# Knowledge Transformation Flow (KTF) of Visually Impaired Students: The Virtual Knowledge System as a New Service Innovation

Chatcai Tangsri, Onjaree Na-Takuatoong

**Abstract**—This paper aims to present the key factors that support the decision to use the technology and to present the knowledge transformation flow of visually impaired students after the use of virtual knowledge system as proposed as a new service innovation to universities in Thailand. Correspondents of 27 visually impaired students are involved in this research. Total of 25 students are selected from university that mainly conducts non-classroom teaching environment; while another 2 visually impaired students are selected from classroom teaching environment. All of them are fully involved in the study along 8 weeks duration. All correspondents are classified into 5 small groups in various conditions. The research results revealed that the involvement from knowledge facilitator can push out for the behavioral actual use of the virtual knowledge system although there is no any developed intention to use behaviors. Secondly, the situations that the visually impaired students inadequate of the knowledge sources that usually provided by assistants i.e. peers, audio files etc. In this case, they will use the virtual knowledge system for both knowledge access and knowledge transfer request. With this evidence, the need of knowledge would play a stronger role than all technology acceptance factors. Finally, this paper revealed that the knowledge transfer in normal method that students have a chance to physically meet up is still confirmed as their preference method. In term of other aspects of technology acceptance, it will be discussed together with challenges and recommendations at the end of this paper.

**Keywords**—Knowledge system, Visually impaired students, Higher education, Knowledge management enable technology, Synchronous/Asynchronous knowledge access, Synchronous/Asynchronous knowledge transfer.

## I. INTRODUCTION

IN Thailand, a statute of education for disabled population announcement 2551 (year 2008) has mentioned one of the equality in education that disabled population has the rights to obtain the education service without costs since the first recognition of disability for lifelong. The services include for both the assistive technology and other related study support services. DSS that stands for disability support service organization has been formed and operating for years in universities but not anywhere. Many studies in the past contributed on the assistive technology development and improvement for people visually impairment to shift their ever day's life. While the few cases focused in individuals' learning aspect. The main contribution of this study is to explain how the

Chatcai Tangsri is with the Technopreneurship and Innovation Management Program, Graduate Institute, Chulalongkorn University, Bangkok, Thailand.

Onjaree Na-Takuatoong is with the Faculty of Education, Department of Technological Education, Chulalongkorn University, Bangkok, Thailand (Corresponding author; e-mail: Onjaree.n@chula.ac.th).

virtual knowledge system assists in knowledge transformation for visually impaired students. Finally, this study attempts to discuss of the related factors behind the knowledge transformation flow in term of technology acceptance.

## II. LITERATURE REVIEW

### A. What is the Difference between vCoPs and COPs?

Meaning of Community of Practice (CoPs) was firstly introduced in 1991 that explained the combination of Domain, Community and Practice [1]. Traditional CoPs supports the community members to meet and practice the activity in groups in the same place but this model is not applicable when taking into the same place has become a serious issue. Later the application of CoPs is wildly supported by information technology to get rid of the constraints of time and place in joining the knowledge access and transfer activities. This coming of information technology has made CoPs come out virtually under the term of virtual community of practice (vCoPs) that allows community members to flexibly interact to each other in the same time or differently. Therefore, the mode of interaction topic should be added for further implications discussion in details to fulfill the extension of vCoPs. Normally synchronous interaction mode is applied when virtual knowledge member join the knowledge activities same time while asynchronous interactive mode explains the knowledge activities that conducted in different time among community members.

### B. Previous Studies for Information Access

#### 1. World Wide Web for Information Access

Although the World Wide Web technology has been applying to extend the use of information access for visually impaired people for decades but knowledge workers or users still encounter with many implementation issues such as speech synthesis software development, search engines interface or difficulty of web accessibility standard [2]. However, the computer literacy and internet availability is another considerable issue that reinforces the knowledge service limitation over the World Wide Web.

#### 2. Special Service or Feature for Information Access

There are different kinds of eyes' sight disability, regarding to critical needs from various disability types researcher has found some service concerns from previous study that demonstrated the new special service might need to be

considered [3]. The new service was implemented to support the National Library project that offered specific translation and vocal filtering service [4].

### 3. Telephone Dial for Information Access

With today's telephone technology is much improved and cheaper therefore it is wildly for all people and not limited to visually impaired people. Previous studies proposed a solution of using telephone dial to access the information for this group of people [5] and came out with positive results. It's possible to further enhance the telephone dial access technology or to combine with another supportive technology that allows users to learn in group.

### III. RESEARCH DESIGN

Group 1 and 2 of the correspondents were selected from Open University that usually conducts non-classroom teaching method; all of them work fulltime on the working days. Face-to-face knowledge transfer session allows the first meeting among them. They have involved in 20 sessions of face-to-face knowledge access and knowledge transfer activities that provided by the DSS officer. At the end of activity, one of them has demonstrated high participation rate in questioning and encouraging other members to express both tacit and explicit knowledge. However, researcher has not found the knowledge access and knowledge transfer activity from these groups although additional knowledge contents have been added into the virtual knowledge system. The interview results revealed their concerns in careers and knowledge access fees.

Group 3 and 4 of the correspondents were selected from Open University same as group 1 and 2 but the difference is that there is no face-to-face knowledge transfer experiences provided to them before start using the virtual knowledge. Furthermore, researcher has put the involvement from knowledge facilitator into the group3. Both of group 3 and 4, students don't have audio files.

Group 5 of the correspondents under inclusive education environment were selected from Close University, 2 of them are visually impaired students. Their teaching methodology is different whereby the classroom attention is formally required for the course evaluation. Having this condition, all of them consequently meet and participate in educational activity for both formally and informally almost every day. After this group has done few sessions of face-to-face knowledge transfer, the average session participation shows a higher rate when compares to group 1 and 2. Researcher found out that relationship plays a supportive role to the session; many questions and suggestions fluently flow across the sessions. The interview provides more explanation that all of them are closed and provide peer assistance to each other for more than 2.5 years.

TABLE I
VIRTUAL KNOWLEDGE ACCESS INVESTIGATION RESULTS

| Samping Group Teching environment | Group | Facilitator involved | No. | Perceive | | Attitude | Behavioral Intention to use | Actual use (virtually) | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Usefullness | Ease of use | | | Knowledge Access | Knowledge Transfer |
| Non-classroom | 1,2 | Yes | N01 | Y | Y | Y | | N, N | N, N |
| | | | N02 | Y | Y | Y | | N, N | N, N |
| | | | N03 | Y | Y | Y | | N, N | N, N |
| | | | N04 | Y | Y | Y | | N, N | N, N |
| | | | N05 | Y | Y | Y | | N, N | N, N |
| | 3 | Yes | N06 | Y | Y | Y | | Y | *y |
| | | | N07 | Y | Y | Y | | N | N |
| | | | N08 | Y | Y | Y | | N | N |
| | | | N09 | Y | Y | Y | | Y | *y |
| | | | N10 | Y | Y | Y | | N | N |
| | 4 | No | N11 | Y | Y | N | Y | N | N |
| | | | N12 | Y | Y | N | Y | N | N |
| | | | N13 | Y | Y | Y | Y | N | N |
| | | | N14 | Y | Y | Y | N | N | N |
| | | | N15 | Y | Y | Y | N | N | N |
| | | | N16 | Y | Y | N | Y | N | N |
| | | | N17 | Y | Y | N | Y | N | N |
| | | | N18 | Y | Y | N | N | N | N |
| | | | N19 | Y | Y | Y | Y | N | N |
| | | | N20 | Y | Y | N | Y | N | N |
| | | | N21 | Y | Y | Y | N | N | N |
| | | | N22 | Y | Y | N | N | N | N |
| | | | N23 | Y | Y | N | Y | N | N |
| | | | N24 | Y | Y | Y | Y | N | N |
| | | | N25 | Y | Y | Y | N | N | N |
| Classroom (inclusive education) | 5 | No | C01 | Y | Y | Y | N | Y | N |
| | | | C02 | Y | Y | Y | N | Y | N |

## IV. RESEARCH RESULTS

### A. The Behavioral Intention to Use on the Virtual Knowledge System is Applicable to the Case Below

Group 3 (students have no audio files and have no face-to-face knowledge transfer experiences, they were selected from non-classroom teaching environment, knowledge facilitator only paid to this group)

1. The involvement of knowledge facilitator that paid on this group; it encourages their behavioral actual use of virtual knowledge system although the behavioral intention to use was not there at the beginning.

### B. The Behavioral Intention to Use on the Virtual Knowledge System is NOT Applicable under the Cases Below

Group 1 and 2 (students have audio files and face-to-face knowledge transfer experiences, they were selected from non-classroom teaching environment)

1. Students have audio files and have face-to-face experiences although the usefulness, the ease of use and the attitude of the virtual knowledge system are all positive.

Group 3 (students don't have both audio files and face-to-face knowledge transfer experiences, they were selected from non-classroom teaching environment)

1. Group 4 is similar to Group 3 but only no involvement from knowledge facilitator, there are few cases that although 3 positive feedback falls into all factors but there is no behavioral intention to use the virtual knowledge system, an in-depth interview revealed that their fulltime career and cost of service access are their concerns.

Group 5 (students have audio files and face-to-face knowledge transfer experiences, they are selected from classroom teaching environment)

1. Students have explained that they didn't intend to use the virtual knowledge system because they perform the face-to-face knowledge transfer among peers as usual. They remarked that they realized the usefulness, ease of use and have positive attitude to the system but they still prefer the face-to-face than the virtual one.

This group was selected from classroom teaching environment from closed university.

Refer to the findings; the knowledge transfer behavior through the virtual knowledge system was not happened from the observation of sampling groups 1, 2, 4 and 5 while it was detected from the group 3 that the knowledge facilitators tangibly involved into this group. Simultaneously, the knowledge transfer in face-to-face mode was arisen in the group 5 but not through the virtual knowledge system. An in-depth interview makes researcher perceives that members from group 5 have strong believes in synchronous knowledge transfer that cause to a real-time interaction among members. Their preference in face-to-face is the main reason that block the intention to use of the virtual knowledge technology.

Teaching environment of the group 5 would bring another analysis. Actually, there are 2 different teaching environments namely the classroom and non-classroom teaching environment. The members from group 5 were selected from the inclusive education that consists of both visually impaired students and normal sight students. The being of classroom teaching fixed-schedule supports their free time face-to-face opportunity and bridge to the knowledge transfer activity under real-time interactions.

[6] Kluge and his team revealed the knowledge management survey results in his book *Knowledge Unplugged* that "This is not to say pull is good and push is bad. It is a question of finding the right mix between the two approaches. At the more-succesful companies we visited there was a balance of pull and push measures." The virtual knowledge system that used in this research supports only the knowledge pull strategy in asynchronous mode while the knowledge push strategy has been performed by the knowledge facilitators manually by the action of knowledge seek encouragement to the group 3 and cause to the positive knowledge transfer actual use at then end. The improvement on further virtual knwoeldge system for visually impaired students would focus on the knowledge push fuctions that would be done by system rather than human and another area would be the extension of synchronous real-time discussion function that possibly fulfill the knowledge pull strategy and needs for the members like group 3.

## V. CONCLUSION

Researcher synthesizes the knowledge transformation flow that represent the knowledge flow of visually impaired students after using the virtual knowledge system along the 8 weeks duration of system test. There are 2 important technology levels that support the virtual knowledge system (1) knowledge access enabler technology and (2) knowledge transfer enabler technology.
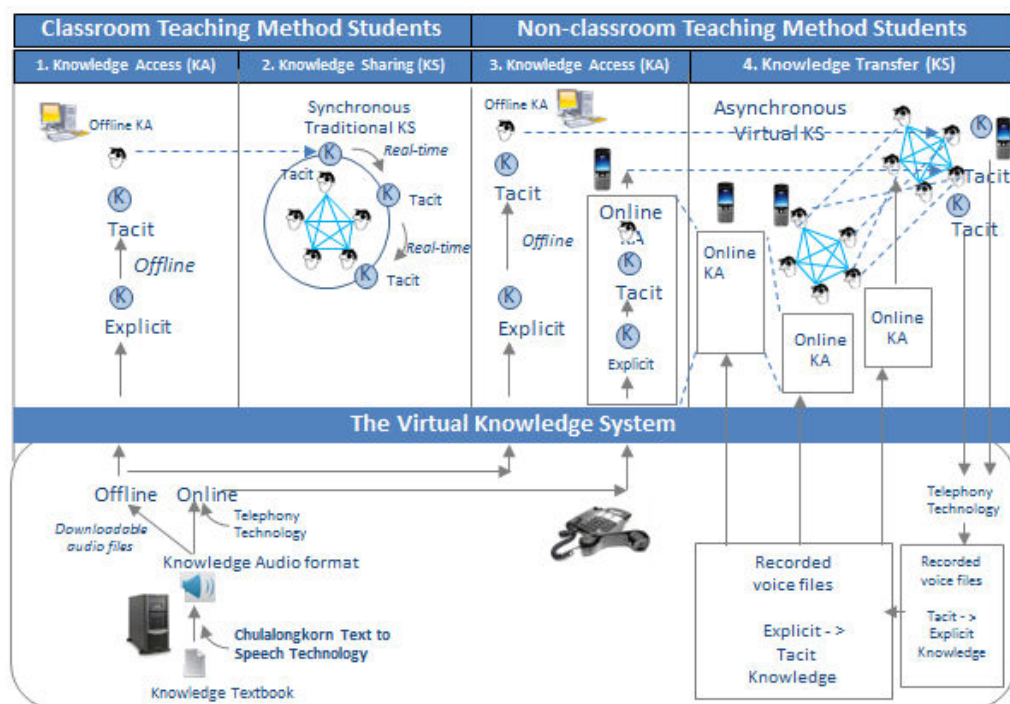
Fig. 1 Knowledge Transformation Flow of visually impaired students' classroom and non-classroom teaching environment

## VI. FUTURE WORK

Currently this research provides the knowledge transformation flow using knowledge system that the visually impaired students involved in 8 weeks duration. This research also revealed the most important factor that supports the use of knowledge system. The future work might be on the knowledge use or the knowledge system sustainability.

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