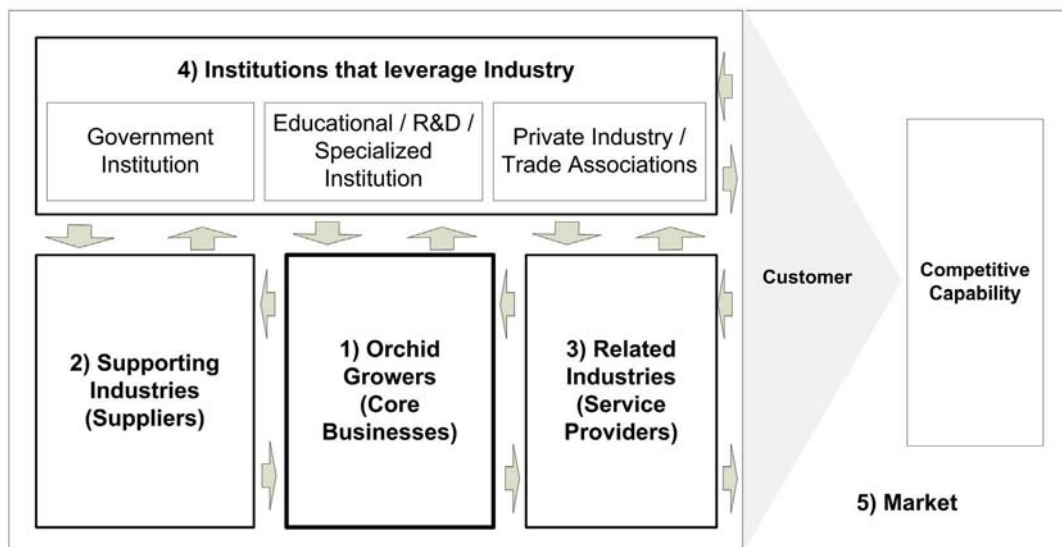
These critical challenges are closely intertwined. Upgrading quality and standards requires highly experienced and skilled human resources and sound logistics management. Presently, the Thai government is shifting its role to become more supportive in leveraging Thai orchid competitiveness. The aim is to reach a value generation of 10 billion Baht annually by 2012. This megaproject also encourages the sector to upgrade the quality and standards of exported orchids. Since Thai orchid cluster development has been led and driven by the private sector, they need tool to acquire and create the knowledge and information to leverage, maintain, and sustain their competitive capability.

### 3.2 Knowledge sharing and collaboration in the clusters

After the concept of industry cluster was tangibly applied in Thailand in 1999, companies in many industries began to form their cluster to maintain business competitiveness in the market. One key success factor behind their venture is knowledge sharing and collaboration among members of the cluster. Orchid production is the direct result from both science and arts that involve three cluster activities to enable knowledge sharing and collaboration in the cluster, namely, site visiting, meeting, and training. As explicit knowledge about orchid farming business is abundant in public domains, tacit knowledge which plays a key role is difficult to acquire since it is mostly passed down within family from generation to generation or sharing among trusted friends, excluding the outsiders. With the management of these cluster activities, CDA establishes the feeling of trust and equality among cluster member. After all, knowledge is fully shared and applied (from Interviewing CDA and orchid growers, 2011). We will use this finding to design KMS to replicate cluster activities on mobile using online site visit, telemeeting, and blended training approach.

### 3.3 Communication in the demand-supply chain

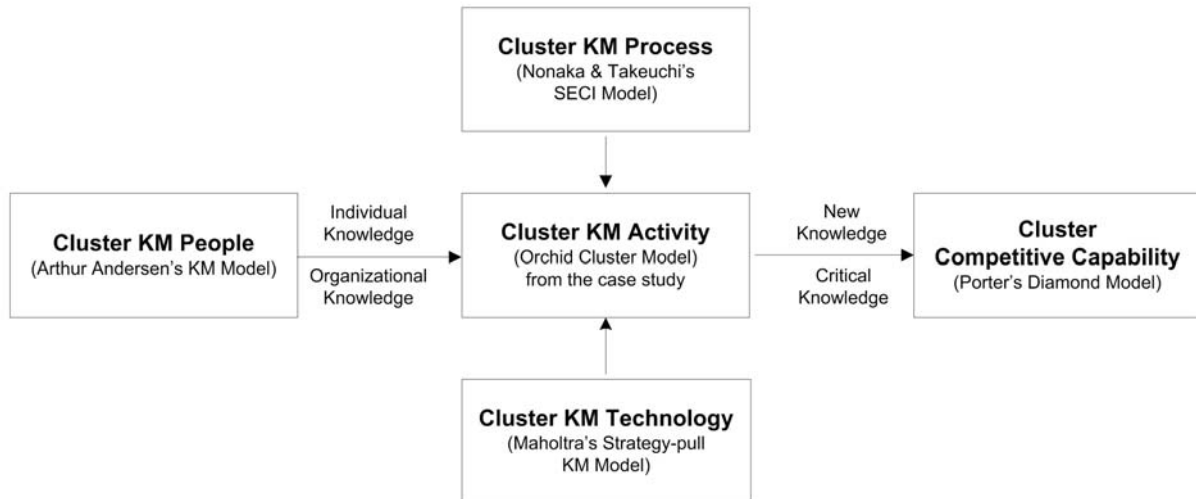
Collaboration in demand-supply chain aims to increase utilization and synchronization of the information chain. Unmatched production to market demand will result in business loss. The ability to make rapid decision constitutes a competitive advantage by decreasing the unknown or uncertain demand and supply. We apply cluster map concept to design knowledge flow in the demand supply chain. Figure 3 describes knowledge flow in the orchid cluster demand-supply chain adapted from Information technology permeates the value chain (Porter, 1985).



**Figure 3:** Conceptual knowledge flow in the orchid demand-supply chain (Keoplang, 2011)

## 4. Proposed approach

The proposed conceptual framework for KMS model has five modules. It is based on Porter's Diamond model for cluster competitive capability (Porter, 1998); Nonaka and Takeuchi's SECI model (Nonaka and Takeuchi, 1995) for cluster KM process; Maholtra's Strategy-pull KM model (Maholtra, 2005) for cluster KM Technology; Arthur Andersen's KM model (AA, 1998) for Cluster KM People; and Cluster KM activities from the case study research findings as illustrated in figure 4. This model emphasizes on innovation utilizing convergence of new smartphone technology and mobile learning technology on Social Network platform by assimilating cluster's KM activities among actors in the demand-supply chain to create cluster competitive capability. Visiting activity provides the host member the opportunity to share the know how to other members. Meeting activity is to arrange joint-problem solving. Training activity brings outside experts to transfer critical knowledge to tackle unsolved problems. However, by the nature of farming, distance, and unexpected incidents are the obstacles for participation in these activities. With this approach, all three clusters activities will be functioned on mKMS as complimentary to face to face activities. The proposed framework as illustrated in figure 4 will serve as a ubiquitous means to attain the aforementioned goals.



**Figure 4:** Knowledge Management System model for the industry cluster (Keoplang, 2011)

#### 4.1 Demand and supply chain processes: The value chain

Beech (1998) suggests three key elements, namely, the core processes of the supply and demand chain, viewed from a broad cross-enterprise vantage point; the integrating processes that create the linkage between the supply and demand; and the supporting infrastructure that makes such integration possible. Sureephong (2008) identifies key factors for developing collaboration that are trust and commitment, communication, and adaptation. Orchid cluster confirms that timely information among growers, exporters, and importers in the value chain are critical for making right decision in business (from interviewing CDA). We have identified key knowledge to focus on our study. They are Principle of orchid growing and Orchid production for commerce. Some preliminary case study results of this value chain will be furnished in Section 4.3.

#### 4.2 mobile Knowledge Management System (mKMS)

The system emphasizes the benefit of cluster KM activities by blending conventional face-to-face approach and face to handset display approach as part of the training activity. The cluster members can participate in conventional training session via real life, online, or view later on demand. For the meeting activity, it starts with a common goal among cluster members within individual constraints or limitations. The goal can be a problem, a project, or an interest that is agreed by cluster members. Limitations range from physical participation to knowledge analysis, synthesis, and evaluation.

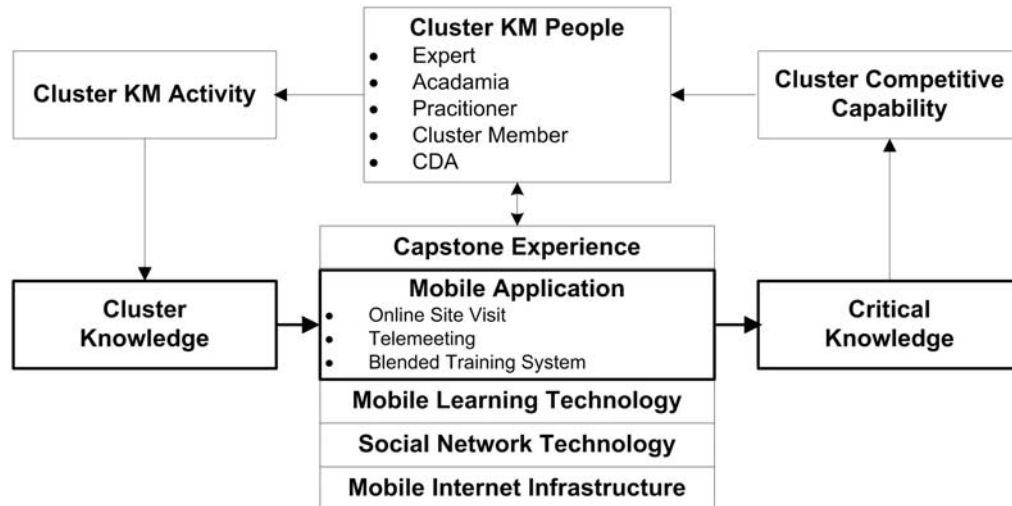
The emphasis of this mKMS is to facilitate cluster activities as much as possible, i.e., learning from seeing by visiting; learning from insider by meeting, and learning from outsider by training. This is not meant to replace but to complement the existing system by providing cluster activities online as an alternative. As these cluster activities are underway, the KM process cycle is activated and operated. This mKMS will provide online site visit, telemeeting, and blended training system as main functions on mobile to enhance KM cluster activities that have never been done before as KM tools for multilateral actors in this particular cluster.

Irrespective of the approaches, tacit knowledge and explicit knowledge are regularly acquired, classified, deposited, retrieved, and shared. Such an acquisition will gradually accumulate the repertoire of cluster competitive capability. The content of the knowledge will be recorded and shared on social network using smartphone. The proposed framework of mKMS is shown in figure 5.

#### 4.3 Hypothesis and testing

Based on theoretical model of embedded ties and acquisition of competitive capabilities to extend the benefit of the link between firms' networks and competitive capabilities (McEvily and Zaheer, 1997; McEvily and Marcus (2005), we hypothesized that:

*Hypothesis 1: Cluster KM activity will positively influence the cluster knowledge sharing and learning.*



**Figure 5:** Proposed mKMS framework for orchid cluster (Keoplang, 2011)

To overcome various limited capabilities of regular mobile phones such as restricted input methods, display screen size, and low rates of connectivity (Naismith *et al*, 2004), we conduct pilot test the viability of the proposed approach. The study used questionnaires survey to a group of 17 participants in orchid training program co-organized by colleges of agriculture and technology and Orchid Career Incubator Center and 5 orchid growers. The results are interpreted as following:

- Principle of orchid growing and orchid production for commerce are the most important subjects to learn.
- Learning at workplace is the most preferred mode of learning.
- Motivation for learning comes from the perceived benefit of the content.
- Cluster members learn and share knowledge most from cluster activities.
- Trust and sense of equality are prerequisites for knowledge sharing.

We conduct the second test by giving Samsung Galaxy Tab to the same 5 growers and interviewing post-treatment. The result shows that all participants are interested in using the technology, feel the ease of use, and see the benefits to the industry. This finding indicates that the orchid growers have tendency to use smartphone technology for knowledge sharing among cluster members. Next step we will conduct ethnographic exploratory research to test hypothesis 2 on a group of orchid growers.

*Hypothesis 2: Critical knowledge will be positively related to cluster competitive capabilities.*

This group is high potential cluster development ranked in top 15 from 322 production and service groups in Thailand based on criteria in Porter's Diamond model (Kenan Institute Asia, 2006).

#### 4.4 Expected benefits

The proposed model will furnish a number of fruitful benefits for orchid clusters as following:

- Provide knowledge to produce quality product,
- Provide information needed by demand-supply chain, and
- Provide a tool for human resource development.

Based on the case study, the first benefit apparently assists local orchid growers and the likes to attain high yields at superior quality. The next benefit facilitates timely supply to meet the demand, whereby greatly increases the volume of sale and minimizes perishable losses. The final benefit culminates the essence of E-learning that extends the realm of knowledge assimilation to a new horizon. As current training still uses old-fashioned approach which takes place every 2 months in the city, remote area growers who are unaware of or unable to attend can take advantage of mobile training function of mKMS conveniently.

## 5. Discussion

The proposed mKMS aims to provide a solution to cluster member for acquiring competitive capability and to solve many identified problems in areas of quality, logistics, and human resources. The cluster members need an effective and efficient tool to share information between growers and exporters/importers. The proposed framework will be carried out in a phased research project. At present, a number of alternatives are being realized which can be summarized as following:

- Smartphone is opportunistic mean for knowledge transfer in various forms exploiting its new multi-functionalities. This will motivate member's participation in all three cluster activities, whereby enhancing the KM process.
- Social networking websites can be appropriately integrated into the KM as a platform or learning and sharing tool among users.
- The KMS models as proposed by many researchers using conventionally management approach lacks of the flexibility, visualization, and ubiquity of mKMS. That is the reason why we establish the three activities as the gateway to build a real life and collaboration in life-long learning system.
- The framework is based on orchid clusters in Thailand to set up an M-learning base that exploits the smartphone capability, social network site, interviewing, observation, and participation of cluster members' activities. This group exemplifies the success story of industrial cluster development (Kenan Institute Asia, 2006). The results show that there is a potential of acceptance if the system is easy to use, encompasses usefulness, and can secure confidential data. Eventually, growers or business owners are looking for knowledge transferring tool to the next generation and a communication means as per on-demand basis to serve different needs.

## 6. Conclusion and future work

This study opened with the observation KM activities in the orchid cluster and exploring the existence of mobile learning technologies and social network site in the industry to define the basic requirements for the design of cluster mKMS. The finding shows key content for training and positive perception of using smartphone technology and the benefits it affords the industry. In the next stage, we will finalize on the specifications of a holistic strategic framework that enhances effective communication and knowledge sharing among actors in the orchid demand-supply chain. We will develop a prototype to propel the Thai orchid industry with a capstone mKMS. The main benefit is targeted to the orchid growers who are interested in exporting orchid to the world market. Additionally, future development will also include the collaborative environment where experts can enhance existing knowledge for community of practice as a whole. In the end, we will arrive at an innovative mKMS for Thai orchid clusters to create a sustainable edge by transforming orchid cluster to real time enterprise (Maholtra, 2005). The model of this system will be adapted to similar clusters in agricultural industries.

## References

- AA (1998), *Best Practices in Knowledge Management*, Arthur Andersen.
- Andrew, H.G. et al., (2001) "Knowledge Management: An Organizational Capabilities Perspective" *Journal of Management Information System*, Vol 18, No. 1, pp. 185-214.
- Aujirapongpan, S. (2010) "A Model of Knowledge Management Capability Development of Innovative Entrepreneurs in Thailand", PhD thesis, Chulalongkorn University, Bangkok, Thailand.
- Awad, E.M. and Ghaziri, H.M. (2004) *Knowledge Management*, Upper Saddle River, NJ: Pearson Educational Inc.
- Bajpai, B.R. (2011) "M-learning and Mobile Knowledge Management: Emerging New Stages of e-learning and Knowledge Management" *International Journal of Innovation, Management and Technology*, Vol 2, No.1, February, pp. 65-68.
- Beech J. (1998) *The Supply - Demand Nexus: From Integration to Synchronisation* (in "Strategic Supply Chain Alignment : Best Practices in supply chain management", edited Gattorna, J.), Gower, Hampshire, England.
- Boyett, J.H. and Boyett, J.T. (2001) *The Guru Guide: The Best Ideas of the Top Management Thinkers*, John Wiley & Sons Ltd., New York.
- Brown, J.S. and Duguid, P. (2000) "Balancing Act: How to Capture Knowledge without Killing it", *Havard Business Review*, Vol 78, No. 3, pp. 73-84.
- Darroch, J. and McNaughton, R. (2002) "Examining the Link between Knowledge Management Practices and Types of Innovation" *Journal of Intellectual Capital*, Vol 3, No. 3, pp. 210-222.
- Davenport, T.H. and Prusak, L. (1998) *Working Knowledge: New Organization Manage What They Know*, Harvard Business School Press, Boston.
- Faux, F., McFarlane, A., Roche, N. and Facer, K. (2006) "Learning with Handheld Technologies - A Handbook from Futurelab", [online], <http://archive.futurelab.org.uk/resources/publications-reports-articles/handbooks/Handbook198> .

- Gloet, M. and Terziovski, M. (2004) "Exploring the relationship between knowledge management practices and innovation performance", *Journal of Manufacturing Technology Management*, Vol 15, No. 5, pp. 402 - 409
- Hartwich, F. et al. (2007) "Knowledge Management for Agricultural Innovation: Lessons from Networking Efforts in the Bolivian Agricultural Technology System" *Knowledge Management for Development Journal*, Vol 3, No. 2, pp. 21-37.
- Henrie, M. and Hedgepeth, O. (2003) "Size is Important in Knowledge Management", *Journal of Knowledge Management Practice*, [online], [www.tlinc.com/artic153.htm](http://www.tlinc.com/artic153.htm) .
- Johnson, L., Smith, R., Willis, H., Levine, A., and Haywood, K., (2011). *The 2011 Horizon Report*. Austin, Texas: The New Media Consortium.
- Kenan Institute Asia (2006) "Final Report-Cluster Mapping for Leveraging Competitive Capability of Production and Service Sector" submitted to Office of the National Economic and Social Development Board, The Prime Minister Office, Thailand.
- Lundvall, B. and Nielson, P. (2007) "Knowledge Management and Innovation Performance", *International Journal of Manpower*, Vol 28, No. 3/4, pp. 207-223.
- Maginnis, F., White, R., and Mckenna, C. (2000) "Customers on the Move: m-Commerce Demands a Business Object Broker Approach to EAI", *eAI Journal*, November/December, pp. 58-62.
- Maholtra, Y. (2005). "Integrating knowledge management Technologies in organizational business processes: getting real time enterprises to deliver real business performance", *Journal of Knowledge Management*. Vol 9, No. 1, p. 7-28.
- Marquardt, M.J. (1996) *Building the Learning Organization*, McGraw-Hill, New York.
- Naismith, L., Peter Lonsdale, P., Vavoula, G. and Sharples, M. (2004) "REPORT 11: Literature Review in Mobile Technologies and Learning", [online], [http://archive.futurelab.org.uk/resources/documents/lit\\_reviews/Mobile\\_Review.pdf](http://archive.futurelab.org.uk/resources/documents/lit_reviews/Mobile_Review.pdf) .
- McEvily, B. and Macus, A. (2005) "Embedded Ties and the Acquisition of Competitive Capabilities", *Strategic Management Journal*, Vol 26, No. 11, pp.1033-1055.
- McEvily, B. and Zaheer, A. (1999) "Bridging Ties: A Source of Firm Heterogeneity in Competitive Capabilities", *Strategic Management Journal*, Vol 20, No. 12, pp. 1133-1156.
- Nonaka, I. (1991) "The Knowledge-Creating Company", *Harvard Business Review*, Vol 69, Nov-Dec, pp. 96-104.
- Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating company: How Japanese Companies Create the Dynamics of Innovation*, Oxford University Press.
- Onoparatvibool, P. (2010). *Competitive Challenges and Cluster Responses: Orchids, Cars and Electronics in East and Southeast Asia*. Ph.D. Dissertation. Erasmus University Rotterdam.
- Owen, M., Grant, L., Sayers, S. and Facer, K. (2006) "Open education: social software and learning", [online], [http://archive.futurelab.org.uk/resources/documents/opening\\_education/Social\\_Software\\_report.pdf](http://archive.futurelab.org.uk/resources/documents/opening_education/Social_Software_report.pdf)
- Panich, V. (2003) "Strategic knowledge management" (Thai), [online], <http://kmi.or.th>.
- Panich, V. (2004) "What is knowledge management?-to do to know" (Thai), [online], <http://kmi.or.th>.
- Parlby, D. and Taylor, R. (2000) "The Power of Knowledge: A Business Guide to Knowledge Management" [online], KPMG, [www.kpmgconsulting.com/index.html](http://www.kpmgconsulting.com/index.html).
- Plessis, M. and Boon, J.A., (2004) "The role of knowledge management in eBusiness and customer relationship management: South African case studying finding", *International Journal of Innovation Management*, Vol 24, No. 1, pp. 73-86.
- Porter, E.M. and Miller, V. (1985) "How Information Gives You Competitive Advantage", *Harvard Business Review* (Reprint 85415), July-Aug, pp. 1013.
- Porter, E.M. (1998) *The Competitive Advantage of Nations*, New York: The Free Press.
- Porter, E.M. (2008) "Clusters, Innovation, and Competitiveness: New Findings and Implications for Policy", Presentation at European Presidency Conference on Innovation and Clusters, Stockholm, Sweden, January.
- Scarborough, H., Swan, J. and Preston, J. (1999) *Knowledge Management: A Literature Review*, London, Institute of Personnel and Development.
- Sureephong, P., Chakpitak, N., Ouzrout, Y., Neubert, G. and Bouras, A. (2006) "Knowledge Management System for Cluster Development in Small and Medium Enterprises" in *Proceeding of International conference on Software Knowledge Information Management and Applications*, Thailand, p.15-20 [online], <http://hal.archives-ouvertes.fr/hal-00156803/fr/>.
- Sureephong, P., Chakpitak, N., Ouzrout, Y., Neubert, G., Bouras, A. (2007) "Knowledge Management System Architecture for the Industry Cluster" Author manuscript, published in *The Proceeding of The International Conference on Industrial Engineering and Engineering Management*, Singapore.
- Sureephong, P., Chakpitak, N., Buzon, L. and Bouras, A. (2008) "Cluster Development and Knowledge Exchange in Supply Chain" published in *The Proceeding of International conference on Software Knowledge Information Management and Applications*, Katmandu: Nepal.
- Sveiby, K. (1997) *The New Organizational Wealth*, Berrett-Koehler.
- Thai Customs Department. (2011) "Export Statistics" [online], <http://www.customs.go.th>.
- The Gartner (2011). "Gartner Identifies the Top 10 Strategic Technologies for 2011" [Online], <http://www.gartner.com/it/page.jsp?id=1454221>.