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; Parlby 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.

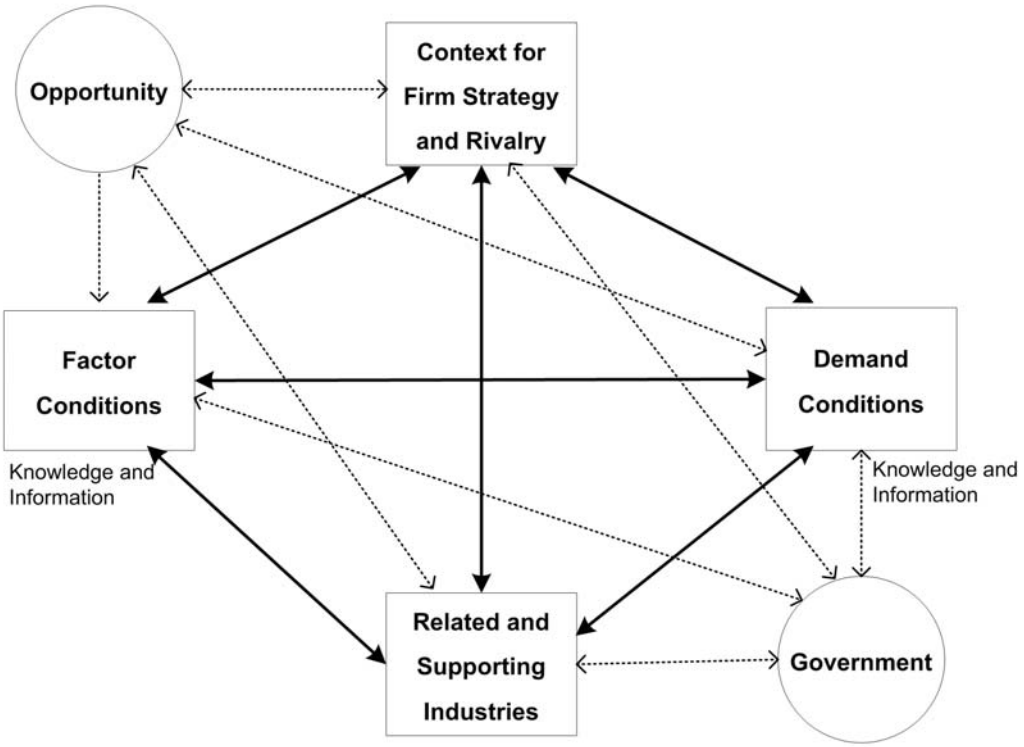

Figure 1: Role of knowledge and information in Porter's Diamond model

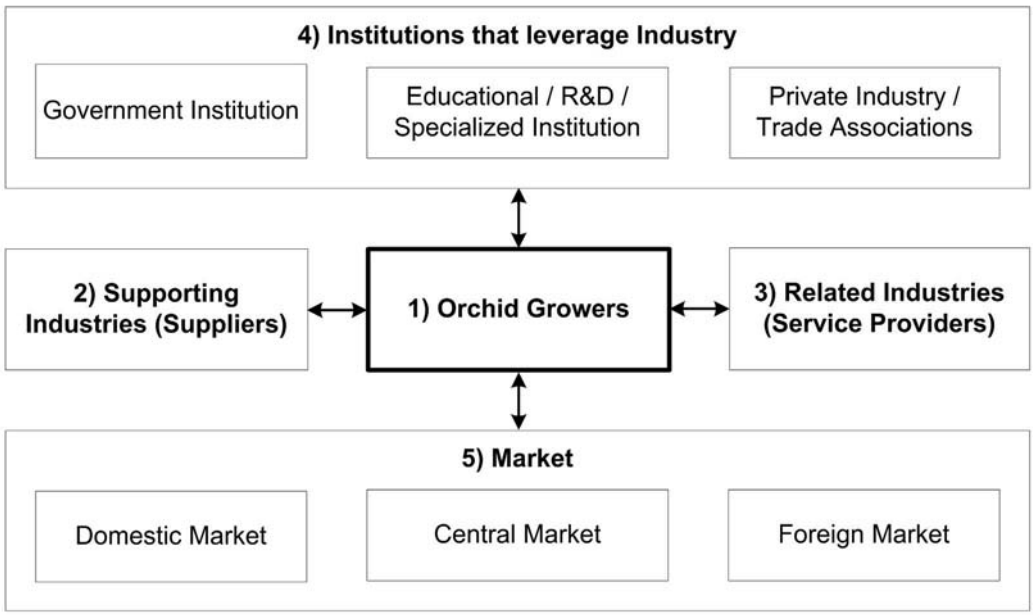

Figure 2: Thai orchid cluster map (Keoplang, 2011)

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).

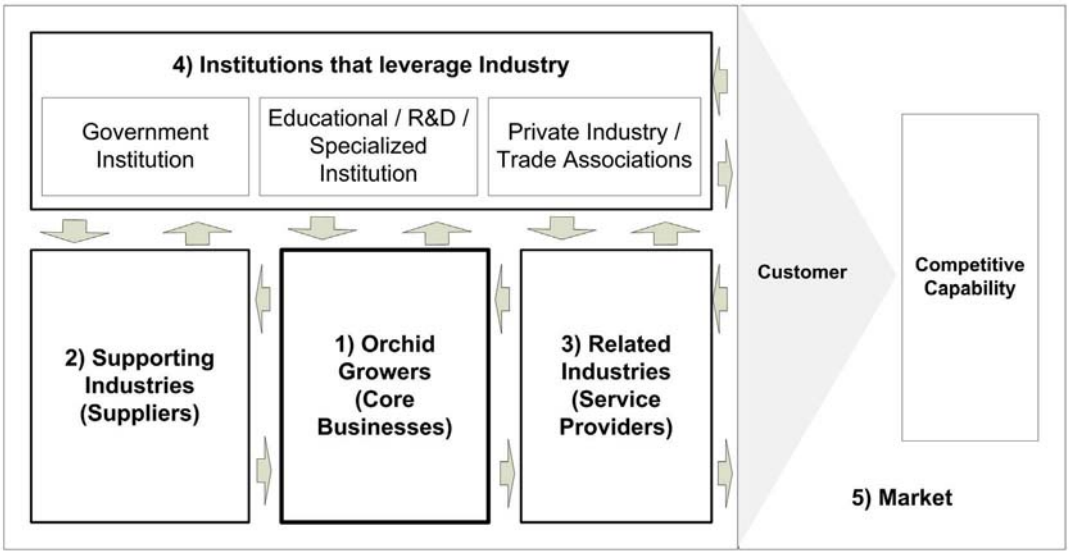

Figure 3: Conceptual knowledge flow in the orchid demand-supply chain (Keoplang, 2011)

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.

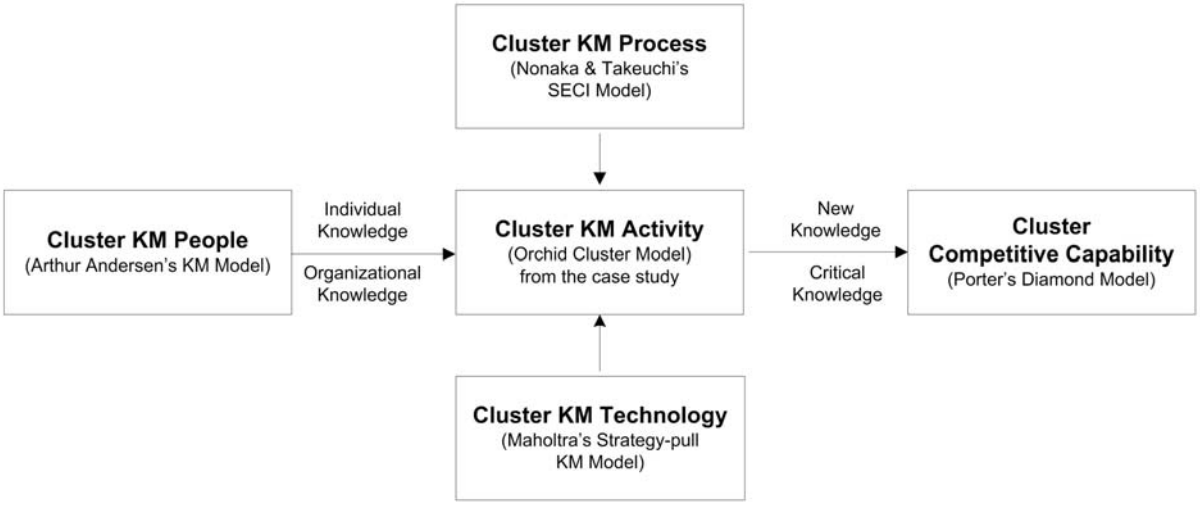

Figure 4: Knowledge Management System model for the industry cluster (Keoplang, 2011)

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.

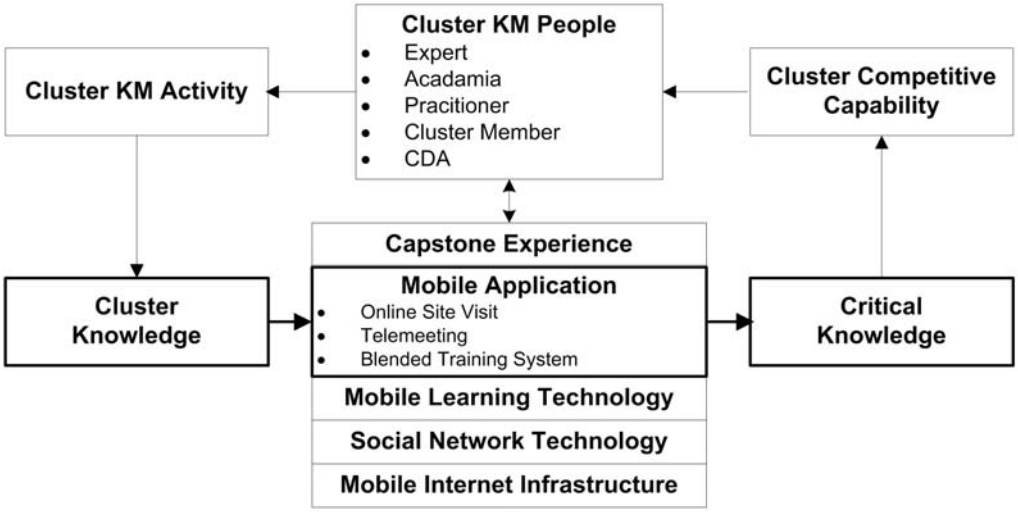

Figure 5: Proposed mKMS framework for orchid cluster (Keoplang, 2011)

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.

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